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## Great Achievements in Modern Bridge-Building.

By Frank W. Skinner, C.E.

Bridge-building is one of the oldest of the engineering arts, & yet in the principles and methods which it follows to-day it is one of the newest. It is impossible to say when the first bridge was built, so shrouded in antiquity is the date. But the first metal truss bridge, the erection of which marks the beginning of modern methods of construction, was put up no longer ago than 1840. Almost all the great bridges of the world have been built within the past quarter-century. In 1863, a bridge was thrown across the Ohio river with a span of 320 ft., then an unprecedented length. At the present time the limit of a single span has been extended to 1,710 ft. in actual construction, while others of nearly 3,000 ft. have been designed by able builders & undoubtedly will be erected.

It may be seen, therefore, that in spite of its newness, bridge-building as it is carried on to-day is not an undeveloped art. Within the space of an ordinary lifetime it has attained to a perfection & a final standard that is comparable with the progress of architecture through all the centuries since the time of the Pyramid-builders. It is safe to say, indeed, that as an art bridge-building has reached a point where it must await the invention of some new material to afford it scope for any radical improvement.

The great factor in this advance has been the improvement in the manufacture of steel & its extension to this branch of construction. Bridges may be built of materials other than steel. Many such have been built, & are now in use. Stone was one of the early materials employed, but stone has never been extended to spans of more than 250 ft. Wooden bridges have been built with spans above 200 ft. in length, while others of wood & iron combined have exceeded 300 ft. For all of these materials comparatively low limits are defined by the rapidity with which strains and weights increase with the increase of span. The same consideration applies to steel, but for the performance of any given duty steel is actually much lighter than timber. Steel has no competitor as a material for great bridges at the present day. Even with steel, however, the cost of construction increases approximately with the square of the increase in span. This factor of cost, rather than mechanical difficulties, is likely to set the final limit to the length of bridge spans.

While steel has been the chief element in making possible the big bridges of to-day, it has been by no means the only one. The invention of powerful tools & hydraulic

machinery, which forge & lift & rivet massive pieces that previously could not have been made or handled, has contributed to the same result. Every process in the production of these immense structures is carried on now on a scale undreamed of 25 years ago.

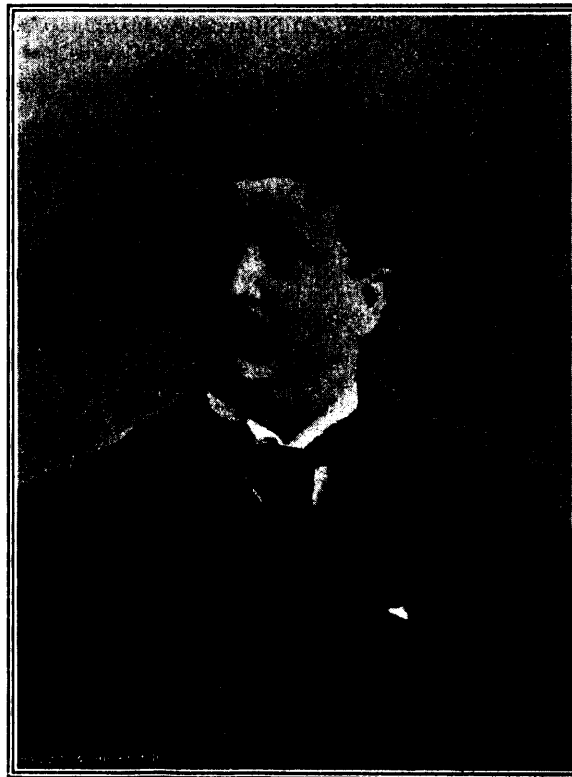
The methods of modern bridge-building form a subject on which it is difficult to generalize effectively. The conditions surrounding the erection of two great bridges are never alike. The engineer's problem is always one of adaptability, while new & perplexing difficulties must be met & overcome in every fresh undertaking. The building of

from its own weight & the weights it is intended to carry. The impact & vibration from the vehicles which are to cross it must be determined. The strain of wind & storm beating against it must be calculated. The almost irresistible expansion & contraction of the mass of metal under the influence of summer heat & winter frost must be provided for. All these problems are solved by the computer in his plan. His designs predetermine to the fraction of an inch how much a thousand-foot span will deflect under a load of one or 20 locomotives. It is all figured out before a bar is cut or a stroke given toward actual construction.

After verifying the designs, which are in the field of the mathematician, the next step is to put these designs into form, a task which falls to the lot of the metallurgist & steel-maker. This is by no means an unimportant part of the process. The steel which is to form the bridge is turned out in bars, many of them so strong that singly they could sustain the pull of 14,000 horses hauling on common roads, so ductile that a short bar will still stretch half its own length before giving way, so tough that great bars when perfectly cold can be tied into hard knots without cracking.

Following the plans, the bars, plates, & shapes are formed into flexible chains, the weakest links of which can sustain loads of a million pounds each; into huge girders which alone could carry the heaviest trains across an ordinary street; into riveted braces so large and long that eight-oared rowing shells might easily be stored in them. To join the separate parts together, solid steel bolts as large as stove pipes are provided. And the holes for which these bolts are destined are bored & polished to an accuracy of a hundredth of an inch in position & diameter. These features of the work are the best measures of the tools, hydraulic forgings, & electric machinery employed by the manufacturers, who have capital aggregating many millions invested in shops equipped solely for turning out bridge-material.

The outcome of all this is the finished bridge in the form of a hundred car-loads of rods, bars, braces, girders, columns, & boxes of rivets. They are dumped down at some spot, perhaps in the heart of the wilderness, where the problem of handling them may become one of appalling difficulty. From them the builder must evolve his bridge. The huge, inflexible pieces must be fitted together with watchmaker's precision, & the 100,000 lbs. masses must be swung high in air to form part of a self-sustaining structure over a hitherto impassable torrent. Or perhaps the situation is of another sort, and the acres of forged and riveted members are destined to span a river in angry flood or with treacher-



EPHRAIM TIFFIN,

Traffic Manager Intercolonial & Prince Edward Island Railways.

each immense span must be looked upon & judged as a separate engineering feat, rather than an incident in the general industry. The location of the structure, the conditions surrounding it, & the general purpose for which it is intended, are the fixed factors with which the engineer sets about his task. With these in mind, he plans the finished work, & the results are such as to astonish those unfamiliar with the progress attained by the engineering art.

The truss, or skeleton, of separate steel pieces must be so arranged as to convey to the abutments in proper proportions the loads

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ous bottom, or to replace a weakened struc-  
ture without interrupting the traffic of  
hundreds of daily trains or fleets of vessels.  
These things & others still more difficult are  
accomplished by the bridge-erector, who,  
with a few diagrams, some car-loads of  
steam-engines, ropes, tools, timbers, & a few  
score men, rapidly and safely assembles the  
great fabric, in summer or winter, storm or  
flood, with a resourcefulness, skilled ability,  
& ready courage that can hardly be matched  
by any other calling.

The most simple and usual way of erecting  
the superstructure of a great bridge is to  
build underneath it a temporary wooden plat-  
form, called a "falsework." On this the  
different members of the trusses are supported  
until they can be connected together and  
enabled to sustain themselves. Such a false-  
work costs many thousands of dollars, & in  
itself is often an engineering work of no small  
magnitude. It is composed ordinarily of  
rows of heavy piles driven deep in the river  
bottom, & carrying above the water-level  
story after story of framed timber columns  
and beams bolted and braced in every di-  
rection. On top of this edifice are wide steel  
tracks, on which rolls a tower of steel or  
wood called a "traveler." This traveler  
does the heavy work of construction, its  
booms and tackles, operated by hoisting  
engines, swinging the great steel pieces into  
position.

These falsework structures must be solidly  
built, for they are called upon to endure  
enormous strains. With all care in their  
erection, they are sometimes wrecked by  
floods or ice, or by the scouring of the river  
bottom beneath them. Sometimes the dis-  
aster comes suddenly, & the workmen have  
barely time to escape. Sometimes the danger  
is known well in advance. In these disasters,  
hairbreadth escapes for the men are of no  
uncommon occurrence. In one wreck of an  
Ohio river bridge, in which many men were  
killed, different portions of the span fell suc-  
cessively from one end to the other. One  
man fleeing toward shore just kept pace with  
the falling structure, so that all the time he

was running up an incline. At length the  
collapse of the falling timbers overtook him,  
& he was knocked into the river, whence he  
was rescued by his comrades on shore.

An accident equally remarkable and more  
ludicrous occurred during the building of the  
Washington Bridge across the Harlem River,  
in New York. The plate girder arches of  
this bridge were erected on falsework nearly  
150 ft. high, with wide openings in it to per-  
mit the passage of boats and trains. In the  
course of the work a man fell from near the  
top. He struck head first in the shallow  
water, and stuck fast in the mud, his feet  
waving signals of distress in the air until he  
was pulled out, when he was found to be only  
slightly injured.

In building the Poughkeepsie bridge across  
the Hudson, the depth of water & mud was  
so great that piles 120 feet long were re-  
quired. As such dimensions could not be  
secured from single trees, each pile was com-  
posed of two large tree trunks spliced  
together. Above the water-level these were  
capped with square timbers, on which was  
erected a massive body of symmetrical timber  
work of remarkable proportions. It extended  
to the lowest part of the bridge-span, 120 ft.  
above the river level. Upon it was reared a  
tower over 100 ft. high, which carried the tackle  
for assembling the trusses. In its entirety  
this temporary structure, built merely to  
facilitate the erection of the bridge, attained a  
height greater than that of the majority of  
"sky-scrapers."

While the Poughkeepsie falsework was one  
of the most lofty ever constructed, the most  
massive was built at Memphis during the  
erection of a railway bridge across the  
Mississippi. The bridge itself is the longest  
truss span in America, & with two exceptions  
the longest in the world, its span being 790 ft.  
The foundation of the falsework was formed  
by rows of 100 ft. piles driven through 60 ft.  
of water and twenty ft. of sand. On these was  
built a superstructure 85 ft. high, carrying 20  
lines of heavy stringers to sustain the weight  
of the bridge and traveler.

Where it is impossible to drive piles in the  
river channel, temporary trusses are some-  
times supported on the bridge-piers as  
platforms from which to erect the permanent  
structure. This was done in the case of the  
Plattsburgh bridge across the Missouri.  
Three short spans with timber towers were  
used for the erection of one main span. After  
the completion of the latter, the temporary  
structure was lifted on boats and towed  
around into position to be used on the next  
span. This was a hazardous undertaking,  
but it was successfully accomplished.

When it has been found difficult or im-  
possible to erect a bridge on the actual site  
which it is to occupy, the problem has some-  
times been solved by putting the span com-  
pletely together on shore, & then floating it  
into position. This operation is one of the  
most spectacular connected with bridge  
erection, as it also is one of the most hazard-  
ous. Notable among those constructed in  
this manner is the Hawkesbury bridge of  
Australia.

More difficult still was the erection of the  
Canada Atlantic Ry. bridge near the Coteau  
Rapids, in the St. Lawrence river. Here the  
task was complicated by the depth of the  
water & the swiftness of the current. The  
bridge contained 14 spans, each more than  
200 ft. long. These spans were erected on  
shore, & skidded on greased rails to the tops  
of towers built on the decks of a pair of scows  
braced together like a catamaran. The un-  
wieldy craft & its topheavy load were in each  
case floated several miles down the swift  
current, anchored in 30 ft. of water, & the  
span lowered to its seat of masonry.

The largest span ever erected in this  
manner was 523 ft. long. It forms part of  
the Brunot Island bridge across the Ohio,

near Pittsburg. The span was first assembled on piles near the shore. Then nine large barges, partly submerged, were floated beneath it. Timber trestles were built from their decks to the lower side of the steel girders. When the water was pumped out of the scows, they lifted the entire structure clear of its former supports. The long, flexible line of boats, carrying the great mass of steel & timber 150 ft. high and weighing 3,600,000 lbs., was pulled out into the river, revolved through a quarter circle, & towed by steamboats to the bridge site, where the span was deposited on top of its 80 ft. piers.

An unusual method was adopted recently for replacing a heavy 236-ft. span carrying the main line of the Pennsylvania R. R. across the Schuylkill river. Temporary timber piers were built in the river above & below the old span at both ends. These piers supported a low bridge, the top of which formed a platform on which the new span was assembled. Double sets of long steel rails were laid across the tops of the piers at both ends, & 150 solid steel rollers placed between the top & bottom rails of each set. The new & old spans were lowered to rest on the upper rails, & four powerful tackles being attached to them, & operated by as many hoisting engines, moved both spans sidewise until the new span completely displaced the old one & was ready to receive traffic. Then the low bridge which had formed the erecting platform was rolled across underneath, as the main spans had been, & was used to support the old span while it was being removed. This operation involved moving 950 tons 27 ft., & it was accomplished in 2½ minutes, in an interval between the crossing of two trains, an achievement which probably has never been paralleled.

In foreign countries a favorite method of erecting bridges is to assemble all the spans together in one continuous structure on shore at one end of the bridge, & then to push the whole mass forward on rollers till it advances successively from pier to pier, resting on rollers on top of each, & finally attaining its required position. The protrusion is usually effected by gangs of men with long ratchet levers laboriously turning the rollers.

The longest trussed spans in the world are two 1,710 ft. cantilevers of the famous Forth bridge in Scotland—a gigantic structure which weighs over 100,000,000 lbs., which was over seven years in building, & which cost \$16,000,000 & scores of human lives. From each of the three main piers rise huge wedge-shaped steel towers that cover spaces nearly a city block in area & reach 361 ft. above the water. From each side of each tower there extends a pair of great curved trusses, 680 ft. long, that balance each other, & approaching the ends of corresponding arms from the next piers, sustain between them separate complete bridge-spans of 350 ft. that are there suspended above the loftiest topmasts of the ocean ships passing below. These overhanging arms that are un-

supported at their outer extremities are cantilevers. They have been adopted for all the greatest trussed spans, because by their use the opening can be virtually subdivided into three parts, each having its separate trusses, & thus can be made lighter, & can be more advantageously built. On the American continent the largest cantilevers have been built of struts & ties & beams manufactured at the shops & rapidly fitted together with single large bolts or pins, but in the Forth bridge the principal members of the trusses are enormous steel tubes made of thick plates, curved, fitted, & riveted in place. Large shops were built on shore, special machinery was designed for them, & the manufacture of the bridge progressed there adjacent to its erection.

First the inclined posts of the main towers were built up from the bottom. Each of the four columns forming a tower is a 12 ft. tube large enough to run a railway train through. These

was removed and built on in front, so as to advance it enough to support the next section, & so on.

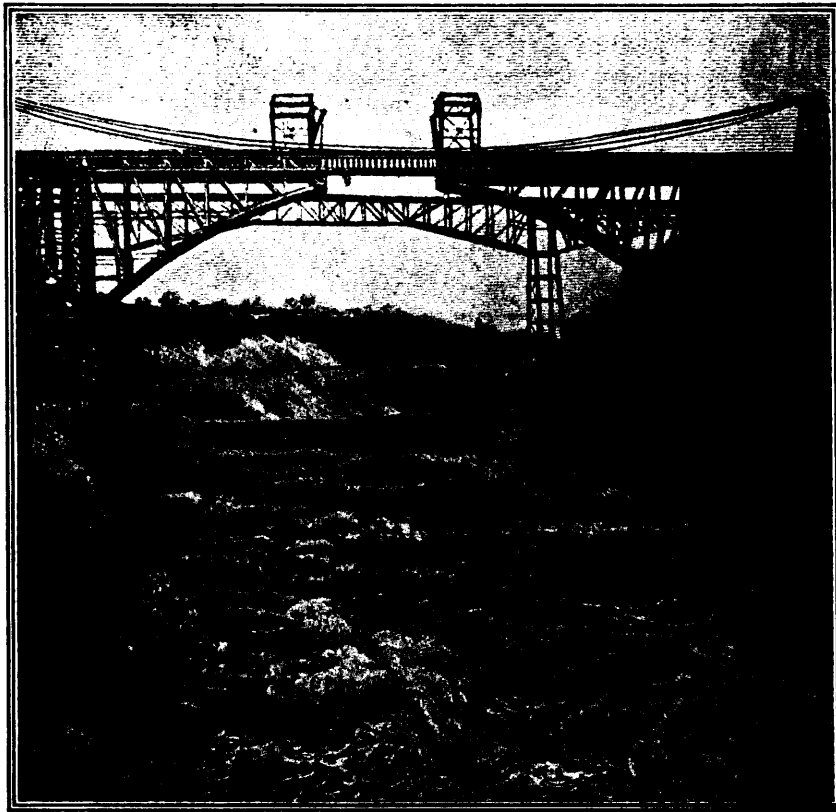
The Forth bridge is characteristically English, massive in design, & ponderous in the very methods of construction & erection. The contrast with American types is exemplified by our great cantilevers that span the Missouri, the Hudson, the Niagara, & other rivers. These latter are lofty, slender structures that look against the sky like etchings on glass, yet they inflexibly sustain express trains & endure without a tremor the hurricane blasts that sweep through the chasms which they span. Another distinction between English & American methods of bridge construction is found in the greater rapidity which the latter make possible. In building the Mississippi river bridge at Cairo, Ill., a 2,000,000 lb. span 518 ft. long was erected in six days. Probably no European span of equal length was ever assembled in tenfold this length of time.

The four great railway bridges across the Niagara river gorge stand as an epitome of American bridge engineering. They illustrate the development of bridge construction during the past half-century, & afford examples of all the types of heavy spans. These bridges cross a chasm more than 200 ft. deep, at the bottom of which water of great & unknown depth rushes along at tremendous speed. It is said that the first communication between the opposite banks was established by flying a kite across, & that the string of this kite served to pull across a rope, which in turn conducted above the stream the cables sustaining the light highway bridge erected in 1847. In 1855 this bridge was replaced by the famous suspension bridge, the first of its kind. The successful creation of this structure was a monument to its builder, Roebling, and vindicated his designs.

