A CENTURY OF STEAM RAILWAY DEVELOPMENT

SIR HENRY THORNTON

ALTHOUGH the year 1925 is generally accepted as marking the hundredth anniversary of steam railways, and September 27th is the date actually observed, railroads and the use of steam as a means of locomotion came into being over twenty years before 1825. In fact, it is recorded that as early as the year 1530 crude rails were used for the convenience of the trams in which ore was hauled in the mines of the Tyrol.

Ask the average person who invented the steam locomotive, and the immediate answer will be "Stephenson." Ask him whether it was George or Robert, and an element of doubt will at once arise in his mind. Mention the name of Trevithick, and unless he has made a thorough study of railroads and their development he will tell you he never heard of the name. Yet Richard Trevithick and his cousin Andrew Vivian built the first locomotive which successfully hauled a train, and they put it into operation in February, 1804. Even ask many railroad men the name of the first railroad, and the answer will be the Stockton & Darlington, the hundredth anniversary of the inauguration of whose service was September 27th of this year. But even this is incorrect. The Stockton & Darlington Railway's distinction lies in the fact that it was the first railway to carry both passengers and freight, and for that reason modern steam railroading is dated from the opening of this company's service between Stockton and Darlington. The operation of Trevithick's locomotive between Merthyr Tydvil and the Aberdare Canal at Abercynon, nearly twenty-one years before, had been exclusively for hauling freight and mine products, while other steam railways previous to the opening of the Stockton & Darlington were used for similar purposes.

With these few common errors corrected, it would perhaps be well to revert to the discovery of steam as a source of power. To James Watt, a Scotsman, we all agree must be given the credit for discovering the compound nature of water and the elastic force of steam, which was first employed in stationary engines and for pumping water; but even during the early days of its use for this

purpose inventive geniuses bent their efforts towards its use for the purpose of locomotion. To Trevithick must be given credit for having built the first successfully operated locomotive, which not only propelled itself, but also hauled a load of thirteen tons for nine miles at the rate of five miles an hour; but as far back as 1763 attempts had been made to adapt steam to locomotion. Nicholas Joseph Cugnot, a Frenchman, invented a steam carriage, but it failed entirely and was discarded after its first trial. In the meantime an inventor by the name of Evans attempted to obtain patents in the United States for applying steam to locomotion, but it was thought that his invention was the fancy of a disordered mind. In 1781 William Murdoch and in 1786 William Symington lent their efforts towards the application of high pressure steam to locomotion; yet it remained for Trevithick not only to produce the first successful locomotive, but to develope in 1808 another engine weighing ten tons and capable of a speed of ten miles an hour.

The development of steam locomotives passed through many and strange stages in rapid succession in those early days. Engineers of that period feared that the locomotive would never be successful, foreseeing a difficulty in making the wheels adhere to smooth rails under the strain of a load. To overcome this, John Blenkinsop of Middleton Colliery, Leeds, developed a rack railway in 1811 whereon a suitably geared locomotive was operated. A year later W. and E. W. Chapman built a railway on which a chain, anchored at both ends of the line, was wound around a grooved drum, and the locomotive actually pulled itself along by this means. The "walking engine," built at Butterley Iron Works in 1813 by Brunton, showed another early conception of what the locomotive should be. Probably the outstanding development of the chrysalis stage of the locomotive was that made by William Hedley, who in 1813 coupled all the wheels together by gear, thus increasing the adhesion to the rails. In this venture Hedley was assisted by Timothy Hackworth, and the result was "Puffing Billy," the first of all locomotives remembered by name.

Then follows the name familiar to all and most frequently associated with the early development of the locomotive—Stephenson. It was in 1814 that he appeared on the scene. His first locomotive was the "Blucher," and from the day it was given its first successful trial down to the present time the name Stephenson has constantly been associated with locomotive building in England. The year following the appearance of the "Blucher," George Stephenson—with the aid of Ralph Dodds—developed a nearer approach to the modern locomotive by building an engine in which

the drive was given direct to the wheels without the aid of gears. Discussing this locomotive, a contemporary publication said: "We scout the idea of a general railroad as altogether impracticable. The gross exaggeration of the powers of the locomotive steam engine may delude for a time, but must end in the mortification of those concerned"; and of its inventor it was remarked in parliament that he would "inevitably damn the whole thing and be himself regarded as a maniac fit for Bedlam."