The general construction of the suspension bridge, & the manner in which its trusses were supported from four great cables, each formed of

3,640 parts of an endless straight iron wire, wrapped together in a cylindrical bundle 10¼ ins. in diameter, have been so often described as to be generally familiar. But the first building of the bridge was scarcely more remarkable than the manner in which it was from time to time repaired and reconstructed.

After the bridge had been in service for 22 years, it was found that some of the small wires of the main cables were being weakened by rust. The defective portions were removed, & new pieces were spliced in under strain, & so delicately adjusted as to carry their exact proportion of the total load. A little later it was discovered that, while each cable had a resisting strength of 6,000,000 lbs., the strength of the anchor chain was less than 3,500,000 lbs. To remedy this discrepancy the anchor pits were opened, the chains which supported the whole weight of the bridge & of the constantly passing trains were disconnected, & new bars were added



Three great types of long-span railway bridges over the Niagara River, showing engineering progress in the last half-century; the 800-ft. suspension bridge built in 1855; the 550-ft. arch replacing it in 1897; the 470-ft. cantilever (one of the first ever built) erected in 1883—each of the three about 240 ft. above the head of the Whirlpool Rapids.

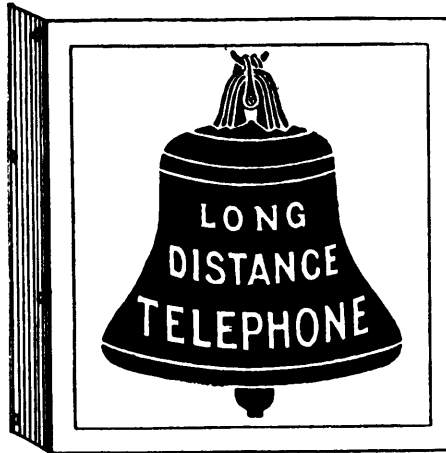
columns were built together & braced against each other, while powerful hydraulic presses inside of them supported & constantly lifted in advance pairs of heavy iron girders, themselves as massive as ordinary railroad bridges, & from these girders the machinery & materials were supported. Following them, circular cages inclosed the tubes & supported the men & machinery that riveted the cylinder plates together. After the towers were completed the cantilever arms were extended from both sides, & sustained themselves at all times by their own rigidity without requiring any support. The curved arch-like top & bottom pieces of the trusses were also 12 ft. steel tubes, which were ingeniously built out in their approximately horizontal extensions by means of a sleeve-like framework that projected beyond the end & was furnished with derricks for assembling the steel plates of the cylinder. As fast as the sections were fitted together the rear part of the inclosing sleeve

# ENAMELED IRON TELEPHONE SIGNS.

Guaranteed Not to Fade or in any way to Perish from Exposure.



No. 1. Single, 17 x 18 inches. If made double with flange 18½ x 18 inches.



No. 4. Double, 18½ x 18 inches, including flange. If made single, without flange, 17 x 18 inches.



No. 2. Single, 17 x 18 inches. If made double, with flange, 18½ x 18 inches.



No. 5. Double, 19½ x 8 inches, including flange. If made single without flange, 18 x 8 inches.



No. 6. Double, 19½ x 8 inches, including flange.



No. 7. Double, 19½ x 8 inches, including flange. If made single, without flange, 18 x 8 inches.



No. 3. Single, 6½ x 7½ inches.



No. 8. Single, 18 x 8 inches.

These signs can be made in any colors. Blue and white are the most effective and are generally preferred.

Signs with any other design or lettering made to order.

PRICES ON ANY QUANTITIES FURNISHED ON APPLICATION.

The ACTON BURROWS COMPANY, 29 Melinda Street, TORONTO.

Importers of Enameled Iron Signs of the best English manufacture.



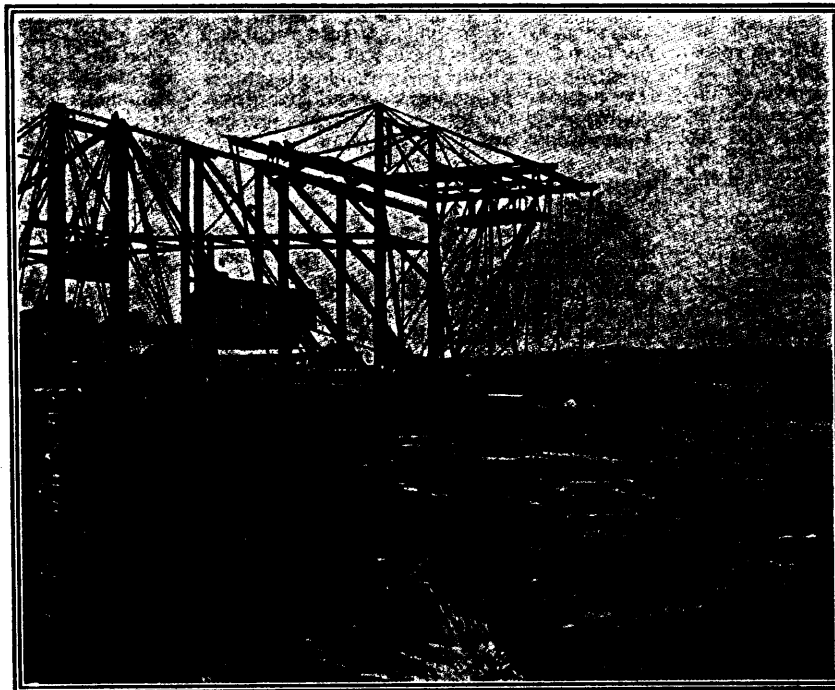
to them. The strains were adjusted to the new portions by heating the iron & carefully measuring the consequent elongation until exactly the right point was reached. In 1880 the old wooden stiffening trusses & floors were removed piecemeal, & replaced by steel, without impairing the integrity of the structure in the slightest. A few years afterward, it was found that the temperature elongations & contractions of the main cables had bent the towers back & forth until many of their solid stones were cracked & broken. These stones were removed & new ones inserted in their places. In 1886 new steel towers were built up outside the older ones of masonry, & the cables were lifted up by hydraulic pressure & deposited in new seats. All of these changes, affecting nearly every portion of the bridge, were made without interrupting the traffic across the structure, without serious mishap or the loss of a life. They form a series of brilliant achievements unprecedented in the annals of bridge construction or repair. The later ones were designed and executed by L. L. Buck, now the chief engineer of the new East River bridge in New York, which, with its six railway tracks, footwalks & bicycle paths, will be the greatest, though not the longest, span in the world.

Notwithstanding the repeated improvements in the Niagara suspension bridge, it finally became inadequate for the increasing volume of railway traffic. In 1896-97 it was entirely replaced by a new structure, built on the same site, & without interrupting traffic. This seems like an impossible feat, but the principles on which it was conducted are well established in bridge-building, & are well understood by bridge-engineers. The span of the massive 550-ft. steel arch was built out panel by panel from the opposite abutments in the form of cantilevers. These cantilevers were partly supported by forged steel bars temporarily anchoring their upper parts to steel beams bedded in masses of concrete which filled pits blasted out of the solid rock. The work advanced from both sides of the river at the same time, & the materials were carried into place by steel derricks running on top of the completed portions of the growing structure. Thus the old bridge was gradually enclosed by the upper part of the steel arch, which surrounded it on sides & bottom, but did not touch it or interfere with its daily functions. The two semi-arches were built so that their extremities would be a little too high and too far apart when the final joint between them was reached. They were then united by slightly extending the anchor chains from each side. It is a delicate matter to lengthen chains that are under a strain of more than a million pounds, but it was accomplished by means of an ingenious toggle arrangement. The two parts came easily together; the bridge was complete, & took up the duties of the older structure without the slightest hitch.

A few hundred feet above this bridge is the famous Niagara cantilever, one of the first of this type to be built. It is seen in the background of the illustration on page 35. In the

foreground are shown the two semi-arches of the new structure that has replaced the old suspension bridge. They are shown as they approached completion, with the old bridge still intact above them. Thus are grouped in this view the three great types of long-span bridges, forming an historic trio that disappeared with the final removal of the suspension bridge. Just below the Falls is a beautiful steel-arch bridge of 840 ft. span and 135 ft. rise. It is by far the longest arch in the world. It was erected cantilever fashion much as was the one already described.

The loftiest trussed bridge in the world is the Kaiser Wilhelm, near Mungsten, which carries a double-track railway across the valley of the Wupper, 350 ft. above the stream. It has a clear span of 525 ft. The manner in which the bridge was built illustrates typical European methods, elaborate, slow & costly. The first step was to build a temporary service bridge across the river on steel & timber towers about 100 ft. high. Large shops & work-yards were established on one bank. Inclined planes & electric cable roads were



Building out one arm of the 477-ft. cantilever at St. John, N.B., 97 ft. above the water. Here the roaring tide rises and falls 30 ft., and it was impossible for falsework to withstand it.

run from both ends, parallel to the bridge, to serve for the distribution of material. Huge timber towers were built at each end of the arch for falseworks, from which the permanent steel towers were erected. This method was very slow & costly. In this country it would have been dispensed with entirely, and the towers would have been made self-supporting during erection. After the towers were completed, their tops were tied back with steel cables to the special anchorages provided, & then the arch trusses were built out & up from their springing lines at the abutments to the crown. While building, the semi-arches were partly sustained by steel backstay cables. The trusses were built out panel by panel without further support until they met at the centre. Then the huge semi-arches were tipped forward a few inches by lengthening the anchor lines, so as to secure the exact space required for the last pieces in the key of the arch. Finally, the strains on the towers were adjusted by hydraulic presses at their feet.

One of the most interesting factors in mod-

ern bridge building is the workmen. Their experiences aloft tend to make them forget the matter of altitude entirely, & they will unhesitatingly assume the most daring risks in doing their work. But many of their exploits that are so nerve-shocking to the inexperienced observer seem very simple matters from the workman's point of view. They become so expert, cool-headed & sure-footed that they very seldom fall. They will run on a beam a few inches wide & lying a hundred feet in the air; will swing a sledge while standing on an ice-covered timber projecting at a dizzy altitude; or will walk across a springing plank when the wind blows so fiercely that they are compelled to lean far out against it to keep their balance. They will pose in the most startling positions whenever the work is being photographed; in one instance, a workman actually stood on his head, on the top of a derrick, a hundred feet above the water, in order to demonstrate his nerve & indifference.

In replacing the Niagara suspension bridge nearly all of the workmen employed were floating mechanics & laborers, who had no previous knowledge of bridge-work; yet they did the work well, so perfectly & simply was it planned & so skilfully was it directed. Some of the men, when they applied for work, requested permission to stay mainly on one side or the other of the boundary line between the U. S. & Canada, which the bridge crossed, because on the opposite side their liberty had been jeopardized by various misdemeanors. Notwithstanding the great height at which the men worked above a maelstrom from which escape would have been impossible, most of them soon grew unconcerned, & some of them, indeed, vied with one another in reckless daring. So many valuable tools were dropped from the bridge that some of the more careless losers were discharged. Consequently one day, when a man dropped a wrench 200 ft. to the water's edge, he foolishly started to recover it by climbing down hand over hand on a steeply inclined

thin wire cable nearly 500 ft. long. He had no sooner begun his insane exploit than a rival, not to be outdone, started out of sheer bravado to descend an adjacent rope. After going a few feet they tried in vain to return, & it seemed to their horrified companions on the bridge above that human muscles could not endure the increasing strain of their long journey. The foreman instructed them how to climb more easily & what to do at the bottom, accompanying his orders with violent abuse, wisely bestowed to divert them from the fright that added to their danger. By nothing less than a miracle both men held on until they had crossed over the water. Then one of them, watching his chance, dropped safely into a tree-top. The other finally gave out, & fell a considerable distance to the ground. But both escaped practically unhurt. Instead of being received as heroes, however, both were immediately discharged by the foreman. No serious accidents occurred on the bridge, but there were some hairbreadth escapes, as when one man, carrying in his tongs a white-hot rivet, ran along a well-oiled, narrow iron



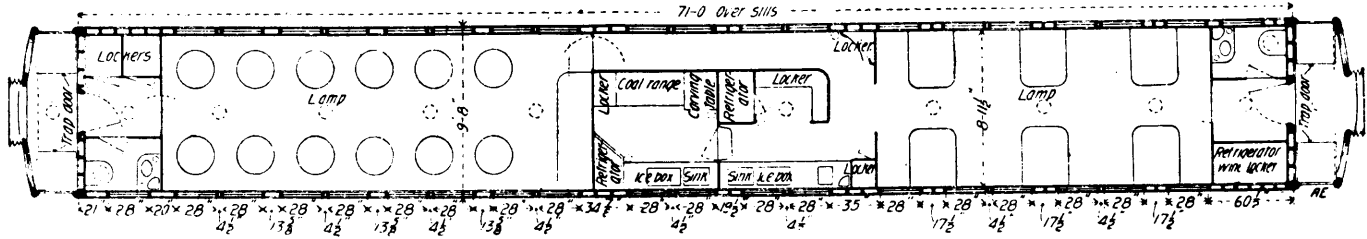
plate at the extreme edge of the bridge & fell violently on his face. He grasped the slender cord instinctively with arms & legs, rose, carried the rivet to its destination & helped to drive it.

Latterly, the great increase in the extent of bridge-construction has caused it to become a specialized calling. At the present time the men who rear our great bridges are for the most part men who have been trained in this particular occupation, & who in many cases follow no other. They, as well as the men who design the structure, are entitled to high rank as engineers. The leaders are

Eastern Flyer. The cars are 71 ft. long over end sills & 9 ft. 8 in. wide over sheeting. The vestibules are the Pullman standard type with steel platforms. The windows are large & the roofs of the Monitor type. The cars are mounted on 6-wheel trucks with steel-tired wheels. The dining-room, or cafe, is at one end & the parlor at the other, with the kitchen & serving rooms in the centre. The dining-room seats 24 people at the tables, while the parlor is furnished with 12 large revolving chairs & a sofa capable of seating 4. The interior finish of the car is in Canadian quartered oak with English oak panels, & the floor

net profit of \$74,631.93 as compared with \$61,798.67 for the previous year. From the year's profits there have been paid 4 quarterly dividends of 1 1/4% each, amounting in all to \$40,000, leaving a surplus of \$34,631.93. The maintenance of roadbed, rolling stock, power station equipment, & other property has received careful attention, & the cost has been charged to operating expenses as in previous years.

Although the Co.'s business continues to increase satisfactorily, the operating expenses have also increased \$15,997.48 over the previous year. Of this, \$12,000 is chargeable to



GRAND TRUNK RAILWAY CAFE-PARLOR CAR.

endowed with great professional skill, are quick to plan new methods for difficult cases, & are able to execute delicate & critical operations under perilous & harassing circumstances. They have vast responsibilities, with the possibility of great losses and disasters if they fail, & comparatively little reward except the satisfaction of well-doing when they succeed.

**G.T.R. Cafe-Parlor Car.**

On this page is a floor plan of two cafe-parlor cars recently built at the G.T.R. shops at Montreal for the International Limited & the

coverings are Wilton pile. Considerable skill has been displayed in the interior arrangement, using the space to the best possible advantage. The matter of arranging ice boxes, pantries & cupboards in the kitchen & waiters' room has been given considerable attention.

**Halifax Electric Tramway Co.**

The following report for the year ended Dec. 31, 1900, was presented at the annual meeting held Feb. 11:

During the past year the business of the Co. has shown a decided increase both in the railway and lighting departments, giving a

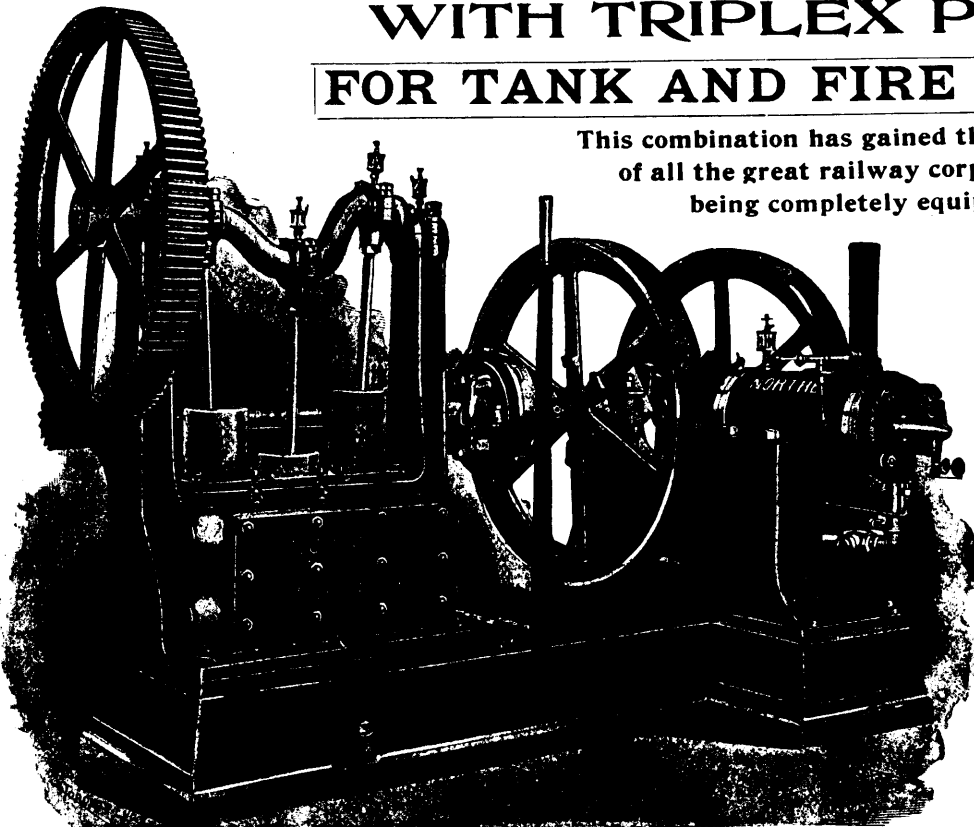
the increased cost of coal. To meet in a degree this advance in cost of coal, the Co. has decided to enlarge its wharf property & coal handling facilities, by which the cost of coal at the Co.'s works will be considerably reduced.

The cost of extending the lighting & power lines not only in the new but in the old districts has been charged to operating expenses, with the exception of \$195.00 appropriated for extension of city arc service.

During the year 2,968,811 passengers were carried, an increase of 352,580 over the previous year. It is estimated that about 20% of the increase of passengers carried, is due to

# The NORTHEY GASOLINE ENGINE WITH TRIPLEX PUMP FOR TANK AND FIRE DUTIES.

This combination has gained the heartiest endorsement of all the great railway corporations. Some are being completely equipped with them.



This cut illustrates a very satisfactory combination of the Triplic Power Pump, actuated by The Northey Gas and Gasoline Engine, for duties wherever an independent pumping plant, ready for instant service, is required. The advantages of this plant are: economy in space occupied, low running expenses, extreme ease in handling (any person can operate it), readiness on the minute for service at all hours, making it invaluable in case of fires, and the absolute safety and precision with which it performs its work.

The Triplic Pump used, with pistons placed 120 degrees apart, gives a practically constant flow of water, minimising strain on pump, connections, piping, etc. Both machines are heavily and solidly built, and carry the most ample guarantees.

We will be pleased to send you catalogues and specifications.

**The Northey Co., Limited,**  
Manufacturers of Pumping Machinery of every description.  
1032 King St. Subway,  
TORONTO, CANADA

the presence of the South African contingents in Halifax during the past year.

The lighting system shows a satisfactory increase, the equivalent of 2408 16 c.p. lamps having been installed during the past year, making a present total installation the equivalent of 19675 16 c.p. incandescent lamps throughout the city.

Mechanical stokers with forced draft have been placed under four boilers, & the power station equipment has been increased by one 750 h.p. condenser. Line transformers 97000 Watts capacity & 125 meters have been installed. Vestibules have been placed upon all box cars. All of which has entailed an expenditure of \$14,511.84, charged to construction account.

In consequence of the death of Dr. A. Haley, a vacancy occurred on the board of directors. This has not been filled, owing to the suggestion made at a previous meeting of shareholders that it was a matter for consideration whether the number of directors might not be reduced as vacancies occurred.

The old board of directors was re elected, J. C. MacIntosh succeeding the late Dr. Haley. The board for 1901 is, President, Hon. D. MacKeen; Vice-Presidents, J. Y. Payzant & W. B. Ross; Secretary, B. F. Pearson; other directors, F. Paul, A. Kingman, J. C. MacIntosh. F. A. Huntress continues as manager.

**MANITOBA'S RAILWAY POLICY.**

**The leasing of the Northern Pacific lines and re-leasing to the Canadian Northern.**

The most important event of the month in railway matters has been the announcement of the contracts entered into by the Manitoba Government, under which the Government has leased all the lines of the Northern Pacific Ry. within the Province, & has released them to the Canadian Northern Ry.

The Northern Pacific entered Manitoba as a culmination of the anti-disallowance agitation which raged there in the eighties. In 1887 the Legislature passed a bill introduced by Premier Norquay, empowering the Railway Commissioner of the Province to build, as a public work belonging to the Province, the Red River Valley Railway from Winnipeg along the west side of the Red River to the International Boundary at West Lynne. Work was started on this line under Mr. Norquay as Railway Commissioner, & was continued under the Greenway Government which succeeded his. In 1888 the Greenway Government made a contract with the Northern Pacific & Manitoba Ry. Co., a subsidiary of the Northern Pacific R. R. Co., under which the Province was to complete the Red River Valley Ry. from the International Boundary to a point on the south side of the Assiniboine River within the city of Winnipeg, & to sell the line, with a limited amount of equipment, to the N. P. & M. R. Co. for \$720,000, to be paid for by 1st mortgage bonds of the Co. on the line, payable in 20 years with interest at 5%. The Co. agreed to bridge the Assiniboine River at Winnipeg, the Government contributing \$40,000 as a bonus, & to continue the line to the north side of the river. The Government agreed to secure right-of-way from a point on the Red River Valley Ry. near Winnipeg to Portage la Prairie, & to pay on behalf of the Co. for the construction of a railway between those points & in purchasing equipment for it, such payments not to exceed \$400,000, any cost in excess of this to be borne by the Co. except that the Government agreed to contribute \$40,000 towards bridging the Assiniboine River, near Portage la Prairie. The Co. agreed to construct a railway from the Red River Valley Railway, near Morris, to Brandon. The Co. was empowered to issue bonds to the extent of \$16,000 a mile, the \$720,000 of bonds issued on the Red River Valley Ry. to be given to the Government in payment therefor to be 1st mortgage bonds & the balance of \$320,000 to be 2nd mortgage bonds. The Government agreed to guarantee the interest on these 2nd mortgage bonds at par, & also to guarantee the interest on bonds on the Portage la Prairie branch to the extent of \$6,400 a mile and also on bonds of the Morris-Brandon branch to the extent of the amount required to make up \$6,400 a mile for the whole of the railways mentioned in the agreement, including the Red River Valley line. The Co. was given important taxation exemptions for 20 years & the Manitoba Government was empowered to fix & regulate all freight charges on the lines mentioned.

Under the contract above summarized the following lines were constructed:

International Boundary to Winnipeg.....	Miles. 65.94
Morris to Brandon .....	145.24
Portage Jct. to Portage la Prairie.....	52.52
	<b>263.70</b>

Subsequently the N.P. & M. Co. through a subsidiary, the Winnipeg Transfer Ry. Co., built a connection of 1.24 miles between the N.P. terminal in Winnipeg & the C.P.R. Within the last two or three years three short branches have been built, one from Departure, on the Morris-Brandon branch, to Hartney, on the C.P.R. Souris branch, 51 miles; one from Portage la Prairie, northwesterly to Beaver, 19 miles, & one from Portage la Prairie, northerly to Oakland, 9 miles, making the Co.'s total mileage in the Province 344.94 miles.

Figures as to the cost of the N.P. lines in Manitoba vary considerably. The returns made by the Co. to the Department of Railways state the cost up to June 30, 1900, to have been \$4,556,698.76. In the agreement between the Manitoba Government & the N. P. Co., the value of the lines is placed at \$7,000,000, while in Premier Roblin's recent speech at Neepawa, which is given on another page, the cost was stated as \$8,445,613.04. In making up the latter figures, capital stock & other items are counted in. The return made by the N.P. Co. to the Department of Railways is a sworn one, & in the absence of evidence to the contrary must be accepted as reliable.

The aid given by the Manitoba Government to the line up to June 30, 1900, was \$632,750. Of this, according to a speech made in the Legislature in April, 1898, by the then Premier, Mr. Greenway, \$532,250 was given to the line between the International Boundary & Winnipeg & to the Brandon & Portage la Prairie branches. The remainder was given to subsequent extensions, principally to the branch from Departure to Hartney.

The N.P. Co. did not receive any municipal aid in Manitoba, but the Hudson's Bay Co., through its then Land Commissioner, the late C. J. Brydges, sold most of the land for the Winnipeg terminals for a nominal consideration.

The earnings of the N.P. lines in Manitoba for the past four years have been as follows:—

Year ended.	Gross Earnings.	Operating Expenses.
June 30, 1896..	\$271,560.00	\$268,623.00
" 1897..	246,627.59	234,162.38
" 1898..	315,876.97	323,528.87
" 1899..	378,724.23	398,577.59
" 1900 ..	391,947.40	577,525.61

\$1,604,736.19 \$1,892,417.45  
Net loss in operating for five years, \$287,681.26.

**Contract With the Northern Pacific.**

Following is the agreement between the Manitoba Government & the Northern Pacific Ry. Co. divested of some of the legal verbiage:—

This indenture, made Jan. 15, 1901, between the Northern Pacific & Manitoba Ry. Co., the Winnipeg Transfer Ry. Co. Ltd., the Portage & Northwestern Ry. Co. & the Waskada & Northeastern Ry. Co., together hereinafter called the lessors of the first part; the Queen, represented herein by the Executive Government of the Province of Manitoba, acting by the Minister of Public Works of the Province, hereinafter called the lessee, of the second part, & the Northern Pacific Ry. Co., hereinafter called the Pacific Co., of the third part.

Whereas the lessors are respectively the owners of & operate certain railways in Manitoba, hereinafter demised, & such railways connect with each other & are operated as one system, the interests of the lessors being common interests in connection with said system; & whereas certain mortgage bonds have been issued by the Northern Pacific & Manitoba Ry. Co., one of the lessors, secured by mortgage upon its railways & undertak-

STATISTICAL STATEMENT.

	1897	1898	1899	1900
Gross receipts.....	\$193,379.68	\$197,830.46	\$203,935.86	\$232,111.21
Railway, light & power.....				28,175.35
Increase 1900 over 1899.....				13.82%
Operating expenses.....	112,570.91	113,081.92	111,137.16	128,134.67
Increase 1900 over 1899.....				14.26%
Operating expenses.....	57.11	59.06	55.12	55.60
Per cent. of total earnings.....				104.611.93
Net earnings.....	80,808.77	84,748.54	91,798.66	124,832.26
Increase 1900 over 1899.....				13.98%
Passengers carried.....	2,334,900	2,419,268	2,616,237	2,968,811
Increase 1900 over 1899.....				354.860
Average receipts per passenger.....	4.99	4.93	4.5	4.55
(Reduced rates in 1899 and 1900).				
Car Mileage.....	575,017	593,608	613,944	612,149

ASSETS.	
Property.....	\$1,400,000.00
Construction account.....	74,471.26
Accounts receivable.....	21,242.96
Supplies on hand.....	10,079.68
Suspense accounts.....	6,426.79
Deposit with city.....	500.00
Cash on hand.....	51,061.62
	<b>\$1,561,782.31</b>

LIABILITIES.	
Capital stock.....	\$ 800,000.00
Five per cent. bonds.....	600,000.00
Accounts payable.....	28,455.64
Securities for lighting account.....	66.74
Tickets outstanding.....	1,081.84
Bond interest.....	15,000.00
Quarterly dividend due Jan. 1, 1901.....	10,000.00
Surplus Jan. 1, 1901.....	107,178.49
	<b>\$1,561,782.31</b>

INCOME ACCOUNTS.	
Passenger receipts.....	\$ 135,173.95
Light & power earnings.....	96,464.86
Sundry railway earnings.....	472.40
Sundry receipts.....	655.39
	<b>\$ 232,766.60</b>
Operating expenses.....	\$ 128,134.67
Coupons.....	30,000.00
Four dividends.....	40,000.00
Surplus.....	34,631.93
	<b>\$ 232,766.60</b>

ings, some particulars of which bonds & mortgages are as follows:—

\$5,260,000, dated May 1, 1889, maturing in 50 years, & bearing interest at 5%. \$920,000, dated May 1, 1899, maturing in 50 years, & bearing interest at 5%. \$750,000, dated Jan. 1, 1890, maturing in 50 years, & bearing interest at 5%. Total, \$6,930,000. The trustees of the mortgages securing the same being the Farmers' Loan & Trust Co. of New York city.

And whereas the lessors have agreed to give a lease and option to acquire the said railways upon the terms & conditions hereinafter set up: Now, therefore, this indenture witnesseth:—

(1) Whenever in the indentures the lessors are mentioned or referred to, such mention or reference shall extend to & include & be binding upon the successors & assigns of the lessors respectively, & shall be construed as binding and including each of the lessors, its successors & assigns, with respect to its part of the premises included in the demised premises to the same extent as if this indenture were entered into separately with the respective lessors, except where the context necessarily otherwise requires, the intention of the parties being for convenience & for the purposes of this indenture to treat the railways & undertakings of the respective lessors as forming one system, for which one rental is to be paid, & one price paid under the option hereinafter given.

(2) Wherever in this indenture the lessee is mentioned, such mention shall extend to & be binding upon the successors & assigns of the lessee & of any company to which the rights & powers hereby conferred may be transferred or assigned.

(3) In consideration of the rentals hereby reserved & the covenants of the lessee hereinafter contained, the lessors do hereby demise and lease to the lessee the several lines of railway & branches belonging to or controlled by the lessors, & situate in the Province of Manitoba, together with all rights of way, etc., & real & personal property of every kind now owned or controlled by the lessors, or by any company or trustee for them, & used or for use upon or in connection with the said railways, etc.; to have & to hold the demised premises under lease for & during & until the full end & term of 999 years, computed from the day when possession is given as hereinafter provided for, the lessee yielding & paying to the lessors in the manner & at the time & place hereinafter

mentioned the following rentals, namely: For the first 10 years of said term the rental shall be \$210,000 a year; for the second 10 years of said term the rental shall be \$225,000 a year; for the third 10 years of the said term the rental shall be \$275,000 a year, & for the balance of the said term the rental shall be \$300,000 a year.

(4) The rentals shall be paid quarterly on the first days of April, July, Oct. & Jan., to the Pacific Co., at some chartered bank or other place in Winnipeg to be designated by the Pacific Co., the Pacific Co. being hereby appointed by the lessors to receive the same & to distribute & pay over the same as the lessors may direct. The Pacific Co. shall in its own name, but on behalf of the lessors, have the right to take all such proceedings as may be necessary in order to enforce payment of the said rentals, & for this purpose the lessee covenants with the Pacific Co. to pay the said rental to it.

(5) Possession of the demised premises shall be given to the lessee on such day as the lessee may call for the same, not later than April 1, 1901, & from & after such possession the lessee shall be entitled to the rent issues & profits of the demised premises, & of the operation thereof, & shall bear & be charged with the operating expenses & other outgoings in connection therewith, & shall indemnify the lessors against any claims or liability arising from the operation of the demised premises.

(6) The intention of the parties is that no interruption may occur in the continuous operation of the demised premises, & that no inconvenience may be suffered by the public by reason of the change of possession, & in order to carry out this intention the lessors will, so far as they are able, cause such of their officers, servants, & employes as are concerned in the operation of the demised premises whom the lessee may ask for to continue in their various offices, situations & employments under the lessee, & the lessee will receive for & account to the lessors for any outstanding current accounts up to the date of coming into possession payable to the lessors by consignees or otherwise in connection with the operation of the demised premises prior to the date of coming into possession as aforesaid.

(7) The lessors covenant with the lessee that at the time possession is given there will not be any time contracts for carriage of freight or express in existence, nor any contracts or other agreements concerning traffic

with any person, railway, express or telegraph company, except a contract with the Great Northwestern Telegraph Company, dated Feb. 18, 1889, the property being leased subject to said contract.

(8) During the term hereby demised the lessee shall have the right to exercise & enjoy all the franchises & powers of the lessors in respect to the acquisition of increased areas of lands for station grounds, right of way, protection against snow, siding & double-tracking & other purposes, & the lessee is hereby authorized, in the exercise of the said franchises & powers, to use the lessee's name or the names of the lessors & the names of the officers of the lessors.

(9) The lessee shall also have the right to make such improvements, alterations & changes in & additions to the demised premises, & to build such buildings, erections, & structures as the lessee may deem proper, & also to make with any corporation or person traffic operating & running agreements for the interchange of cars & traffic, & in the running of engines & cars upon & over the demised premises, the intention being that the lessee shall during the said term, with respect to the use to be made of the demised premises, have all the rights of the lessors.

(10) The lessors covenant with the lessee that at the request of the lessee the lessors will affix the names & seals of the lessors to instruments required by the lessee for purposes connected with the demised premises, & that the lessee shall have the right to make & enforce either in the names of the lessors or of the lessee, such lawful rules, regulations & by-laws concerning the operation of the demised premises as shall be required for the convenient and efficient operation thereof & for the preservation of order thereon.

(11) During the term hereby demised the lessee will keep the demised premises in substantially as good repair & condition as they are at present, & the lessee covenants with the lessors that they will not during the said term be called upon to pay any rates or taxes in respect to the demised premises or charters or franchises of the lessors.

(12) The lessee will at the expiration or other determination of the term yield up the demised premises to the lessors in as good general plight as at the commencement of said term, provided always that with respect to rolling stock, equipment and personal property the lessee may yield up the same or other rolling stock, equipment and personal property of equal value.

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(13) The parties hereto agree that the value of the demised premises & of all the franchises, rights & powers of the lessors, free from incumbrances, is \$7,000,000, & the lessors & the Pacific Co., as owners of the bond in the above recital mentioned, & of all the shares in the capital stock of the lessors, hereby respectively consent to passing of such legislation as may be required in order to enable the lessee at the lessee's option to acquire absolutely the demised premises & the said franchises, rights & powers, free from incumbrances, for \$7,000,000 at any time during the term hereby demised.

(14) The Pacific Co. covenants with the lessee that no default will occur on behalf of the lessors in the payment of interest upon any of the bonds secured by mortgage upon the railways & undertakings, & that there are no bonds charged upon the said railways & undertakings other than those set out in the recital. The Pacific Co. further covenants with the lessee that upon the maturity of said bonds, in case the lessee has not then exercised the option to acquire the demised premises, the Pacific Co. will, so far as it is able & to the full extent of its interests in the said bonds & in the capital stocks of the said lessors, consent to the time for the payment of the principal of said bonds being extended & will use its best endeavors to procure the same to be extended so long as the lessee has not exercised said option.

(15) The lessors & the Pacific Co. covenant that there are no liens or incumbrances against the demised premises, except those above recited. The Pacific Co. and the lessors also covenant that they have not done & will not do or suffer any act or thing which will disturb or impair said title or possession.