It was about 1821 that the question of locomotive power of the Stockton & Darlington Railway was first suggested. George Overton, the original surveyor of the railway, had dropped out, and George Stephenson prepared plans for a new route abolishing the sharp curves and eliminating the cutting proposed by Overton in his effort to obtain a level route. Stephenson's scheme introduced gradients, and it became evident that machinery would be required to haul trains over such a line—not necessarily locomotives, but machinery which was then not unknown to railroads, Benjamin Thompson of Ayton having just patented a method of continuous movement of trains by having one train—hauled from a given point by a stationary engine—take with it the tail of a rope which would haul another train in the opposite direction. Thompson in the glow of pride over this scheme of locomotion did all possible to disparage steam locomotives, but at that point Edward Pease, the James J. Hill of early railroading, came to the front. It was Pease who planned and financed the Stockton & Darlington, and it was Pease who finally decided that stationary engines should be used on both sides of the Brusselton incline and on the north side of Etherley. The inclined plane on the south side of Etherley provided for itself, and on the remainder of the line Pease's decision was in favor of locomotives. At least Pease was "playing safe". The stationary engines were ordered, and on September 16th, 1824, the railroad's two locomotives were requisitioned.

"Locomotion No. 1" was the name of the Stockton & Darlington's first engine, and it is still preserved,—an object of curiosity and a worthy fore-runner of the modern locomotive. It weighed $6\frac{1}{2}$ tons! The modern freight locomotive on the Canadian National Railways weighs 325 tons. This comparison, perhaps, gives a striking illustration of the strides that have been made in railroad practice and operation during the century. "Locomotion No. 1" was followed by the "Hope," "Black Diamond," "Experiment" and "Royal George," and in rapid succession others were produced, each introducing improvements, some successful, others discarded after trial, none fully justifying the locomotive in the minds of all.

Even in 1828, when James Walker and John Urpeth Rastrick were given a commission to report on railways, they made the frank statement that stationary engines were superior to locomotives, and that the one redeeming feature about the latter was that there was more ground for expecting improvements in them than in engines of a stationary type.

It was not until 1829 that the success of the locomotive was finally determined, and again the name of Stephenson is coupled with the success. The Liverpool & Manchester Railway directors, in their dilemma to determine once and for all whether a locomotive of unquestioned ability to haul trains could be developed, offered a prize of £500. Competing for the prize were the "Novelty" by James Braithwaite and J. Ericson, "Sans Pareil" by Timothy Hackworth, "Perseverance" by T. Burstall, "Cyclopede" by T. S. Brundreth, and the famous "Rocket" built by George Stephenson, his son Robert, and Henry Booth. The "Rocket" developed a speed of 24 miles an hour, and then and there the future of the locomotive was assured.

To tell the complete story of the development of the locomotive would consume considerable space. To describe the various stages of its transition would be to write pages of railway history, and to tell the story of the evolution of the steam locomotive to the present Mallet, Pacific, Mountain and Santa Fé types would involve chapters of treatises on mechanics. This is the story of the development of the railroad from the days of 1676, when Roger North described "bulky carts on four rowlets", to the present era of steam locomotion.

How true is that trite saying "History repeats itself"! For just as in a later period Canada's first railways were constructed as portage lines connecting the waterways of traffic, so were England's first railways supplementary to her canals. Also, just as Canada had its period of railroad construction when group after group vied with one another in obtaining charters, so in England were there no fewer than twenty applications for Acts creating railways before the Stockton & Darlington Railway was built. All the preceding is, then, preliminary to the event which was celebrated in the railway world this year. All this was the modern steam railway in its embryo state. Now let us consider the occasion which we are actually commemorating—the opening of the Stockton & Darlington on September 27th, 1825.