(16) In case the lessee makes default in payment of the rental or in case default be made in payment of any rate or taxes lawfully imposed upon or in respect of the demised premises or franchises, & such default in either case continues for 90 days, the lessors or the Pacific Co. may give the lessee 30 days' notice in writing to put an end to such default, & if such default continues during said 30 days the lessors or the Pacific Co. may by notice in writing terminate the lease & the lessors may thereupon repossess themselves of the demised premises.

(17) The parties hereto will use their best endeavors to procure such legislation from the Legislature of Manitoba & the Parliament of Canada as may be necessary to confirm this indenture & to enable & require the parties to carry out the same.

(18) Any notice which the lessee may desire to give to the lessors may be validly given by serving the same on the Pacific Co.

In testimony whereof this indenture has been duly executed for the Northern Pacific & Manitoba Ry. Co. by C. S. Mellen, President; R. H. Reif, Secretary; for the Winnipeg Transfer Ry. Co., by C. S. Mellen, President, & R. H. Reif, Secretary; for the Portage & Northwestern Ry. Co., by C. S. Mellen, President, & R. H. Reif, Secretary; for the Queen, represented by the Government of Manitoba, by R. Rogers, Minister of Public Works of said Province; for the Northern Pacific Ry. Co., by C. S. Mellen, President, & R. H. Reif, Assistant Secretary.

Forty miles an hour is the speed maintained by a trolley line running between Nashua, N.H., & Haverhill, Mass. The line will carry passengers, freight, & baggage, & probably has the fastest schedule of any similar line in the world.

A natural spring is to be seen bubbling from the top of a trolley pole in Brooklyn, N.Y. The pole is one of the hollow ones, & the water spurts like a regular geyser. It is supposed that its bottom end has tapped an underground spring.

### Contract with the Canadian Northern.

Following is the agreement between the Manitoba Government & the Canadian Northern Ry. Co., divested of some of the legal verbiage:—

(1) Wherever in this indenture the Government or the Co. is mentioned or referred to, such mention or reference shall extend to, include & be binding upon the successors & assigns of the Government or the company, as the case may be.

(2) The Government does hereby assign, transfer & set over unto the Co. the said lease & option & the term thereby created & the premises thereby demised & the rights & powers thereby conferred, & benefits & advantages of said lease & option & the covenants herein contained.

(3) The Co. covenants with the Government to pay the rentals under said lease & option when the same become due, & to make all other payments which the Government herein covenants shall be paid, & to abide by, carry out & perform all the covenants & agreements, terms & conditions of the said lease & option made or agreed to therein by the Government, & to indemnify & save harmless the Government against all loss, costs, & expenses in connection therewith.

(4) The Government & the Co. shall at the next session of the Legislature of Manitoba & of the Parliament of Canada use their best endeavors to procure the necessary legislation to enable the Co. at its option to acquire absolutely the demised premises included in said lease & option, & the franchises, rights & powers of the lessors therein named, free from encumbrances, for \$7,000,000 at any time during the term thereby demised. The Government & the Co. will also use their best endeavor to procure from said Legislature & Parliament such legislation as may be necessary to confirm the said lease & option & this indenture, & to enable & require the parties to carry out the same in order that their true intent & meaning may be properly & fully accomplished.

(5) The Co. is to prepare & issue bonds at the rate of \$20,000 a mile of its line of railway from Port Arthur to Rainy River, not exceeding 290 miles, such bonds to be payable on June 30, 1930, with interest half-yearly at the rate of 4% per annum, & to be secured by mortgage to National Trust Co., Ltd., as trustees covering the said line of railway from Port Arthur to the Rainy River, & all leases & agreements with the Minnesota & Manitoba Ry. Co. respecting traffic or running powers, or otherwise, & all leases & agreements with the Minnesota & Ontario Bridge Co. with reference to the proposed bridge across the Rainy River, also the said lease & option, subject to the right of the Co. to exercise such option and to create a first mortgage on the premises demised by said lease & option, securing an issue of bonds for the purpose of raising \$7,000,000, with which to purchase said demised premises; also covering, as a second charge thereon, the lines in Manitoba already covered by mortgage securing the bonds heretofore guaranteed by the Government after a first charge of \$10,000 per mile.

(6) The said bonds are to be made ready for issue & delivery, & the Government is to guarantee payment thereof. The said bonds, with the said guarantee thereon duly signed on behalf of the Government, are to be deposited with the trustees of the mortgage securing the same, & when, but not before, the Co.'s line from Port Arthur to the Rainy River has been constructed & opened for public traffic, & a through train from Winnipeg has been run over the said line to Port Arthur, the said guarantee bonds shall be certified & delivered by the trustees to the Co. or its order, any overdue coupons on the bonds so delivered shall, before delivery, be cut off and cancelled. Provided always that

no bonds shall at any time be certified or delivered by the trustees, as in this paragraph provided, unless and until present outstanding bonds to an equal amount are from time to time delivered to the trustees in exchange therefor, so that there shall never be outstanding at one time a greater amount of bonds covering said line than at the rate of \$20,000 a mile of said line between Port Arthur and Rainy River not exceeding 290 miles. Provided, also, that until the whole of the present outstanding bonds have been so received in exchange by trustees, the rights & priorities of the present outstanding bonds actually received in exchange shall, for the protection of the Government be maintained & preserved, & said bonds shall, in the hands of the trustees, inure to the benefit of the Government in case the bonds given in exchange therefor are retired by the Government under said guarantee. Provided, further, that when all the said present outstanding bonds have been so received in exchange by the trustees the same shall be cancelled.

(7) The Co. covenants that its line from Port Arthur to the Rainy River will be constructed & opened for public traffic & that a through train from Winnipeg will be run over said line to Port Arthur on or before Oct. 1, 1901. Provided, that, if by reason of the weather, strikes, difficulties in procuring men or materials, or for other reasons beyond the Co.'s control, the construction of the said line is delayed, the Railway Commissioner of the Province of Manitoba may extend the time for said construction and running of said train.

(8) In consideration of the guarantee of the said bonds & the assignment of said lease & option, the Co. hereby agrees that up to June 30, 1930, the Lieutenant-Governor-in-Council shall from time to time fix the rates to be charged or demanded by the Co. for the carriage of all freight from all points on the Co.'s lines in Manitoba to Port Arthur, & from Port Arthur to all points on the Co.'s lines in Manitoba, & from all points on the Co.'s lines in Manitoba to all points on said lines in Manitoba, provided, always, that before any rates are so fixed the Co. shall be heard, & their interests taken into consideration. The Co. agrees that it will not at any time after the said rates have been so fixed charge or demand for the carriage of freight between the points aforesaid greater rates than those so fixed by the Lieutenant-Governor-in-Council.

(9) The Co. hereby consents to the passing of such legislation by the Legislature of Manitoba as may be necessary to confer upon the Court of King's Bench for Manitoba full jurisdiction at the instance of the Attorney-General of the Province on behalf of the Government to decree specific performance & observance by the Co. of each & every of the terms of this agreement & of the said lease & option, & the Co. hereby consents to & submits to the jurisdiction of the said court.

(10) Commencing when this agreement takes effect, the Co. shall reduce its passenger rates in Manitoba to not exceeding 3c. per passenger per mile.

(11) The receipts & incomes of the Co. from operating the lines of railway included in the mortgage securing said guaranteed bonds, & from all its lines in Manitoba, including the lines demised by said lease & option, shall be applied in the first place in payment of the working expenses of said lines of railway, & in the second place, in payment of the rentals under said lease & option & interest on bonds on said lines heretofore or hereafter guaranteed by the Government or issued with the consent of the Government. And in consideration of said power given to the Lieutenant-Governor-in-Council respecting the fixing of rates the Government agrees that

if the said receipts & income after payment of said working expenditure are not sufficient to pay said rentals & interests the deficiency (if any) shall be borne by the Government, & the Co. shall be relieved therefrom. Provided always that the said deficiency (if any) shall be ascertained at the end of each period of two years, commencing from Oct. 1, 1901, & any surplus in either year of any such period shall as far as necessary be applied in reduction of any deficiency in the other year of such period, but each period of two years shall for the purpose of this clause be treated apart from each other period. For the purposes of this clause the term "working expenditure" shall not include the salary or remuneration of any officer, employe or other person whose time is not wholly employed bona fide in connection with the said lines or railway in this clause mentioned, but as to officers and employes and other persons whose services are necessary or desirable in connection with the said lines, & whose whole time is not taken up in connection therewith, there shall be included reasonable remuneration for the time actually expended & services actually rendered by them in connection with said lines, & the said term shall not include any expenses, payments or outgoings not reasonably necessary for the efficient management, maintenance, operation & repair of the said lines.

Should any dispute arise between the Government & the Co. as to "working expenditure" under this clause the same shall be referred to the Chief Justice of the Court of King's Bench for Manitoba, who may consult with experts & use his own judgment in coming to a decision, & his decision shall be final & without appeal. For the purposes of this clause the Minnesota & Manitoba Ry. shall be deemed to be a line or railway included in said mortgage securing said guarantee bonds.

(12) The provisions contained in existing legislation & agreements relating to the Northern Pacific & Manitoba Ry. Co. relating to running powers by other companies over the lines included in said lease are not to be abrogated by anything herein contained, but all such powers may be exercised to the same extent with respect to the lines demised by said lease as if the lease & option & this agreement had not been made.

The Co. may allow any other company, except the Canadian Pacific Ry. Co. & any other company or companies running in the interests of the C.P.R. Co. running powers over any of the said lines at reasonable rates & tolls & upon such conditions as may be agreed upon.

(13) The Co. shall provide & maintain such equipment for its lines of railway as will reasonably provide for the requirements of freight & passenger traffic of such lines, & should any dispute arise under this clause the same shall be decided by the Railway Committee of the Privy Council of Canada.

(14) The Co. covenants with the Government that its accounts shall be audited not less than once in each year by an auditor appointed by the Co. with the approval of the Government.

(15) The Co. will arrange for connection between its railway systems from a point east of Sprague station & some line of railway now or hereafter connecting with Duluth on Lake Superior.

(16) Notwithstanding its present exemption from taxation, the Co. covenants to pay each year after the year 1905 & up to the maturity of the bonds hereby agreed to be guaranteed a sum to be fixed from time to time by the Lieutenant-Governor in Council, not exceeding 2% of the gross earnings of the Co. from its lines in Manitoba covered by the mortgages securing bonds heretofore or hereafter guaranteed by the Government, & from the

lines included in said lease or option, & in consideration of the said payments the Co., its properties, incomes & franchises shall be exempt from such taxation as is provided for by sec. 13 of chap. 57 of the statutes of Manitoba of 1900 during the currency of the said bonds. Provided, however, that any lands now exempt shall continue to be exempt from such taxation during the currency of said bonds.

(17) The Co. shall continue & maintain as its workshops at Winnipeg the workshops of the Northern Pacific & Manitoba Ry. Co. & the general offices of the said Co. with respect to the operation of the lines covered by said mortgages shall be at Winnipeg.

(18) The Co. covenants that all controllable freight originating on or delivered to the lines covered by said mortgage shall be carried over said lines as great a distance as possible on its way to its destination.

(19) The Co. shall not nor shall any of the branch lines thereof or any lines of railway leased by the Co. or under its control be at any time amalgamated with the Canadian Pacific Ry. Common fund or pooling the earnings or receipts of the said two companies' railways or any of their branch lines shall be absolutely void. This provision, however, shall not extend to traffic or running arrangement made with the assent of the Governor-in-Council.

(20) The Co. hereby grants to the Government the option to be exercised during the year 1929 of purchasing the then entire undertaking of the Co., including all rights, franchise, power, real & personal property connected therewith. This option is not assignable by the Government.

In witness whereof the parties hereto have duly executed these presents this 11th day of Feb., 1901. Signed, sealed & delivered in the presence of Z. A. Lash. R. P. Roblin, Railway Commissioner, for the Government.

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Canadian Northern Ry. Co.

### The C.P.R. Co.'s Offer.

President Shaughnessy of the C.P.R. has made public the following letter, written by him at Winnipeg, Jan. 22, to Premier Roblin:—

"Referring to the discussion at our interview this afternoon, I desire to repeat what was stated in general terms to you & the other members of your Government. The C.P.R., as described in the contract between the Government & the syndicate, received substantial aid in the way of constructed lines, lands & cash, but the road as then contemplated would not at this date be earning money enough to give any return on the private capital invested in the enterprise, much less to have enabled the proprietors to raise the large additional amount of money that has been expended on the line since its nominal completion to improve its character so that it might be operated more economically & effectively. That the Co. has been financially successful is due to the broad policy of building & acquiring feeders, adopted almost in the beginning & pursued ever since. To-day there are upwards of \$225,000,000 of private capital invested in the enterprise. Common honesty demands that the people who invested that vast sum of money in our country should receive fair treatment at the country's hands. The Government could, of course, by utilizing the resources of the Dominion or any of the Provinces for the construction of competing lines, seriously injure, or, indeed, totally destroy, the property of these investors.

"The Government cannot operate a railway any more economically than a private company; indeed, experience teaches that Government operation is the more expensive, but with the public chest from which to make up deficits, the rates for the carriage of traffic over a Government railway system could be established on a basis that would be impossible in the case of a private corporation. It would take the public some time to find out that the apparent reduction in rates was more than counterbalanced by the increase in taxation. Speculators can be found who with a sufficient Government bonus will undertake to build lines, & will accept almost any conditions as to rates, their interest being only in the profit to be realized from the construction of the lines, without any regard to their successful operation in the future. Even where there is a specific contract by which the Government waives the control of rates until certain things have come to pass, as in the case of the C.P.R., the Government is justified in resorting to all reasonable measures to secure fair rates of transportation for the people of the country, but in determining what are fair & reasonable rates some recognized course should be adopted. It would be manifestly wrong to arbitrarily name the rates that are to be put into effect, without reference to their efficiency or fairness. The C.P.R. has not attempted, it has no desire, to use its contract with the Federal Government for the purpose of securing rates for the carriage of freight that are unreasonably high. It has been the policy of the Co. to reduce rates from time to time in one locality or another, when it could be done without unduly sacrificing the interests of its security holders.

"The Co. has a line of railway from Lake Superior to the Pacific coast, with branch lines in the Provinces & Territories. South of the International Boundary there are two railways similarly situated. The circumstances under which the lines are operated are identical in many particulars, but the advantage is with the lines south of the International Boundary. Their rolling stock, fuel & supplies cost them less money than ours

cost us. There is little, if any, difference between us in the matter of wages. Each of the railways south of the boundary has a population to serve several times as large as the population along the Canadian railway, consequently these lines have more local business. Their tolls & fares are controlled by the Federal Government with reference to certain classes of traffic, & by each of the states throughout which their lines pass with reference to the traffic within the state. It may be assumed that under all these circumstances their tolls are as low as can be reasonably expected. In any event, we do not hear that either the Federal or State Government will provide money for the acquisition or construction of lines to compete with them. Is there any reason why the rates in C.P.R. territory, between Fort William & the Pacific coast, should be lower than those which prevail in the territory between Duluth and the Pacific coast in the U.S.? On the contrary, taking everything into consideration, should not the C.P.R. be entitled to somewhat higher rates, in view of the conditions prevailing north of the International Boundary?

"I make the statement most positively that our rates are as low as those of any of the railways in corresponding territory in the U.S. I think that the Minister of Railways, Mr. Blair, who caused an exhaustive comparison to be made upwards of a year ago, will bear me out in this statement. If these be the facts, & they can be easily verified, is there any reasonable ground for complaint against the C.P.R., is there any justification for legislative action that is calculated to force down to an unreasonable & indefensible basis the compensation that the Co. shall receive for its services, thereby using the strong arm of the Government to attack investors, & to injure, if not destroy, their property?

"The popular demand for what is known as a ten-cent rate on wheat in Manitoba has at the present time no more justification in fact than would a demand that gold dollars should pass current at 70c. in that Province. No such rate prevails elsewhere under like conditions. It is 30 to 40% lower than the rates from corresponding points in the U.S. to Duluth. It is the policy of the C.P.R. Co. to reduce the rates just as rapidly as circumstances will permit. The increase of tonnage will be a most important factor in bringing this about, because on the western sections of the system several times as many freight trains could be run without any increase in the fixed expenses, the additional cost being practically represented by the wages of the trainmen, fuel & repairs. Everything that has been done & may be done to divert the tonnage to other routes is an obstacle in the way of the reduction which I beg to assure you in all sincerity the shipper is no more anxious to secure than the Co. is to make just as rapidly as the conditions warrant. Notwithstanding the Co.'s desire & determination to pursue this policy, it seems impossible to satisfy the public & a large section of the press of its sincerity, & therefore the Co. has decided to do what it can in ordinary prudence toward allaying agitation by submitting for the acceptance of your Government the following proposition for the control of rates:—

"The Co. will agree to build a line from a point near Brandon, on the Great Northwest Central Ry., northwesterly through the municipalities of Daly & Woodworth for a distance of about 34 miles during the current year; also a line from Carman eastward 16 miles towards Osborne. The Co. will lease for 99 years from the Government the Northern Pacific lines in Manitoba, including equipment & terminals, paying therefor an annual rental of \$220,000 for the first 10 years, \$245,000 for the second 10 years, & \$300,000 thereafter. In consideration of the Province placing the

Co. in the same position that the Canadian Northern now occupies with reference to taxation, & an undertaking on the part of the Provincial Government that for a period of 10 years the Government will not grant aid towards the construction of any railways within the Province south of a line drawn easterly between the western boundary of the Province as it now exists, or may hereafter exist, through Binscarth to the eastern boundary of the Province, nor any railway line between any point in the Province & a port on Lake Superior, & the Co. will make the following specific reductions in its rates:—

"Sept. 1, 1901—Grain & flour, 1½c. per 100 lbs.

"Sept. 1, 1902—Grain & flour, ½c. per 100 lbs.

"Sept. 1, 1903—Grain & flour, ½c. per 100 lbs.

"Sept. 1, 1904—Grain & flour, ½c. per 100 lbs.