On the 19th September, a week before the big event, a strange public notice was posted at Darlington. It read as follows:

The
STOCKTON & DARLINGTON
RAILWAY COMPANY
Hereby give Notice,

THAT the FORMAL OPENING of their RAILWAY will take place on the 27th instant, as announced in the public papers;—The Proprietors will assemble at the Permanent Steam Engine, situated below Brusselton Tower, about nine miles west of Darlington, at 8 o'clock, and, after examining their extensive inclined Planes there, will start from the foot of the BRUSSELTON descending Plane, at 9 o'clock, in the following order:

1. THE COMPANY'S LOCOMOTIVE ENGINE.
2. THE ENGINE'S TENDER, with Water and Coals.
3. SIX WAGONS, laden with Coals, Merchandise, etc.
4. THE COMMITTEE, and other PROPRIETORS, in the Coach belonging to the COMPANY.
5. SIX WAGONS, with Seats reserved for STRANGERS.
6. FOURTEEN WAGONS, for the Conveyance of Workmen and others.
   The WHOLE of the above to proceed to STOCKTON.
7. SIX WAGONS, laden with Coals, to leave the Procession at the DARLINGTON BRANCH.
8. SIX WAGONS, drawn by Horses, for WORKMEN and others.
9. Ditto Ditto
10. Ditto Ditto
11. Ditto Ditto

☞ The COMPANY'S WORKMEN to leave the Procession at DARLINGTON, and DINE at that Place at ONE o'clock; excepting those to whom Tickets are specially given for YARM, and for whom Conveyance will be provided, on their Arrival at STOCKTON.

TICKETS will be given to the Workmen who are to dine at DARLINGTON, specifying the Houses of Entertainment.

The PROPRIETORS, and such of the NOBILITY and GENTRY as may honour them with their Company, will DINE precisely at THREE o'clock, at the TOWN HALL, STOCKTON;—Such of the Party as may incline to return to DARLINGTON that Evening will find Conveyances in waiting for their Accommodation, to start from the COMPANY'S WHARF there precisely at Seven o'clock.

The COMPANY take this Opportunity of enjoining on all their WORK-PEOPLE that Attention to Sobriety and Decorum which they have hitherto had the Pleasure of observing.

The COMPANY give this PUBLIC NOTICE, that all Persons who shall ride upon, or by the sides of, the RAILWAY, on Horseback, will incur the Penalties imposed by the Acts of Parliament passed Relative to this RAILWAY.

It must indeed have been a strange procession of "carriages" that travelled over the Stockton & Darlington that day by means of stationary engine power, gravity, steam locomotive and horse. But simple as was the locomotive and crude as were the carriages in which passengers and workmen rode, they were the true forerunners of the modern steam railway. They marked the beginning of the era of real progress in railroading.

Opposition to the railway did not cease, however, with this successful opening. Many predicted absolute failure, and others classed the locomotive, emitting sparks and belching steam and smoke, among the works of the devil. A German doctor of this period, for example, declared that it would be impossible for people to watch trains pass at the terrific speed of twenty miles an hour without going mad, and predicted that cows' milk would turn sour unless barriers were erected beside the tracks to cut off the view. Almost as amusing is a contemporary account of the opening of the Cumberland Valley Railroad in the United States in 1837, which read thus:

> Dogs dropped their tails between their legs and ran like frightened fiends, howling and trembling, to the far-off mountains. Men there were who cleared ditches and fences at a single bound as the hissing engines approached. Old men and women leaned on their staffs and gazed with visible awe as if Doomsday were at hand.

And this from a resolution passed by a schoolboard in Ohio not so many years ago:

> You are welcome to use the schoolhouse to debate all proper questions in. But such things as railroads and telegraphs are impossible and rank infidelity. There is nothing in the Word of God about them. If God had designed that his intelligent creatures should travel at the frightful speed of 15 miles an hour by steam, He would have foretold it by the mouth of His holy prophets. It is a device of Satan to carry the souls of the faithful down to hell.

But in spite of such antagonism and criticism the steam railroad rapidly came into its own, and not many years had passed before the Anglo-Saxon world entered what might properly be termed a railway era. By 1843, twenty-four railway Acts had passed the British parliament. In 1844 thirty-seven more were added, and by 1845 public opinion had been entirely reversed, with the result that a mania for railroads spread throughout the country and by the end of that year the lines projected and authorized totalled 1,428, with a capitalization aggregating approximately $3,500,000,000.

It is unnecessary to state that not all these lines were constructed, and that many of them were never finally authorized.

While all this was going on, railway equipment went through various stages of improvement. New types of locomotives were developed, greater comfort and convenience for passengers were provided, guards and employees were given more consideration. It is even surprising to note the speed attained by some of the earlier engines. We are inclined to look with pride to-day on our great locomotives, and picture them travelling at the rate of a mile a minute; but when we reflect, and remember that Stephenson's "Rocket" made six miles in six and a half minutes, one wonders if this is really the age of speed.

Perhaps the greatest development of the earlier period of railroading was in the matter of rails and ties. This feature of railroading is by no means spectacular, and it lacks the romance that is found in the development and improvement of rolling stock, but the railroad man knows how much speed, comfort and safety depend upon rail and road-bed. The first rails were of beech and sycamore, laid on transverse sleepers of oak placed about two feet apart. This type of road was improved when wooden rails were superimposed on longitudinal timbers which, in turn, rested on transverse sleepers. Later came the wooden rail with a metal surface, and then the rectangular rails of iron, four inches by one and a quarter inches by five feet, laid on longitudinal oak rails fastened by pins to sleepers. Angle iron rails with flanges followed, and then T-rails with flanged wheels on the rolling stock. Other types included the fish-bellied rail which was popular for a time, and for a period stone blocks were used in place of wooden ties. Some of the rails of this period weighed 28 pounds to the yard, as contrasted with the 100 pound rails of to-day. It was about this time that a type of rail was developed which required no ties, and for a time it looked as if this would be a marked improvement and would make for economy. It failed, however, because no provision had been made for expansion and contraction. It was not until the eighties that rails 30 feet in length were used. Then there came the tendency to double that length, but eventually 45 feet became the standard.

During this period the matter of gauge remained unsettled. Seven feet was the gauge of the original steam railway, and after passing through many changes the 4 feet $8\frac{1}{2}$ inches gauge was adopted as standard. Strangely enough, England—though progressive in other railway matters—was the last country in which standard gauge was finally adopted by all railways.

In the matter of adopting steam as a means of locomotion Canada was not far behind the Mother Country. It was in 1832—seven years after the opening of the Stockton & Darlington Railway, and only two years after the completion of the Liverpool and Manchester line—that the legislature of Lower Canada granted a charter for the construction of the Champlain & St. Lawrence Railway from Laprairie on the St. Lawrence river to St. John's, sixteen miles distant, on the Richelieu river. Up to this time communication between New York and Montreal had been chiefly by water, and here again we see that Canada's first railroad, like the early rail lines of Britain, was constructed as a portage road—an auxiliary to, rather than a substitute for, the existing routes of water travel. Construction on this line was commenced in 1835. In July, 1836, the wooden rails with thin flat bars of iron protecting their surface were laid between the two terminals, and the first trains over the route were hauled by horses. The following year the "Kitten," a locomotive from England, was placed on the rails. The trial was made under cover of darkness, and the "Kitten" refused to move. In the meantime the Baltimore & Ohio Railway had had success with the operation of steam locomotives, and an engineer was imported from this line. Like the experienced garage employee who always looks for the empty gasoline tank in a stalled motor, this engineer discovered that all the "Kitten" needed was more fuel and water. With this supplied, the locomotive developed a speed of 20 miles an hour. By 1852 the rails of this line had been extended to Rouses Point, N. Y., thus shortening the water route to New York, and virtually marking the beginning of the substitution of railroads for water transport in Canada. For ten years this line held the distinction of being the only Canadian railroad.

By this time 2,800 miles of track had been laid in the United Kingdom. Many roads were projected, many charters were applied for; but political and financial troubles prevented the consummation of these plans, and it was not until 1845, when the railway mania broke out in England, that Canada found available capital and sufficient interest to develope more extensive plans of railway construction. The aggressiveness of the United States and its bid for western traffic also had influence then as in the later days when the Canadian Pacific was projected.