"Sept. 1, 1905—Grain & flour, ½c. per 100 lbs.

"Sept. 1, 1906—Grain & flour, ½c. per 100 lbs.

"Thus making a reduction within that period of 4c. per 100 lbs. from all points within the Province.

"The rate on salt will be reduced forthwith to 15c. per 100 lbs. from Fort William to Winnipeg, & to all other points in proportion, according to existing tariffs.

"The rate on coal, Fort William to Winnipeg, will be reduced to \$2.50; to Portage la Prairie, \$3, & to Brandon, \$3.35 per ton of 2,000 lbs.

"In order to define, control & to deal with disputes that may arise with reference to rates, the Co. will undertake to pay to the Government a sum not exceeding \$5,000 a year as the salary of a competent man to be appointed by the Government for the purpose of receiving, investigating & reporting upon every complaint about the transportation charges of the Co. If at any time such official shall be of opinion that any of the company's local rates between points within the Province of Manitoba, or between any point in Manitoba & Lake Superior, in either direction, is not fair & reasonable, the Railway Commissioner for Manitoba may notify the Co. to that effect, & of the change which, in his opinion, is necessary to make it so. If the Co. be not satisfied with the proposed change, it shall, within one month from the receipt of the notice, satisfy the Commissioner that the rate proposed by him is not a fair & reasonable one. Failing this, the question shall be referred to the adjudication of the Court of King's Bench in Manitoba, to determine what, under the circumstances, is a fair & reasonable rate in respect of the matter in connection with which the proposed change is required. Such court may, for the purpose of determining the matter, make full inquiry & receive such evidence as may be adduced by either party. It shall be the privilege of either of the parties to appeal from the judgment of such court to the court en banc, whose decision in the matter shall be final. It would be necessary, of course, in any formal agreement, to amplify the details of the procedure, & to provide means of compelling the Co. to put into effect the rates finally decided upon.

"If it be deemed desirable that the portion of the line between Winnipeg & Portage la Prairie should be reserved for the purpose of giving the Canadian Northern Ry. a connection with the Winnipeg & Southeastern Ry. & the Ontario & Rainy River Ry., that line may be reserved by the Government, the rental to be paid by the C.P.R. to be reduced pro rata according to the mileage. It is understood, of course, that the proposition is submitted as a whole & subject to acceptance within a reasonable time. If there be anything in the proposition requiring further



explanation or amplification please advise me."

AN AMENDED OFFER.

On Feb. 8 Mr. Shaughnessy met Premier Roblin in Toronto, & made him an amended offer in the following letter: The Executive Agent of the Co. has reported to me your advice to him that at a caucus of the members of your party recently held it was decided by a majority of the members, against the wish of your Government, not to accept the proposition of the C.P.R. Co. addressed to you & dated Jan. 22 last. In view of your assurance to me when in Winnipeg that your Government would not reject the C.P.R. Co.'s proposition without my having a further opportunity of communicating with you to enable me to amend the proposition to, so far as possible, come into accord with the wishes of your followers, I have decided on behalf of the C.P.R. Co. to submit the following modifications of the original proposition & also the alternative offer herein contained. I am constrained to endeavor to meet the views of your followers, not only by my desire to make an arrangement with your Government which will be in the best interests of the Province & will secure for the Co. the hearty support & co-operation of all residents of Manitoba, but also by your frank statement to me that the proposition was a much better one than you had expected to obtain, & by the further statements made by yourself to Mr. Baker & by Mr. Rogers to Mr. Phippen, that the proposition was—subjected to the modifications which are now provided for—entirely satisfactory to your Government, & was in the opinion of all the members of your Government the best offer in the interests of the Province that you had received, & that it was against the unanimous wishes of your Government & against what you considered to be the best interests of the Province that the caucus had decided not to accept. For these reasons, & the reasons hereinafter discussed, I beg, on behalf of the C.P.R. Co. to offer the following modifications to the proposition of Jan. 22 which, except as herein altered, will stand as originally made:

"(1) The Co. will withdraw that portion of its original proposition restricting your Government from assisting other roads in certain sections of the Province for 10 years, thus leaving the Government of the Province free to act as it may deem best in such matter.

"(2) The Co. will modify its request to be placed in the same position as to taxation as

the Canadian Northern Co., by agreeing to pay such taxes as may be imposed up to 1% (instead of 2% as at present) of the Co.'s earnings in Manitoba.

"The result of these modifications is practically to offer your Government, without return, the great advantages contained in the Co.'s offer of Jan. 22, the only benefit the Co. is to receive being a slight reduction in the amount of taxes to be imposed, but still leaving the C.P.R. Co. the only railway taxed by your Province. I have personally given you the reasons why, in my opinion, it will be most disastrous to the Province should the contract, the terms of which you have disclosed to me, be entered into with the Canadian Northern or any other railway company. I have pointed out to you that in making the proposed contract the Province assumes a fresh liability of \$12,800,000, & an annual payment of \$682,000; that according to the sworn returns to the Dominion Government the lines of the Northern Pacific Ry. Co. in Manitoba were last year operated at a loss of \$185,573.21, apart entirely from interest on bonds, notwithstanding the fact that these lines are constructed through some of the most fertile parts of your Province; that, taking this as a basis, & allowing every margin in favor of the Canadian Northern Co., that Co. cannot hope to more than pay its operating expenses for many years to come, & that in the meantime the Province of Manitoba must pay out annually for rental & interest \$682,000, a sum approaching the present total gross revenue of the Province, without any claim against or hope of recovery from the Co. I have shown you that the statement that the Canadian Northern Ry. Co. has been able to pay its operating expenses & interest on its bonds from the commencement may be due to abnormally high freight rates charged by that Co. to its contractors (its owners) for hauling construction material, & that this view is clearly substantiated, not only by the history of other companies similarly situated, but by the unprecedentedly low percentage of its operating expenses, as shown by its Government returns.

"I have urged upon you the fact that any substantial reduction of rates, such as the C.P.R. Co. has specifically offered, & such as you hope to obtain, must have a disastrous effect upon a company like the Canadian Northern. I have pointed out to you that this is by far the most important transaction the Province has ever considered, a trans-

action in which a mistake may not only be fatal to Manitoba but seriously detrimental to all of Canada, & have most strongly urged, as representing a company most deeply interested in the future of western Canada, that your Government should, before finally committing the Province by any contract, make the fullest and most searching inquiries into this subject. The time so far at your disposal cannot possibly have permitted you to make a thorough investigation & to have resort to the technical information, wide range of facts & other matters necessary to enable you to arrive at an intelligent conclusion. Under these circumstances, would it not appear to be imprudent, if not absolutely reckless, to enter into a contract with the Canadian Northern Co., which, in the expressed opinion of your Government, is not in the best interests of the Province, & which was decided upon in contravention of the best judgment of your Government at a meeting of your followers hastily called and held under such conditions as would make it impossible for these gentlemen to become fully informed as to the magnitude of the financial responsibility that the Province proposes to assume?

"In order to enable you to make the necessary investigation the C.P.R. Co. is willing to enter into an agreement with your Government for, say, one year, to the effect that the Government shall during that period operate the lines proposed to be leased from the Northern Pacific Ry. Co., & that the C.P.R. Co. will provide the rolling stock & accord most reasonable rates for handling between Winnipeg & Fort William or Port Arthur all traffic originating on or destined to the lines operated by the Government. These rates I am now ready to discuss & in a spirit calculated to enable you to determine within the year the earning capacity of the lines proposed to be leased from the Northern Pacific, when operated under most favorable circumstances as a portion of a system extending to Lake Superior. This Co. will also agree that at the end of the term its proposition of Jan. 22, as amended by this letter, will be open for acceptance by your Government. The Co.'s justification for making this offer, under all the circumstances outlined above, is that these lines can be operated most economically as a portion of its large railway system, & because the revenue from the traffic that the lines would contribute to its extensive mileage east of Fort William would make them more valuable to this Co. than they could possibly be to the Northern Pacific Ry. Co., the Canadian

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Northern Ry. Co., or to the Manitoba Government.

"The magnitude of the proposed transaction between the Government, the Northern Pacific Ry. Co. & the Canadian Northern Ry. Co. & the crushing financial burden that it would probably impose on the Province, from which there can be no escape once the contract has received legislative sanction, prompt me to urge upon you that no definite arrangements in connection with it be made between the Government & the other parties until at least there has been further opportunity to discuss the whole subject with the members of the Legislature."

#### Premier Roblin's Explanation.

At a dinner given at Neepawa, Man., to the Provincial Treasurer, Hon. J. A. Davidson, Premier Roblin made the first public announcement of the Government's railway policy. He began by remarking that the transportation problem was one of the questions Hon. H. J. Macdonald, as leader of the party, said he would undertake to solve, but the way in which the solution would come he was not in a position to disclose. "It has fallen on me," said Mr. Roblin, "as leader of the Government, to finish the task he was able to begin. I think you will agree with me that so far as the question of transportation is concerned it has been solved. I will give my reasons for giving you the conditions of the contract. The principle of Government ownership was a plank in the platform of the party, but the conditions were not such as to make the application of that principle an easy one. We had to deal with things as we found them. We have, however, done our best. We have, I believe, filled up the measure of our responsibility, even to the extension of Government ownership or Government control. Looking over the ground, we saw that four or five hundred miles from the point where we were to have competition—that is, Lake Superior—and from Brandon, from a centre, there were two railways already owned by private corporations, one in active operation, the C.P.R., & another, the Canadian Northern, destined to reach the northwest in a short time. We had no powers vested in the Legislature that would compel these railway corporations to make any concessions.

As a Province we concluded that the Northern Pacific was a very important factor, & therefore decided that we should secure, if possible, that system. To that end we began negotiations. We waited on President Mellen & discussed the situation with him. We told him frankly that his road was popular, & if his company were disposed to make concessions which the people believed ought to be made we were prepared to deal with him. Mr. Mellen declared positively & without equivocation that under no consideration would the N. P. either build one mile in the Province or reduce the transportation charges a millionth part of one per cent. We were somewhat astonished to find the N.P. taking such a position. We then said:—"If we cannot induce the N.P. to reduce its rates & extend its system, then we ought to secure that road as a Government road on any terms reasonable and fair. We made them an offer in a formal way, & that offer was carried to the board in New York by President Mellen, & submitted to the directors of that great corporation, & very promptly declined. The result was that we could not & did not get any intimation from them as to what they would do. We were somewhat embarrassed at the situation. We thought it possible they would make an alternative offer, but they did not approach us again. Finally, in an interview, they intimated on what conditions & terms they would dispose of their roads.

As a result of the negotiations I have the contract entered into by the Northern Pacific

on the one hand & the Province of Manitoba on the other in my hand to-night. That contract was entered into on Jan. 15 last, & the conditions are these:—We lease from the N.P. Co. its entire system in Manitoba, including all terminals in Winnipeg, all rolling stock & all appurtenances of every kind, including telegraphs, etc. We have agreed to lease these under contract for 999 years. The terms are these:—\$210,000 for the first 10 years, \$225,000 for the next 10 years, \$275,000 for the next 10 years, & for the balance \$300,000, with an option that can be purchased at any time for \$7,000,000. This amount for 354 miles of railway is said by some to be in excess of what the road might be built for at the present time. I believe it is possible to build that road for less money to-day, but the question is, could we build a road that would secure a trade so developed with another line? Seven million dollars does not represent the amount of money that the road has cost.

I have the exact figures here, taken from the N.P. books, showing the total for 354.54 miles, \$7,514,300. To be added to that are improvements, \$194,340; real estate in Winnipeg, \$40,832; Souris River branch, \$347,096; Portage & Northwestern branch, \$346,720; Waskada, \$2,222; total, \$8,445,510. That was the cost of that system to the N.P. Co., but it is admitted that all the money the railway cost did not go into construction. We had to deal with men who are independent, who are not British, who hardly believe in fair play, & we had to make such a bargain as they were willing to make from their standpoint. The value of the road is not open to dispute. We have been offered a handsome margin upon that price by a corporation, with a guarantee that the amount would be paid the moment the papers were signed; therefore, we feel very strong in the position we take, that this was a good bargain.

I want to go a little further with the N.P.R. before I leave it, because there are certain statements that are official that are to be found in the public records of the country that would lead the ordinary or superficial observer to believe that the N.P.R. in this province was not a paying concern. I therefore propose to submit some detail regarding that to disprove in anticipation any criticism that may be made along that line, because while the great majority of the people of this country, I have no doubt will agree that any transaction that a private or public body make that will permit of considerable profit being made on the turnover is a good one, yet I fancy from what I have heard in the last 24 hours that there are those who will say that the leasing of the N.P.R. & the option of purchase such as I have indicated is not a safe & good transaction. Now to meet that, I want to submit certain figures that have been compiled under the seal of the N.P.R. to show just what that railway really is worth so far as its earning power is concerned. The statements that have been compiled & filed in the Department of Railways at Ottawa show, taking the year that ended June 30, 1900, a loss of \$77,347.21, that is, shows a loss, not after the fixed charges have been paid, not after interest paid on \$8,000,000, but the statement filed in the Department at Ottawa shows it did not meet its operating expenses within \$77,000 as I have stated. Now that is very misleading, & for this reason: The N.P.R. Co. treats its various branches as part of the whole system, & the earnings of any branch or portion of the line, such as the N.P. & Manitoba, is treated on a mileage basis, that is to say, if 200 miles between two given points, say Brandon & Duluth, & 20 miles or 40 miles of that is in Manitoba under a separate charter, they only get out of the earnings from that point to Duluth the proportion that 20 is to the whole distance. That, of course, is not the fair,

nor honest nor customary way in which railways calculate their earnings of their branches. We will take it, therefore, on the principle on which they calculate the earnings of branch lines on other roads. Why the N.P.R. calculate in that way, I am not in a position to say. President Mellen was not willing to explain; it was their method & that was all so far as he was concerned. We will just take the general figures; the total earnings according to the sworn statement for the year I have mentioned, in Manitoba, was \$394,032.21, operating expenses & taxes in Manitoba \$471,379.42, making the deficit that I have just mentioned.

[NOTE BY EDITOR.—The above figures are those given by Mr. Roblin, as reported in the Provincial Government's organ at Winnipeg, but they do not agree with the statement in the report of the Department of Railways for the year ended June 30, 1900, which are: Gross earnings \$391,947.40, operating expenses \$577,525.61, loss \$185,578.21.]

"Now, statistics, experience & statements made by all roads go to show that about 50%—some say 55, some 45—of the gross earnings are required to meet maintenance & operating expenses. Now take 50% from the figures of the year in which they were compiled. The percentage of gross earnings required for operating expenses, as shown by their own statement, was 52%. Now take 48%, which is only fair & reasonable on \$6,900,000 & what have you? You have \$467,200. Subtract that from the total of \$973,500 and you have \$506,300 as the net profit, net earning power of the N.P.R. in this Province. Therefore, no wonder that railway people, knowing the earning power of the road, knowing that the statement filed in the Department at Ottawa was misleading & did not correctly represent the facts, no wonder I say, that they are willing to pay us a handsome profit on our transaction. I say the earning power therefore is such as justifies & warrants the statement that it can pay interest on every dollar it costs, even on \$8,500,000 & more too. Therefore I claim that with the statistical position & the facts in connection this road justifies the statement I have made that it is a good bargain from a business standpoint.

We realized that we had a lever with which to move other corporations, or, if we could not succeed in moving them, which would justify us in building another line to Lake Superior. When the other corporations found that we had secured this road in defiance of them, after they had done their best to prevent our getting control, they were willing to negotiate with us. We then undertook in the name of the people, to secure what I believe is the solution of the transportation question. We were offered by one corporation a very substantial profit on the bargain, with material consideration as to rates, but we wanted absolute control of rates on all classes & kinds of merchandise. If the contract before us is ratified, Manitoba will be in the most enviable position of any Province in the Dominion of Canada, or any portion of the North American continent, because the Government of Manitoba can make rates on all classes of merchandise to Lake Superior & from Lake Superior back, even to the extent of carrying it free if necessary.

Mr. Roblin then read the clauses of the contract with regard to rates & continued:—

That places the matter of rates on wheat & other articles of merchandise in the hands of the people of Manitoba, through your representatives. No other province in Canada, no state in the Union, has any such power or authority. The question arises as to what have we given for the right to control rates on everything exported or imported. We had to guarantee the bonds on the Ontario & Rainy River division of the Canadian Northern Ry., 290 miles, at \$20,000 a mile

In the contract made with the Canadian Northern we have secured control over a system of about 1,022 miles, a very important system. It covers the following: Gladstone & Saskatchewan, 389 miles, guarantee \$8,000, which makes \$3,112,000; the Gilbert Plains branch, 27 miles, \$216,000; the Southeastern Ry., 152 miles, \$1,216,000, making a total of \$4,544,000. The total liability of 858 miles of the Canadian Northern Ry. is \$10,344,000. The general liability per mile is \$12,056. That is the lowest bonded charge of any railway on this continent, & we have control. The people own it, & can do as they choose, so far as rates are concerned. Added to this is the Northern Pacific Ry., some 350 miles, which makes a total of 1,200 miles in the Province. The bonds we will guarantee will be secured by a first mortgage, the only mortgage the Co. will put upon the road. It will cover all the rolling stock, appurtenances & properties connected with the system, & being the lowest on the continent, must necessarily be absolute security.

Just on that point it will be well to give you an idea of what our \$12,000 per mile is & to compare it with the funded charges of some of the other roads. We will take the N.P.R.,

& that we all know is in a flourishing condition to-day. The statement of the N.P. for 1889 showed gross earnings \$26,048,674, & expenses \$12,349,452; net earnings, \$13,699,222. Percentage of expenses to earnings, 47.4; No. of miles operated, 4,579. Its bonded debt is \$202,144,000, or \$44,145 a mile, & to this has to be added the capital liability as well of \$410,736.00, or an actual liability on each mile of \$89,700, & the government has a system with a liability of only \$12,500 per mile.