Canada's second railway was eight miles long. It was completed in 1847, and extended from Montreal to Lachine, taking the place of the stage route. Next came the line between Caughnawaga, Que., and Mooer's Junction, N. Y., where it connected with the American lines, thus competing with the Champlain & St. Lawrence

route. It did not prosper, however, and was afterwards absorbed by the latter line. In 1850 the line from Lanorai to Industry Village, later known as Joliette, P. Q., was opened for summer traffic only. At this stage Upper Canada began to consider a plan for circumventing Niagara, and the Erie & Ontario Railroad was chartered, operating between Queenston and Chippewa. Grades here were too stiff for locomotives, and horses were used to haul the cars. The terminal being at least one hundred feet above the river, the line failed as a portage road, so that in 1852 it was re-built from Chippewa to Niagara-on-the-Lake, and operated by steam. This later became a part of the Canada Southern Railway.

The first international railway was the St. Lawrence and Atlantic, connecting Montreal and Portland, which later became a part of the Grand Trunk System. The romance of deciding the route for this railroad is well known. It was a battle between Boston and Portland as to which should be the American terminus, and the decision rested on a cross-country race between stage coaches. The Portland courier covered the three hundred miles in twenty hours, twelve hours ahead of his Boston rival. Such names as Moffatt, McGill, Molson, Stayner, Torrance and Galt are connected with the building of this line, and an interesting feature—one which later figured prominently in the building of railways—was the fact that the city of Montreal subscribed £125,000 for stock in this railroad. Financial difficulties in England caused the withdrawal of stock subscriptions at this time, but others came to the rescue, and even farmers subscribed and paid for their stock in pork and eggs which were used to feed the construction gangs.

In the meantime other railroads were projected in both Lower and Upper Canada. It would be difficult to enumerate them all, or to attempt to describe the financial difficulties that attended their construction and the various transitory stages through which they passed to become eventually units in larger modern systems. The Toronto, Simcoe & Huron Union Railroad Company is one worthy of mention, as it was the first in Upper Canada on which the steam locomotive was successfully used, and also because when other means of financing failed, Frederick Chase Capreol—its Manager—devised a lottery as a means of stimulating the sale of shares. The lottery was unsuccessful, but the road was eventually built.

The provincial governments at this time took a deep interest in the construction of these new railroads. Canada was then selling her highways to toll companies, and naturally had more than a passing interest in this new competitive form of transportation. Everyone was optimistic as to the future of railways, and had visions

of huge profits from their operation. One result of this feeling was that in the granting of many of the charters the governments stipulated that the railroads could be taken over by the government after a stated period of years at a figure equal to the cost of construction *plus* twenty or twenty-five per cent.

Another result of this optimistic view of railway profits was the early regulation of passenger and freight rates. There was no Railway Commission or similar body existing at that period, so that the regulation of rates was made a part of the charter or subsequent amendments to the charter of each individual railroad. The question became rather acute in the early eighties by reason of the railway amalgamations which then took place, when the competitive influence as a curb on excessive rates was in a large part destroyed. Continued efforts were made to secure legislation regulating rates, and in 1888 authority to supervise rates was given to the Railway Committee of the Privy Council, which was composed of designated members of the cabinet, presided over by the Minister of Railways and Canals. Complaints in regard to rates were to be heard by this committee, and provision was made for a uniform classification of rates; rebates as well as other forms of discrimination were prohibited. The question of the appointment of a special regulatory tribunal came up again in 1896, and finally an amendment to the Railway Act was passed in 1903 under which the Board of Railway Commissioners of Canada was constituted. This board was given jurisdiction over rates, railway facilities and service, but was given no jurisdiction over capitalization or compensation to employees. Under certain conditions the finding of the board may be appealed to the Supreme Court and the Governors in Council. This is the situation as it exists in the Dominion of Canada to-day.

From 1835 to 1850 many railway schemes had been projected for the Maritime Provinces, but up to 1847 not a mile of track had been constructed except a small coal tramway. Interests had been looking towards linking up St. Andrews, St. John and Halifax with Quebec. .St. Andrews was the winter port at that time, and it was planned to build a direct route to the city of Quebec, also linking up with the railways in the State of Maine. The survey which in 1842 determined the boundary line between the State of Maine and the Province of New Brunswick made it necessary to alter the plans. The original survey called for a line not more than 250 to 300 miles long, but the Ashburton Treaty made a new route necessary; the distance as laid down in 1848 was figured at 635 miles from Halifax to Quebec, and the cost of this proposed line was estimated at £5,000,000. Steps were taken to build it in 1849 if the British gov-

ernment would assist, but Downing Street replied that no aid should be given. It was in June, 1854, that work was finally commenced on a railway line connecting Halifax and Truro with a branch line to Windsor, N. S. By 1858 the ninety-three miles planned had been completed, and Nova Scotia won the distinction of operating the first locomotive in Canada using coal for fuel. Nine years later an extension from Truro to Pictou was constructed, giving Nova Scotia at the time of Confederation 145 miles of railroad built at a cost of $44,000 a mile.

In New Brunswick the possibilities of St. Andrews as an ocean terminus had been made more remote by the changing of the Maine boundary, with the result that at the time of Confederation only one-third of the distance between St. Andrews and Riviere du Loup on the St. Lawrence had been constructed, and the road was in the hands of a receiver. An attempt was made to proceed with work on the European & North American in 1852, but this was unsuccessful. This line would have connected the railroads of the State of Maine with the Canadian seaboard.

1852 opened the Grand Trunk era. Some years before, Joseph Howe had returned from England with the statement that he had obtained a loan of £7,000,000 at bargain rates, £4,000,000 of which was to be used in railroad construction in the Canadas, the entire plan being to connect Halifax and Quebec with Hamilton by means of a trunk line. This loan did not materialize, and at this juncture the firm of Peto, Brassey, Betts & Jackson, the outstanding railway contractors of that period, entered the scene. They sent an agent to Toronto in 1851, offering to construct all the roads needed and to find all the capital required with partial government guarantees. After much bickering, Canadian interests that held charters combined forces with the English contractors, and negotiations which eventually resulted in the building of the Grand Trunk Railway were completed in 1853. Thus was begun the construction of the first railway in Canada, which was eventually to bind together Upper and Lower Canada, later to unite the Canadas with the Maritime Provinces and to establish connection with the State of Maine under a 999-years lease of the lines constructed in that State at that time. In the meantime, other similar lines became involved in financial difficulties, and sooner or later were absorbed by the Grand Trunk.

Space will not permit of giving the details of these changes, for to write the railway history of Canada of that period is equivalent to writing the economic history, so closely were the two associated. Suffice it to say that the Grand Trunk was completed from Lake Huron to the Atlantic in 1860. Looking at it from the point of

view of progress in railway building and development, one sees that the Grand Trunk was an achievement for that period. While there were many railroads and many charters, there were actually only sixty-six miles of road in all the provinces in 1850, while ten years later there were 2,065 miles, of which 1,700 were in the Canadas.

The ten-year period of progress had its reaction, and in the seven years that followed 1860—largely because of the influence of the American civil war—the trackage in Canada was increased only 213 miles. At the time of Confederation conditions were such that the Grand Trunk, Great Western and Northern railways were indebted to the old provinces of Canada over $20,000,000 for principal and $13,000,000 for interest, and other roads were indebted to municipalities for another $10,000,000 for principal alone. Railway stocks were down, and with exceptions hardly worth mentioning no dividends had been paid.

For the first thirty years of Canadian railway development the matter of gauge was continually argued. Strangely enough, while many gauges have been tried since the inception of the steam railway, the standard gauge to-day is that determined by the width of the cars hauled on rails in English coal mines decades before the days of the steam locomotive. Four feet eight and a half inches is the width, and as H. G. Wells said: "Before every engine trots the ghost of a superseded horse." When the line connecting Montreal and Portland was constructed, the promoters insisted on a gauge of five feet six inches to prevent the switching of traffic to the rival port of Boston. Montreal also insisted on the same gauge for the Grand Trunk to prevent the diversion of western traffic from eastern Canada and Montreal. This became known as the provincial gauge, and was adopted throughout Canada. In the States five feet was the gauge on many lines. The Erie Railroad was built on a six-foot gauge to suit a locomotive purchased at a bargain price. It was not until the early seventies that the Grand Trunk and Great Western gauges were changed to the now standard four feet eight and a half inches. Other lines followed immediately, but there still remained an agitation for a narrower gauge in various quarters.