Now let me take the C.P.R. for 1899:— Total earnings, \$29,239,038; expenses, \$16,999,872; net earnings, \$12,239,166; percentage of expenses to earnings, 58.16; net earnings, 41.84; miles operated separate from leased lines, 6,456; funded debt, \$188,368,266, or \$29,117 a mile. We have then its capital or stock liability, which makes \$291,146,279, or 45,097 for each mile of C.P.R.

These figures are unanswerable, & make an argument in favor of the contract which cannot be met. As Mr. Davidson said, we have secured additional connections from the Canadian Northern. By virtue of the contract & agreements ratified by Parliament, these have been exempted from taxation for

30 years. We have induced them to permit of taxation, beginning with 1905, at the rate of 2% on their gross earnings, what we are charging the C.P.R. to-day. This will give us very considerable revenue when the time comes. You ask, What has been done with the Northern Pacific Ry.? We have agreed to transfer our leases & right to purchase to the Canadian Northern for the consideration I have read, & the further consideration that they will relieve us from all liability, so far as that rental is concerned, when the road is completed & in operation. On Oct. 1 we will have the right to make the rates charged over that system.

We have made every provision for the enforcement of the conditions, & for the protection of your interests & the interests of the Province as a whole. In my opinion, the railway question in Manitoba is solved. There can be no further agitation as regards freight rates, because it is in your hands to make the rates through your representatives in Parliament. No doubt, when the power is vested in the hands of the people, there will be no rash nor radical reductions made, nor will there be any attempt by this Government, or any other, to use its power to injure any other

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corporation. The other great corporation with which as a Province we will now be a competitor has shown a spirit of liberality, a desire to meet the demands of public opinion, which has been surprising to me, & which justifies the statement that they are anxious to concede to the people whatever may be reasonable & fair, to allay agitation & establish confidence. Therefore, we look to the future with a great deal of assurance that this railway policy will be the inauguration of a new prosperity, growth & expansion, & particularly in agriculture, that will be a marvel to other portions of Canada, because the confidence that will be established by the fact that the people, through the Government, control the rates will be an encouragement to farmers to increase the area of land cultivated, & enlarge their herds. Some may say, What about the ten-cent rate to Fort William? You can have a ten-cent rate or eight or five-cent rate to Fort William if you choose, but the moment the revenue is reduced below the cost of operating & paying interest the Province will be called upon to make good the deficiency. But where it takes only 50% of the earnings to pay expenses, a very material & substantial reduction can be made. On Oct. 1 next we will begin with our own tariff, & show that we have what we promised in 1899, Government control of rates, & have, therefore, fulfilled our promises."

#### RAILWAY APPOINTMENTS, ETC.

**Canadian Pacific.**—A. R. Creelman, K.C., of Toronto, has been appointed Chief Solicitor, to succeed G. M. Clarke, who, it is said, will be retained in the Co.'s service as a consulting counsel, or some similar capacity. Mr. Creelman will not enter on his duties until July 1, as it will take him some time to close up matters in connection with the firm of McCarthy, Osler, Hoskin & Creelman, of which he has for many years been the managing partner.

G. J. Bury has been appointed Superintendent of the Crow's Nest sections, from Dunmore Junction to Kootenay Landing inclusive, with office at Cranbrook, B.C., vice J. A. Cameron, transferred.

D. G. Ross has been appointed Acting Superintendent of the Rat Portage, Wabigoon & Thunder Bay sections, with office at Fort William, Ont., vice G. J. Bury, transferred.

R. Peard has been appointed Assistant Superintendent of the Brandon section & Manitoba branch lines, with office at Winnipeg, vice D. G. Ross, transferred.

G. M. Sherlock succeeds R. Peard as Chief Train Despatcher of the Brandon section & Manitoba branch lines, with office at Winnipeg.

W. Downie, Superintendent of the Cascade & Thompson sections, has been appointed to succeed Capt. J. W. Troup as Superintendent of the Kootenay sections, with office at Nelson, B.C.

Capt. J. C. Gore, Port Captain, has been given the title of Assistant Superintendent of Columbia & Kootenay Steamers, reporting to Superintendent Downie.

H. E. Beasley, formerly Superintendent of the Kootenay sections, and latterly Chief Clerk in the President's office, has been appointed to succeed W. Downie, as Superintendent of the Cascade & Thompson sections, with office at Vancouver.

It is said that Capt. J. W. Troup, Superintendent of Columbia & Kootenay Steamers, will be appointed Manager of the Canadian Pacific Navigation Co., whose stock has been bought by the C.P.R. Co.



J. F. DOLAN,

City Passenger Agent, Richelieu & Ontario Navigation Co., Montreal.

**Canadian Northern.**—It is reported that F. W. Jones, formerly Assistant to the Manager of the C.P.R. western lines, & now Manager of the Columbia River Lumber Co., in which W. Mackenzie, of Toronto, is largely interested, has been offered an important position in connection with the operation of the Canadian Northern Ry. lines.

**Intercolonial.**—E. G. Russell has been appointed Manager of Operating & Maintenance.

**Northwest Transportation Co.**—Following is the list of officers, etc., for the current year, as decided at the recent annual meeting:—President, J. J. Long, Collingwood; Manager & Treasurer, J. D. Beatty, Sarnia; other directors, Jas. Scott, B. E. Walker, T. Long, Toronto; Secretary, D. H. Beatty.



E. A. WILLIAMS,

Superintendent of Rolling Stock, C. P. R.

#### Mainly About People.

A portrait of E. A. Williams recently appointed Superintendent of Rolling Stock for the C.P.R., is given on this page. Some biographical notes about him will be found in our Jan. issue, pg. 17.

Before leaving Toronto recently to become City Passenger Agent of the R. & O. N. Co., J. F. Dolan, who for many years held a similar position in the Co.'s service at Toronto, was presented with an address & entertained by the other Toronto ticket agents. His portrait is given on this page.

Edwin G. Russell, who has just been appointed Manager of Operating & Maintenance of the Intercolonial Ry., was born July 23, 1857, at St. George, N.B. He entered railway service, June, 1877, on the Intercolonial Ry., since which he has been consecutively, June 1, 1877, to Aug. 1, 1878, telegraph operator; Aug. 1, 1878, to Aug. 1, 1880, train despatcher; Oct. 1, 1880, to April 1, 1881, assistant to superintendent; April, 1881, to April 1, 1882, train despatcher; April 1, 1882, to Oct. 1, 1886, Superintendent Telegraph; & Oct. 1, 1886, to March 1, 1888, Assistant General Superintendent Minnesota & Northwestern R., & its successor, the Chicago, St. Paul & Kansas City Ry.; April 5, 1888, to Nov., 1888, Assistant Superintendent Chicago division Illinois Central R.R., at Cairo, Ill.; Nov., 1888, appointed Superintendent Chicago, Madison & Northern R.R., at Rockford, Ill.; Sept., 1889, to Jan., 1890, also Acting Superintendent of the Illinois Central lines in Illinois & Wisconsin; Jan., 1890, to Dec. 1, 1890, Superintendent Northern Lines Illinois Central R.R.; Dec. 1, 1890, to Nov. 1, 1891, Superintendent Wisconsin division, same road; Nov., 1891, to Sept., 1892, Superintendent Transportation, same road, at Chicago, Ill.; Sept., 1892, to Jan. 1, 1893, Superintendent Western Lines, same road, at Dubuque, Ia.; Feb. 1, 1893, to 1899, Superintendent Rome, Watertown, & Ogdensburg R.R., then for two years Superintendent & General Superintendent of the Delaware, Lackawanna & Western R.R.

J. E. Quick, General Baggage Agent of the G.T.R., was re-elected Secretary of the American Association of General Baggage Agents, at the convention at St. Augustine, Fla., Jan. 16, although he was unable to be present owing to Mrs. Quick's illness. In moving his re-election, A. Trayner, General Baggage Agent of the Union Pacific, said:—"This Association feels the absence of Mr. Quick, our most worthy Secretary, who for many years has been, & is now, the most worthy son of this Association. He is a man whom we all know, he is a man who has always been an attendant at our meetings; he is a man who always has taken great interest in our Association; he is a man whose counsel & advice has always been needed; & this Association should look upon his absence at this meeting with a mingled feeling of sorrow & of pride; sorrow, because friends bound by ties formed on many occasions must at some time be separated; pride, because it has been our good fortune to have so competent an officer to attend to the duties of Secretary of this Association for many years. I will make a motion that this Association, by rising to their feet, extend to Mr. Quick a vote of thanks for the able & satisfactory manner in which he has performed the duties of Secretary of this Association for several years, & that this Association regret his absence at this meeting; also that this resolution be placed on our records, & a copy of same sent to Mr. Quick." The resolution was seconded by E. C.

Ensign, General Baggage Agent of the Eric R.R., & carried unanimously.

Adam Rutherford Creelman, K.C., who, as announced in our Railway Appointments column, will become Chief Solicitor of the C.P.R. on July 1 next, was born in Richibucto, N.B., his father being Jas. R. Creelman, a native of Stewiacke, N.S., & his mother a daughter of the late Jno. Patterson, a native of Pictou, N.S. His father is still living in N.B., but his mother is dead. He was educated at the Richibucto Grammar School & at the Restigouche Academy, N.B. Leaving New Brunswick in 1870 he came to Ontario, & within a few days after his arrival began studying law in the office of the late C. Gamon, of Collingwood, continuing his studies with Moberley & Gamon, of the same place. He came to Toronto in 1873, & entered as a student in the office of Crooks, Kingsmill & Cattanaach, with whom he remained during the balance of his term as a student, & in whose office he was managing clerk for about a year. He was called to the Ontario Bar in 1876, & in

May, 1877, took part in the formation of the firm of McCarthy, Hoskin, & Creelman, his partners being the late D'Alton McCarthy, Q.C., & Dr. Hoskin, K.C. In 1882 the late B. B. Osler, Q.C., joined the firm, which since then continued under the name of McCarthy, Osler, Hoskin & Creelman. Mr. Creelman was appointed a Q.C. in 1889. His duties as a lawyer have for many years been chiefly consultation work, principally for banks, loan & insurance companies, municipal corporations, & railway companies, & ever since the formation of the firm he has been its business manager. Politically he is a Liberal, & in religious faith a Presbyterian. He married in Nov., 1878, Margaret, daughter of the late Jno. Jennings, D.D. He has always taken a great interest in athletic & other manly sports, & is a member of a number of clubs. While Mr. Creelman will enter on his new duties in July, it is not expected that Mrs. Creelman & their family will remove to Montreal till at least some months later. Mr. Creelman's appointment is a most popular

one, but the removal of himself & family from Toronto will be very much regretted by Torontonians.

### C.P.R. Earnings, Expenses, &c.

Approximate earnings for Jan., \$2,051,000; decrease from Jan. 1900, \$100,000.

#### HALF-YEARLY DIVIDEND.

The directors have declared dividends for the half year ended Dec. 31, 1900, as follows: On the preference stock, 2%; on the common stock, 2½%.

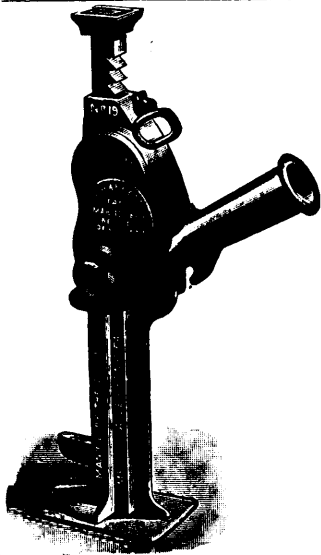
#### SUBSIDIARY LINES.

**DULUTH, SOUTH SHORE & ATLANTIC.**—Approximate earnings for Jan., \$152,262; decrease from Jan., 1900, \$14,885.

Net earnings from Jan. 1 to Nov. 30, 1900, \$871,920, against \$857,560 for corresponding period.

**HANCOCK & CALUMET.**—Approximate earnings for Jan., \$21,413; increase over Jan., 1900, \$1,437.

**MINERAL RANGE.**—Approximate earnings for Jan., \$17,363; decrease from Jan., 1900, \$1,866.



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These Jacks are made with Malleable Iron Frames, Steel Pawls, Machinery, Steel Bearings and Pivots, forged Steel Rack. The wearing parts are removable and readily renewable at slight expense. The rectangular base gives great lifting strength and fits into close quarters better than other shaped stands. Adapted to either high or low set loads.

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Lifting Capacity 10 to 15 tons.

For Catalogue and Price List apply to

**THE DUFF MANUFAC. CO.,**

Marion and Martin Avenues, Allegheny, Pa.

Stock carried by **JAMES COOPER, Agent,**  
299 St. James St., MONTREAL.



PAGE FENCE ON NEW YORK CENTRAL RY.

Page fencing is in use on all of the leading railroads of Canada. We now make our own wire and hence we can furnish a still better fence than ever.. Glad to furnish further information.

THE PAGE WIRE FENCE CO., LIMITED, WALKERVILLE, ONT.

## Edward L. Drewry

**REDWOOD  
BREWERY,**

Winnipeg, Manitoba.

Fine

**ALES, EXTRA PORTER**

... AND ...

**PREMIUM LAGER.**

*Most Extensive and Complete Brewery  
and Malshouses in Western Canada.*

**CHOICE MALT FOR SALE.**

Manufacturer of the Celebrated

Golden Key Brand .. **AERATED WATERS.**

Sale One Hundred Millions a year.

**R·I·P·A·N·S**

**THE WONDERFUL MEDICINE**

They relieve Distress from Dyspepsia, Indigestion and Too Hearty Eating: are a perfect remedy for Dizziness, Nausea, Drowsiness, Bad Taste in the Mouth, Coated Tongue, Pain in the Side, TORPID LIVER.

**They regulate the Bowels.  
They Cure Sick Headache.  
A Single One Gives Relief.**

**WANTED**

A case of bad health that R·I·P·A·N·S will not benefit. R·I·P·A·N·S, 10 for 5 cents, or 12 packets for 48 cents, may be had of all druggists who are willing to sell a low-priced medicine at a moderate profit. They banish pain and prolong life. One gives relief. Accept no substitute.

Note the word R·I·P·A·N·S on the packet. Send 5 cents to Ripans Chemical Co., No. 10 Spruce St., New York, for 10 samples and 1,000 testimonials.

**TORONTO ENGRAVING CO.**  
DESIGNERS, ENGRAVERS,  
ELECTROTYPERS.  
**92 BAY ST.**

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE. — Approximate earnings for Jan., \$304,552; decrease from Jan., 1900, \$31,697. Net earnings from Jan. 1 to Nov. 30, 1900, \$1,912,763, against \$2,088,268 for corresponding period.

**Canadian Pacific Railway Land Sales.**

Acres.		Amount.		
1900	1901	1900	1901	
Jan.....	31,485	27,928	\$100,857.85	\$ 36,752.54

Following is a statement of sales from 1891 to 1900 inclusive :

1900	acres.	for	\$
1890	431,986.01	1,377,715.48	
1891	416,807.41	1,327,667.19	
1892	348,608.10	1,121,774.52	
1893	199,481.86	665,740.03	
1894	87,878.77	308,928.33	
1895	61,077.12	199,280.85	
1896	49,467.90	159,632.10	
1897	107,348.69	352,847.69	
1898	391,467.78	1,355,617.30	
1899	97,240.80	414,945.67	

**Grand Trunk Earnings, Expenses, &c.**

The Secretary advises us that, subject to audit, the accounts for the half year to Dec. 31, 1900, show the following results :

Gross receipts.....	£2,419,000
Working expenses including special appropriation of £20,000 in reduction of bridge renewal suspense account.....	1,632,000
Net receipts.....	187,000
Net revenue charges for the ½ year, less credits.....	503,000
Balance.....	£ 284,000

**CHICAGO AND GRAND TRUNK RY.**

Deficiency for 1900.....	£ 7,400
Charged in G.T. accounts to June 30, 1900.....	30,800
Credit.....	£23,400

**DETROIT, GRAND HAVEN AND MILWAUKEE RY.**

Deficiency for the ½ year.....	5,400
Credit balance.....	18,000
Surplus.....	£ 302,000

This surplus added to the balance of £300 from June, 1900, makes £302,300 available for dividend, which will admit of the payment of the full dividend for the half year on the 4% guaranteed stock, a dividend of 3½% on the 1st preference stock (making with the dividend of 1½% paid for the ½ year ended June 30, 1900, the full dividend of 5% for the year 1900) & a dividend of 3% on the 2nd preference stock, leaving a balance of about £2,500 to be carried forward.

The Railway Times, London, Eng., says:— "A very active speculation in G.T. stocks has developed of late, in view of the dividend for the period to Dec. 31 last. For a long time Trunks were neglected & did not improve even in sympathy with Americans, as is customary. But on good dividend anticipations active buying was indulged in & prices were carried up at a headlong pace. Apparently, it was altogether too quick to last, & a very sudden & disagreeable check was administered by the recent dividend announcement. Instead of the 3¼ or 3½%, which some people foretold, the 2nd preference will only get 3% for the past year. This is even worse than the 1889 result, for the dividend then paid was 3¼% on the seconds. Thus the improvement for the first 6 months of 1900 which gave the first preference 1½% (actual), against 1%, was lost in the second half of the year, & more besides. The half-yearly statement contains some surprises too. It appears that the special charge of £20,000 against revenue for bridge renewals has been repeated, though the general idea was that it would not. But it is clear that the G.T. board is only acting with necessary prudence when it makes such provision out of the profits of what was after all a more than average year. And the sum to be charged to revenue still remaining is £83,000, according to Sir C. Rivers Wilson's

statement at the meeting in Oct. last. Yet another surprise is a substantial credit on account of the Chicago & G.T. Co. (now the G. T. Western). For the first half of 1900 £30,800 was charged against the G.T. in the usual way for deficiencies on the Chicago section; but for the complete year it appears that the deficiency works out at only £7,400, so on balance £23,400 is credited to the G.T. accounts for the period to Dec. 31 last. A year ago the deficit on the same section was £19,000, so in comparison with the same period of 1899 there is an improvement of £42,400. As this represents more than half the dividend now to be paid on the second preference, it is interesting to note how it arises. It is the temporary saving which accrues from the re-organization of the C. & G.T. and the funding of the 6% bonds on a 4% basis. But as that saving of interest is to be utilised to raise capital for the improvement of the Chicago section, the saving is of a distinctly temporary character. So far as the G.T. itself is concerned, it is worth noting that the net balance available is reduced by £55,000, made up as follows:—

Reduction in gross receipts.....	£5,000
Increase in expenses.....	37,000
Increase in fixed charges.....	13,000
	£55,000

"Thus it is largely by the aid of a fortuitous item that the dividend is even as good as 3% on the second preference, & we are not surprised that a general fall in the stocks took place when the dividend statement appeared."