Following Confederation there was another outburst of energy and optimism with regard to railroad construction. Many short lines were constructed in Ontario and a few in Quebec; there were mergers, absorptions and consolidations. In spite of the progress that had been made in the equipment and road-bed, an overwhelming desire for cheaper construction led to the building in 1870 of a road from Quebec to Gosford on which rails fourteen feet long by seven

inches by four inches of seasoned maple were laid, these rails being notched into the sleepers and wedged, with the result that no iron, steel or even spikes were used. Wide wheels were placed on the rolling stock. A similar railway was built between Drummondville and L'Avenir. Another development in railroading about this time was the building of a narrow gauge railway on Prince Edward Island. This road, two hundred miles long, forced Prince Edward Island into Confederation in order to obtain assistance in paying for it; so here again it will be seen that the railroad and economic history of the country are closely associated.

When Confederation came about in 1867, the building of the Intercolonial at the common expense of the Dominion, with an Imperial guarantee to the extent of £3,000,000, was one of the conditions of union. Individual projects which had been completed up to this time left a gap of nearly five hundred miles between Riviere du Loup and Truro. To extend the railroad through this wilderness was a proposal which did not appeal even in those days of hectic railway construction, and with the difficulties arising as a result of conditions brought about by the American civil war it was easier to interest Britain in the bridging of this gap for military purposes, so that negotiations were opened and the assistance mentioned was obtained. The old difficulty as to the route through New Brunswick was still to be settled. Western and southern New Brunswick struggled against the north and against the far east of Quebec; Halifax and St. John also supported forcefully their own interests. Finally the Bay de Chaleur route was adopted, and construction was entrusted in 1868 to a commission of four, the Minister of Public Works taking over control six years later. It was on July 1st, 1876, nine years after Confederation, that the line was opened to traffic. In the meantime the Dominion government took over other Nova Scotia, New Brunswick and Prince Edward Island railroads, and found itself in possession of nine hundred and fifty miles of line. At this time there were 4,268 miles of privately owned lines in Canada.

In 1851 Joseph Howe remarked in Halifax: "I believe that many in this room will live to hear the whistle of the steam engine in the passes of the Rocky Mountains, and to make a journey from Halifax to the Pacific in five or six days." This prophecy materialized in the form of the Canadian Pacific Railway. As far back as 1851 an ambitious Torontonian, Allan Macdonnell, sought a charter for a railroad to the Pacific, and asked the government for a subsidy. While declining, the government did not consider the scheme as visionary even at that time, and said that they hoped that some

day Canada and the United States would jointly construct such a line. As a matter of fact, the Canadian West came near to being penetrated solely by United States lines before the construction of the C. P. R. A glance at the railway map of the United States will show that the Great Northern and other railroads touched the Canadian border at numerous points, and it was only a determined stand on the part of the Canadian government during and after the building of the C. P. R. that held off the extension of these lines into Canada.

British Columbia, which had become a part of the Confederation, was insistent upon the building of a trans-continental line which would serve the interests of that province. A company of men connected with the Northern Pacific Railway in the United States made a proposition, in conjunction with Sir Hugh Allan of Montreal, then head of the Allan Steamship Line. Another group headed by D. L. Macpherson of Toronto organized the Inter-Oceanic Railway Company to oppose Allan's Canadian Pacific. The Grand Trunk Railway was requested to construct the line, but finally the Canadian government undertook the project. The difficulties, however, proved so great that the government of the day, in 1881, was glad to surrender it to a private company for completion. To private enterprise the government gave, free of charge, construction which had cost the country $38,000,000, a subsidy of $25,000,000, and 25,000,000 acres of land. Some guarantees also were extended, but the money market was obliged later to come forward with heavy loans. The late T. C. Keefer, one of Canada's foremost engineers of the day, stated the position in the following terms:

> Politically, the existence of the government depended upon its completion, but the higher consideration was that the expenditure was so vast and ramified, and the liabilities incurred so great, that suspension would have produced a financial crisis such as Canada had never seen and one which it was the duty of any government to avert.

The Canadian Pacific Railway was finally completed to the Pacific coast in 1885; and this portion of the Confederation compact was fulfilled. During the same period, through the process of amalgamation, most of the independent lines in Ontario and Quebec were absorbed by either the Grand Trunk or the Canadian Pacific Railway, and the Grand Trunk had, with the proceeds of the sale of the branch line from Levis to Riviere du Loup to the Intercolonial, succeeded in buying an extension to Chicago, which enabled it to

secure the through traffic from the West for which it had been in large part originally designed.

The settlement of the Canadian West towards the end of the last century was so rapid that inadequate railway facilities became a pronounced public issue. Quick to grasp the opportunity, Messrs. Mackenzie & Mann launched in 1896 the Canadian Northern enterprise which was destined to play such an important part in Canadian railway history. So substantial did the western outlook appear at that time that the Grand Trunk Railway approached the government with a view to construction of a new transcontinental road. As a result, the Grand Trunk Pacific project was launched in 1903. The opening of the twentieth century had been heralded as that of "Canada's Century" and the need of additional railway facilities sufficient to enable the country to take advantage of its splendid opportunity was officially set forth in the following terms, in the preamble of the Bill which initiated the new project of the Canadian parliament:

> Whereas, by reason of the growth in population and the rapid development in the productiveness and trade of Canada and especially of the western part thereof, and with a view to the opening up of new territory available for settlement, both in the eastern provinces and in the west, and the affording of transportation facilities for such territory and for other reasons, the necessity has arisen for the construction of a National Transcontinental Railway, to be operated as a common railway highway across the Dominion of Canada, from ocean to ocean, and wholly within Canadian territory.

During the summer of 1905 the first sod was turned on the prairie section of the Grand Trunk Pacific Railway. Three months later the Canadian Northern Railway reached Edmonton, and served written notice on the promoters of the Grand Trunk Pacific Railway that it possessed the necessary charter powers and intended to extend its system easterly through Ontario and Quebec and westerly to the Pacific ocean. The fact that this meant three transcontinental railways aroused no concern at that optimistic period. Canadians generally saw no reason to doubt the abillity of the Dominion to provide traffic sufficient for three transcontinentals. However, the financial resources of both the Grand Trunk Pacific and Canadian Northern railways were to prove quite inadequate for the requirements of such an ambitious programme. Simultaneous and, in part, competitive construction added greatly to the cost of labour, materials and supplies, and in a very few years the situation thus created had gradually involved the national credit and was making serious inroads on the public treasury. This, in brief, was the situation when war broke out in 1914.

This crisis in world affairs found the Canadian Northern and Grand Trunk Pacific railways struggling toward completion under unforeseen financial difficulties. Both railways were feeling the effects of the unprecedented national activity in railway construction. The eastern section of the Grand Trunk Pacific, which the government was building and which had been estimated to cost $61,000,000, had cost by that time $150,000,000. The western half of the road, which the Grand Trunk Pacific Railway was constructing, had required much more than bond guarantees. Because of difficulties growing out of the guarantee, the government had been obliged to absorb bonds aggregating $33,000,000 and, in addition, had thrice extended cash aid amounting to a total of $31,000,000. The Canadian Northern Railway and the roads absorbed in that system had received cash subsidies amounting to $32,000,000. In 1913 the government had acquired 70,000 shares of Canadian Northern common stock in consideration of certain of these subsidies and in 1914 it had acquired 330,000 additional shares in consideration of a $45,000,000 bond guarantee.

During the last half of the century of railway operation, interest has centred more in construction than in equipment. Invention after invention marked the early periods of railroad construction. During the later days it has been a matter of improvement. Compare the Canadian National Railways' "6000" locomotives with "Locomotion No. 1", or the Canadian National's "4,100" freight engine, 93 feet long with its tender, with Stephenson's "Rocket," or the modern sleeping, dining and compartment-club cars with the earlier coaches. It is all a matter of improvement, comparable with the progress made in all other walks of life during the past hundred years. In those early days it was a convenience for man to travel even under uncomfortable conditions by means of these crude railways. To-day it is the same—it is all a matter of proportion. Tomorrow will bring new improvements; for if we do not progress, retrogression is the result. To-day steam has been supplemented by electricity; tomorrow will bring the crude oil-burning engine developing its own electricity and operating trains without trolley, third rail or storage battery.

To us the romance of the railroad lies in the past;—those of future generations will find it in our efforts.