**MONTHLY EARNINGS.**

The following statement of earnings, supplied from the Montreal office, includes the G. T. of Canada, the G. T. Western, & the Detroit, Grand Haven & Milwaukee Rys.

	1901.	1900.	Increase.	Decrease.
Jan.....	\$2,225,878	\$2,222,200	\$3,678	

**TRAFFIC RECEIPTS OF THE SYSTEM.**

Traffic receipts, Jan. 1 to 31, 1901 :

	1901.	1900.	Increase.	Decrease.
Grand Trunk.....	£ 370,245	£358,166	£ 12,079	
G. T. Western.....	70,233	87,268		17,035
D. G. H. & M.....	16,834	15,712	1,122	
Total.....	£ 457,312	£461,146		£3,834

Mileage in 1900, 4,036, in 1901, 4,028.

**Northwest Transportation Co.'s Str.**

The Northwest Transportation Co. is having built at Collingwood, Ont., a large steel package freight & passenger steamer. Her length over all will be 325 ft. & on keel 308 ft.; moulded beam 43 ft. & moulded depth 27 ft. She will be fitted with triple expansion engines, of 2,400 h.p., with 26, 42 & 70 in. cylinders of 42 in. stroke. Steam will be furnished from four Scotch marine boilers of 12½ ft. diameter & 12 ft. long, with a pressure of 175 lbs. to the square inch.

Her carrying capacity, with a maximum draft of 18 ft., will be 3,250 net tons. On even draft of 16 ft. she will carry 84,000 bush. of wheat, or 2,520 net tons of freight, in addition to 300 tons of coal. There will be five cargo holds below deck, & the main deck will be clear fore & aft for package freight. The hull will be divided into 7 compartments, separated by 6 watertight bulkheads. She will also have a double bottom, with capacity for water ballast of 1,000 tons.

Her maximum speed, running light, will be 18 miles an hour, & 16 miles an hour loaded to 16 ft. draft. Every facility will be provided both for navigation & the rapid handling of freight, the vessel being supplied with steam steering gear, steam pumps, winches & capstans, as well as two steam hoisting engines. She will also be supplied with a complete electric light outfit.

The spar deck will be devoted entirely to passengers. There will be 65 commodious staterooms, saloon parlor, ladies' parlor, ladies' lavatories & bath rooms, steward's office, etc. On the texas deck will be a large smoking room for the accommodation of passengers, captain's office, bedroom & bathroom, & pilot's room.

The vessel is being built from plans & models prepared by H. Calderwood, Manager of the Collingwood Shipbuilding Co., under the regulations of Bureau Veritas, & will receive the highest classification of A1\* for 20 years. The vessel will cost in the neighborhood of \$325,000, & when completed will be one of the finest freight & passenger boats on fresh water. She will run between Sarnia, Port Arthur & Duluth.

The long-looked-for trial of the third-rail system on the New York elevated roads was recently carried out on the Second Avenue branch, when six trips were made between 54th St. & 92d St. The trial train consisted of six cars, the two end cars being each equipped with four motors. The two motor cars were arranged so that the cabs were respectively at the front & rear ends of the train. The trip from 92d St. to 54th St., a distance of 38 blocks, was run in four minutes, at a speed of 30 miles an hour. The superiority of the motors over the old steam locomotives was shown in the rapid acceleration; & the substitution of the air-brake for the old vacuum brake was noticeable in the greater rapidity with which the stops were made. Judging from the results achieved on the trials, it is expected that the trains will run from the Battery to 155th St. on the Sixth Avenue line in 40 minutes, instead of 49 minutes, which was the time taken under the old system. The new & the old cars are similar in appearance, the former being somewhat wider. In place of the old steam heating and oil lighting, they will, of course, be lighted & heated by electricity.

**Temiscouata Railway Litigation.**

In London, Eng., Feb. 5th, the action in which the Trustees, Executors & Securities Insurance Corporation, Ltd., sought to recover £42,000 from W. C. H. Armstrong, came on for trial. The action was before the court some months ago, but stood over to admit of some evidence being taken in Canada.

Mr. Eady, K.C., in opening the case for the plaintiffs, said they were trustees of certain deeds, & the object of the action was to obtain payment of £42,000, being the amount obtained from the original trustees, the plaintiffs' predecessors in the title of a deed dated Aug., 1888, by reason of certain false representations made by the defendant. The circumstances arose out of the Temiscouata Railway, in Canada. By a deed of Aug. 3rd, 1888, between the T.R. Co. of the one part & the trustees of the other part, it was set forth that the main line, as constructed, was to be 81 miles in length; that the Co. had resolved to issue bonds of the Co. for £324,000; & it was agreed by this indenture that the Co. for the purpose of securing the principal & interest of the bonds proposed to be issued, should convey to the trustees the railway, together with (among other things) all lands, lines, tracks, junctions, branches, etc., thereafter to be held or acquired by the Co. in connection with the railway. It was a trustees' debenture deed. Clause 1 provided that of the issue of £324,000 there should be retained £50,000 by the trustees, who should from time to time, at the request of the Co., sell the same, & the proceeds should be applied for the purchase of additional rolling stock, etc. In other words, the proceeds were to be applied in improving the debenture holders' security. The clause further provided that every sale of the retained bonds should be made through the



London agents of the Co., & the trustees were empowered to veto the application of the proceeds of the £50,000 of bonds for any purpose not in the opinion of the trustees a proper capital expenditure, & for the permanent advantage of the railway. Immediately on the execution of the above indenture, the Co., through the defendant, who had been appointed the London agent of the Co., offered for public subscription the whole issue of bonds, less the £50,000 to be retained by the trustees. The issue was not largely subscribed for by the public, but all the bonds offered were ultimately taken up & paid for by the defendant & other persons who had underwritten the issue; so that before the £50,000 were issued the defendant was holder of a considerable number of bonds of the first issue. By an Act of the Canadian Legislature in 1887, the Co. was authorized to construct a branch or extension of its line, & in 1889 the trustees, at the request of the Co., sold the £50,000 bonds to the defendant for sums amounting to £42,500. The Co. & the defendant were desirous that the branch line should be constructed, & the plaintiffs alleged, that the proceeds of the sale of the £50,000 bonds, as realized, should, contrary to the provisions of the indenture, be used for that purpose. The plaintiffs alleged that on Mar. 29, 1889, the defendant saw Paine, Son & Pollock, then acting as solicitors for the trustees, & was told by them that the proceeds of the sale of the £50,000 could not be applied to the construction of the branch line. That interview was not reported to the trustees. On April 27, 1889, the plaintiffs said, defendant wrote to the railway company, asking it, in applying for the proceeds of the sale, not to state that they required them for constructing a new railway, but that it was required "to make a siding for timber." On the same day

he wrote to the Vice-President of the railway company a letter containing the following paragraph:—"If the trustees know that the St. Francis branch is a railway, & not a siding, they will not part with the money; so you must make the expenditure legal." On May 6 he wrote to the trustees that it "had been found necessary & in the best interests of the Co., as well as of the bondholders, to build a siding towards the River St. Francis for the purpose of securing valuable timber freights . . . and to erect snow-sheds to prevent certain portions of the line from being buried in the winter snow-drifts"; & for those purposes he requested the trustees to sanction the payments out of the trust funds then held by them. The defendant on May 21, 1889, wrote to Paine & Co., stating that the matter was purely a "siding" to bring freight to the main line, & Paine & Co. advised the trustees that the money in their hands might be applied for the purposes of the works proposed, & the trustees consented to its being so applied. The sums so paid to the defendant amounted in the aggregate to £42,000. The branch was bonded to the trustees for £140,000; & it was afterwards ascertained that there was no siding, & that the money advanced by the trustees out of the retained bonds of £50,000 had been expended on part of the branch line, which was 35 miles long, & which, the plaintiffs said, was of no advantage to the main undertaking. Mr. Eady said that the representations were made falsely & fraudulently by the defendant to facilitate his dealings with the bonds of the first issue, & that it was not till 1897 that the fraud was discovered. The defendant denied that he had made any false or fraudulent representations, or had been engaged in such Stock Exchange dealings as were suggested, or that he had expected to make any profit on the second

issue of bonds. He also relied on the Statute of Limitations.

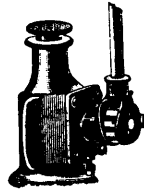
Mr. Eady proceeded to read at great length the correspondence between the parties on matters bearing on the subject of the action,

On Feb. 12, Justice Farwell delivered judgment for defendant, without calling upon his counsel. He said that the action was to recover £42,000, being the aggregate of amounts paid by the plaintiffs as trustees of a certain deed to the defendant, who was agent in London for the Temiscouata Ry. Co., for the purpose of being expended upon a piece of railway—he purposely used that form of language in Canada. It seemed to him that there was not a shadow of justification for the charges of misrepresentation made against Mr. Armstrong. Nor was there now anything new. There was nothing now known to the Corporation that was not known to them in 1889. Ludas Light made the examination for them in 1889. There was not a word suggested against Mr. Light's honesty, & how could it now be said that what was known to him (their agent) was not known to the plaintiffs in 1889? That being so, they nevertheless made no motion for eight years, more than was necessary to justify pleading the Statute of Limitations. But they had discovered nothing new at all. The only matter which had given rise to this unfortunate litigation, which his Lordship feared had been very expensive, was that Mr. Huxtable had discovered, in a house not his own, & in a bundle of letters which he appeared to have "annexed," a private letter from Mr. Armstrong to Hector Cameron, who was a Q.C. in Canada, & a director there of the railway company, advising that if the money was wanted for construction purposes, the Co. should send a formal requisition to that effect, & not to state that it was for the purpose of

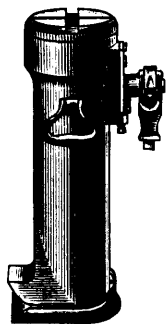
## Norton's Ball Bearing Jacks.

Standard Wherever Jacks are Used.

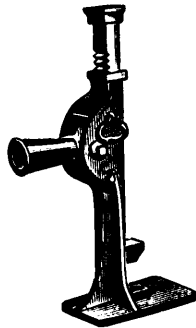
50 STYLES. 8 TO 70 TONS CAPACITY.



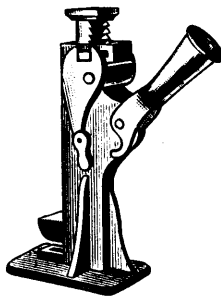
8 Ton Jack.



40 Ton Jack.



10 Ton Automatic Lowering Jack.



15 Ton Track Jack.

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Complete Illustrated Catalogue and Discount on application.

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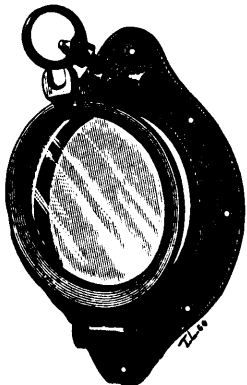
COTTON WASTE—All Grades.

Write for Catalogue.

The N. L. Piper Railway Supply Co.,

MANUFACTURERS,

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## STEEL, PEECH & TOZER,

LIMITED,

SHEFFIELD, ENGLAND.

STEEL AXLES, TYRES, AND SPRING STEEL.

"PHENIX" Loco. Spring Steel is the accepted Standard in Canada.

SOLE AGENTS:

James Hutton & Co., Montreal.

LOW RATES WEST AND NORTHWEST.

On February 12th, and on each Tuesday until April 30th, the Chicago, Milwaukee & St. Paul Railway will sell one-way second-class tickets at the following very low rates:

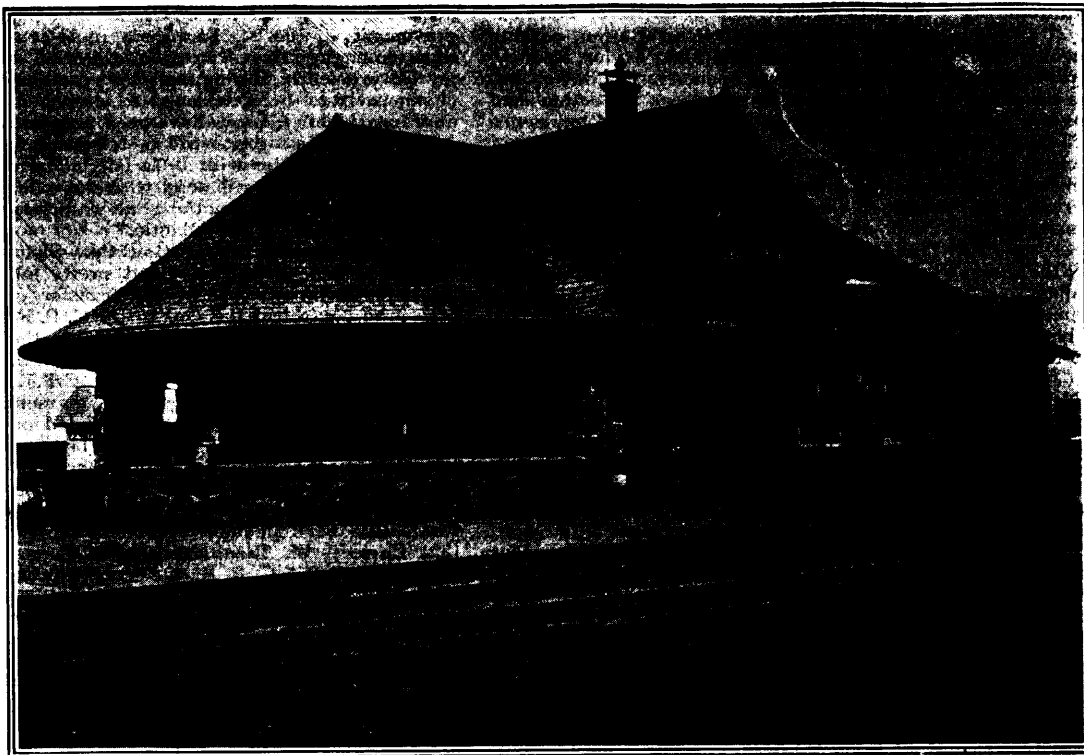
To Montana points	.....\$25.00
To North Pacific Coast points	..... 30.00
To California	..... 30.00

These tickets will be good on all trains, and purchasers will have choice of six routes and eight trains via St. Paul and two routes and three trains via Missouri River each Tuesday. The route of the Famous Pioneer Limited trains and the U.S. Government Fast Mail trains.

All Ticket Agents sell tickets via the Chicago, Milwaukee & St. Paul Railway, or for further information address A. J. Taylor, Canadian Passenger Agent, 8 King Street East, Toronto, Ont.

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RAILWAY and STEAMSHIP TIMETABLES, MAPS, Etc. At Bookstores. On Trains. 5c.



KINGSVILLE STATION, LAKE ERIE AND DETROIT RIVER RY.

constructing a new railroad, but for a siding. That seemed to his Lordship to be an instruction to be careful not to use the wrong phrase, because the Corporation would not consider whether it was a siding or not if the railway company put itself out of court by calling it a branch railway when it was a siding. He could not see how anyone could complain of that. To say that that was evidence of fraud—a letter written in that way by a man on this side to a director on the other—was to suggest a fraudulent conspiracy between Mr. Armstrong & Mr. Cameron, who was now dead, to mislead & deceive the trustees into doing something which would be a breach of their trust. It seemed to him that the evidence had been used in a way that was utterly unjustifiable, & the result was that the action failed, & that he must dismiss it, with costs.

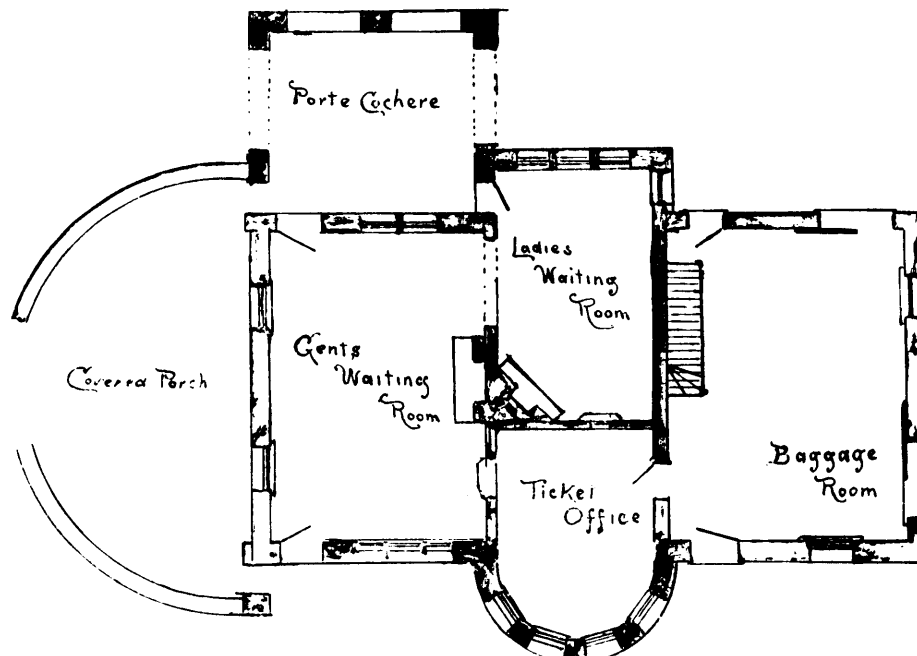
**Central Vermont.**—At a meeting of stockholders at St. Albans, Vt., Jan. 7, the resignation of C. M. Hays as a director was accepted, & George B. Reeve, General Manager of the Grand Trunk Ry., was chosen director in his place. The stockholders authorized the execution of a mortgage supplementary to a present mortgage in favor of the American Loan & Trust Co., of Boston, for the Rouse's Point terminals, recently acquired from the Ogdensburg & Lake Champlain R.R.

**Kingsville Station, L. E. & D. R. R.**—An illustration & plan of the Lake Erie & Detroit River Ry.'s picturesque station at Kingsville, Ont., are given on this page. The station is built throughout with field cobble or rubble stone, which was donated by the people of Kingsville & surrounding country. A great many of the larger stones are split or rough dressed &, particularly those in the bow window of ticket office, are really beautiful specimens. The building is lighted & heated with natural gas; there are fire places in both the general & ladies' waiting rooms & lavatories, etc. There is an extensive portico at the west end & a porte cochere on the north side.

**British Columbia Railways.**—The speech from the throne at the recent opening of the

Legislature contained the following references to railway matters:—"A measure will be introduced with the view of aiding in the construction of a railway from the Boundary Creek district to the Coast; of a railway to the northern end of Vancouver Island; and a railway in Canadian territory from the Coast to the northern boundary of the Province. A delegation, consisting of the First Minister & the Attorney-General recently proceeded to Ottawa to lay before the Dominion Government the claims of B.C. to increased recognition in the matter of railway development, & in other respects, & to arrive at a settlement of certain matters requiring adjustment between the two Governments. The report of the delegation will be laid before you at an early date."

description of the country served by the I.C.R. & the P.E.I.R., with particulars of train service, fish & game laws, fishing & shooting resorts, steamer connections, & a lot of other carefully condensed information which is likely to be of use to those who want to decide where to spend their summer outing. The folder is intended primarily for circulation in the U.S., & it should also be put out through Ontario & Quebec, as there has always been a great dearth of literature of this sort about the Maritime Provinces, the result being that large numbers from Ontario & Quebec go to U.S. summer resorts, many of whom could undoubtedly be secured for New Brunswick, Nova Scotia & Prince Edward Island if those Provinces were more thoroughly advertised.



PLAN OF KINGSVILLE STATION, LAKE ERIE AND DETROIT RIVER RY.

**Niagara Navigation Co.**—At the annual meeting in Toronto, Feb. 16, the Manager's report on the business of 1900, which was very satisfactory, was unanimously adopted. J. Bruce Macdonald was elected a director to fill the vacancy caused by the death of his father-in-law, Sir Frank Smith. Nothing was done in regard to the election of a President to succeed the late Sir Frank Smith, the office being left vacant. The directorate for the current year is Manager, Jno. Foy; Vice-President, Barlow Cumberland; Auditor, R. H. McBride; other directors, J. J. Foy, W. Hendrie, E. B. Osler, J. Bruce Macdonald. The late Sir Frank Smith held a majority of the stock of the Co., which is vested in the Toronto General Trusts Corporation as executors. Under Sir Frank's will, Jno. Foy holds a power of attorney to vote on the stock at meetings of the shareholders.

"Where to go for a Vacation," and "The Summer Land of Eastern Canada," are the joint titles of a folder which has been issued by the Press & Advertising Agent of the Intercolonial Ry. It contains a well written

**C.P.R. Standard Station Names.**

The C.P.R. management has decided that in future all its station name signs will be done in plain block letters, similar to the sign illustrated on this page. These signs are now being made in enameled iron, which has been proved to be much more satisfactory than painted wooden signs, as the enameled iron does not fade or in any way deteriorate by exposure to the weather, & is in consequence more economical than wood.

The letters are 9 inches high & the signs 13 inches high, the length depending on the number of letters in the name. The lettering is white on a dark blue ground, making a very distinct & attractive sign.

All the stations on the Crow's Nest Pass line, the Columbia & Western Ry., & other branches which have been built during the last two or three years, have been equipped with these enameled iron signs, & they are being put on the older lines as new stations are built, or old signs require to be replaced.

Iron signs have been used for all the stations on the New York & Ottawa Ry., the Canadian Northern Ry., & the Inverness & Richmond Ry., & they are also being used on the G.T.R., the Central Ontario, & other lines. They are supplied by the Acton Burrows Co., Toronto.

The Lake Erie & Detroit River Ry.'s extension from Ridgetown to Dutton, passing through Highgate, Muirkirk, Taylor, Rodney, & West Lorne, was opened for traffic Feb. 18, after the usual Government inspection had been made & authority given to commence operations.

**Cattle Guards Legislation.**—Mr. Lancaster has introduced a bill in the House of Commons to amend the Dominion Statutes 1890, chap. 28, sec. 2, by adding the following:—"and no animal not allowed by law to run at large shall be held for the purpose of such

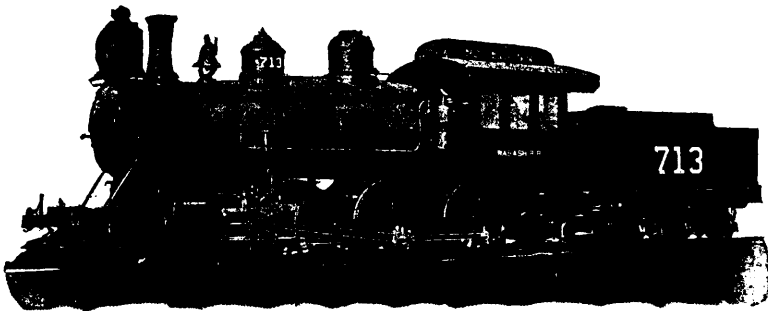
occur to delay its early completion. The improvement of the St. Lawrence route continues to engage the very careful attention of my Government. During the past year ship channels have been widened & deepened, additional lights & buoys have been provided & in a short time there will be telegraph & cable communication with Belle Isle. These additional securities will tend to make safer & more efficient than ever our great waterway between the lakes & the Atlantic."

**Canadian Pacific Navigation Co.**—Since our last issue, which contained pretty full particulars respecting the transfer of the control of this Co. to the C. P. R. Co., we have been informed that the whole of the stock of the C.P.N. Co. has been taken over by the C.P.R. Co. The negotiations, involving assets of over \$500,000, were concluded on behalf of the buyers & sellers & brought to a conclusion satisfactory to all concerned by Commissioner Chipman, of the Hudson's Bay Co. The personnel of the new directorate has been decided upon & it is said that Capt. J. W. Troup, at present Superintendent of the C. P. R. Co.'s railway & steamship lines in the Kootenay district, will be appointed Manager of the C.P.N. Co. No definite information is obtainable as to the improvements contemplated in the C.P.N. fleet, but it is expected that they will be extensive.



liability to be improperly on a place adjoining the railway if such animal gets upon the railway from the highway by reason of such omission or neglect to maintain such cattle guards at the highway crossing."

**The Speech from the Throne** at the recent opening of the Dominion Parliament contained little reference to transportation or the allied interests, the following being the only paragraphs relating thereto: "My Government has learned with great satisfaction of the progress being made with the Pacific Cable scheme, & I trust that nothing may



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BUILDERS OF

Simple and Compound  
**LOCOMOTIVES.**

Adapted to every variety of service.

**MANITOBA**

The Government Crop Bulletin issued Dec. 12th, 1899, gives the following statistics for the year:

CROPS.		
ACRES.	AVERAGE YIELD.	TOTAL.
Wheat.....1,629,995	17.13 bus.	27,922,230 bus.
Oats.....575,136	38.80 "	22,318,378 "
Barley.....182,912	29.4 "	5,379,156 "
Potatoes...19,151	168.5 "	3,226,395 "

**STOCK.**

Beef Cattle exported during the year	12,000
Stockers exported.....	35,000
Total value dairy products.....	\$470,559 09

**10,500 FARM LABORERS**

Came from Eastern Canada to assist in the harvest fields of Manitoba in 1899—and the demand was not fully satisfied.

**MANITOBA FARMERS ARE PROSPEROUS.**

Farmers erected, last year, farm buildings valued at one and one-half million dollars.

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.....**Philadelphia**

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**LEHIGH VALLEY RAILROAD**

Route of the "Black Diamond Express," handsomest train in the world.

Leaving **Toronto** daily (except Sunday) at 9 a.m., Hamilton 9.55 a.m., arrive New York 10.08 p.m.

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Pullman Sleepers from Toronto, Hamilton and London to New York and Buffalo to Philadelphia.

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Canadian Pass'g'r Agt., 33 Yonge St., Toronto.

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**Chas. S. Lee,**

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**A. A. Heard,**

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ASSINIBOIA,  
ALBERTA and  
BRITISH COLUMBIA**

sell through tickets to the Old Country, cheaper than if passengers bought railway tickets to New York or Montreal, and then re-booked.

They also sell prepaid tickets to passengers coming from the old country, cheaper than the rate obtainable in Europe, and on favorable terms.

Apply to any agent Port Arthur and west, or to

**W. P. F. CUMMINGS,**

**C.P.R. Offices,  
WINNIPEG.**



senger, which of late years has become very popular, both with the steamship companies & the travelling public. The first of these to visit the port of New York was the Pennsylvania. She was followed by such vessels as the Cymric, Pretoria, & Grosser & Kurfürst, the latest representatives being the Ivernia & Saxonia, of the Cunard Co. As these vessels are of moderate speed, it is possible to give them very full lines, & they are all of great moulded depth, the Ivernia measuring 49 ft. 6 ins. from the keel to the shelter deck.

The speed being only from 14 to 16 knots, comparatively little space & weight has to be sacrificed to motive power; & as the daily coal consumption is only from 100 to 150 tons, a bunker capacity of from 1,000 to 1,250 tons is found to meet all requirements. These vessels are enormous cargo carriers, the Ivernia having four cargo holds forward & three aft of the engine room, while above these are two decks, also entirely devoted to cargo. When fully loaded she can accommodate 11,610 tons of actual dead weight, while her measurement capacity at 40 cubic feet to the ton is 24,000 tons.

The type is so deep & stable that it is possible, by carrying up the structure of the vessel amidships to an unusual height above the water line, to provide unusual passenger accommodations, the Ivernia being provided with seven decks in all. Above the hold & the orlop & lower decks, which are given up to cargo, there are three other decks, known as the main, the upper, & the shelter decks, which extend entirely from stem to stern. The main & the upper decks are given up to

3rd-class passengers, while the shelter deck is devoted mainly to 1st & 2nd class passengers. For a distance of over 300 ft. amidships there are two other decks, called the bridge & promenade decks, on which 1st & 2nd-class passengers are accommodated. There is provision altogether for 160 1st-class passengers, 200 2nd-class & 1,600 3rd-class passengers, so that in addition to carrying a paying load of 11,610 tons of cargo, this vessel provides for about 2,000 passengers. She burns but little coal, requires but a small engine & boiler-room staff, & hence the running expenses in comparison to her size and earning capacity are very low.

By the courtesy of the managers of the various steamship companies, we have been enabled to compare the average receipts &

expenses for several of these big freighters, & we find a remarkably unanimous opinion that the greatest receipts for a single passage of a ship of the type of the Ivernia are about \$50,000; the revenue from the westward voyages being derived mainly from passengers, & that from the eastward voyages from freight. We have estimated the average cost of one passage at \$20,000; figures which go a long way to explain the popularity of these vessels with the shipowners.

In the Deutschland we see the latest development of the high-speed liner. From whatever point of view she is regarded, she has been such an unqualified success that she lends herself admirably to the present comparison. She is not only the fastest & most powerful, but, by virtue of her coal consump-

	Displacement in tons.	Horse power.	Speed.	First cost.	Coal burnt per day, tons.	Bunker capacity, tons.	Cargo capacity, tons.	Passengers.				Estimated maximum receipts for full ship one passage, exclusive of mails.	Cost of one passage.
								First.	Second.	Third.	Crew.		
" Ivernia " .....	21,000	10,500	16.50	\$1,625,000	150	1,250	11,610	160	200	1600	250	\$50,000	\$20,000
" Deut-chland " .....	23,000	37,000	23.36	3,300,000	572	4,500	600	450	300	300	550	*143,000	50,000
Four-day liner .....	40,000	110,000	30.00	6,200,000	1,710	9,550	None.	800	450	250	750	225,000	80,000

\* Actual value of passenger fares on a recent westward trip.

## WIRE ROPES, MARION STEAM SHOVELS, BALLAST UNLOADERS.

Columbus Pressed Bowl Wheel and Drag Scrapers.

.....Wheelbarrows, Picks, Shovels, Mattocks, Etc.

Contractors Rails and Dumping Cars.

Saddle Tank Locomotives.

**JAMES COOPER, 299 ST. JAMES ST., MONTREAL.**



Established 1831.

Annual Capacity, 1,000.

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SINGLE EXPANSION AND COMPOUND LOCOMOTIVES.



Built for the Great Northern Railway.

**Broad and Narrow Gauge Locomotives; Mine and Furnace Locomotives; Compressed Air Locomotives; Steam Cars and Tramway Locomotives; Plantation Locomotives; Oil Burning Locomotives.**

Adapted to every variety of service, and built accurately to gauges and templates after standard designs or to railroad companies' drawings. Like parts of different engines of same class perfectly interchangeable.

**Electric Locomotives and Electric Car Trucks with Westinghouse Motors.**

**Burnham, Williams, & Co., - - Philadelphia, Pa., U.S.A.**

Established 1849

CHAS. F. CLARK, Pres. JARRD CHITTENDEN, Treas.

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Capital and Surplus \$1,500,000

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THOS. C. IRVING,

Gen. Man. Western Canada, Toronto.

JOHN A. FULTON,

Gen. Man. Eastern Canada, Montreal.

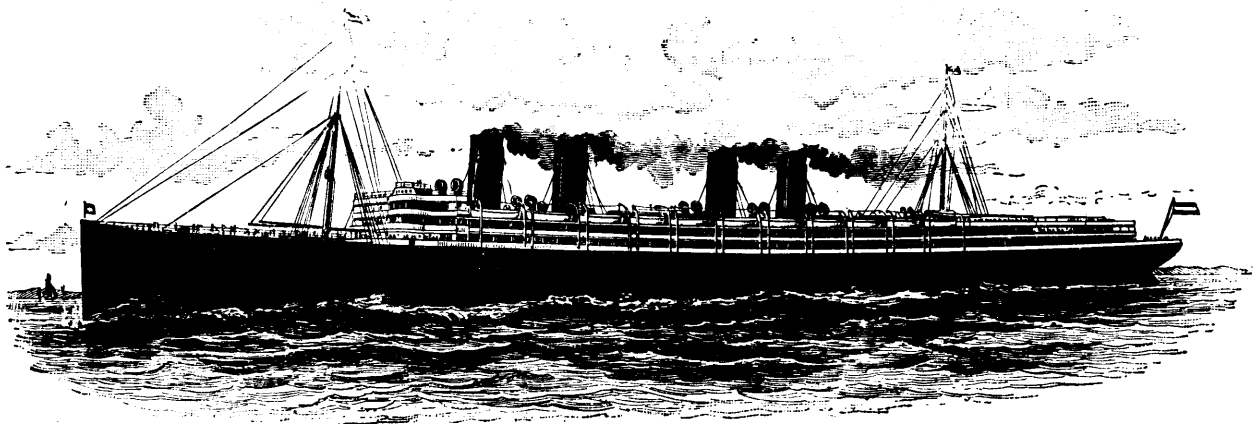
tion of 1.45 lbs. per h.p. per hour, including auxiliaries, she is considerably the most economically-driven big vessel afloat. Compared with the Ivernia, she is 86 ft. longer, has 2 ft. 6 ins. more beam, & 5 ft. less moulded depth. Her working draught of 29 ft. is probably about a foot less, & on this draught, in spite of her much larger dimensions, she displaces only 2,000 tons more than the former vessel, the comparatively small increase in displacement being due to her yacht-like lines. The diagram which we give of the ship on page 53 shows more strikingly than any mere description at what an enormous sacrifice a speed of over 23 knots an hour is obtained; for here we find that the cargo space, which in the Ivernia has a capacity of over 11,000 tons, is in the Deutschland entirely appropriated by the engines, boilers, coal bunkers, machine shops, & stores which go to make up a motive equipment of 37,000 h.p. capacity. The comparison preaches an eloquent sermon on the text that in the same vessel "resistance increases as something more than the cube of the speed." The larger displacement of the Deutschland is partly compensated for by her finer form; yet in raising the speed from 16.5 to 23.36 knots, the horse power has to be increased from 10,500 to 37,000, while the coal consumption runs up from 150 to 572 tons a day.

subjected induces a more rapid deterioration than occurs in slower vessels. Probably the fairest way to reckon depreciation on such high-speed vessels is to assume it as 10% until half of the cost has been covered, & then reduce the rate to 5%. Depreciation & interest, coal, wages of the crew, cost of provisions, dockage, tonnage dues, insurance & other items will bring up the total cost of one passage of the Deutschland to \$50,000.

Does such a vessel pay? Popularly, it is supposed that she does not; but the experience of the Deutschland during her first season last year gives reason to suppose that she is certainly not a losing investment. The popularity of these very fast boats enables the companies to realize correspondingly higher prices for accommodation. As a matter of fact, we know that on a recent westward run of the Deutschland the total passenger fares taken in amounted to \$143,000, & the fares on the return passage brought up the total for the round trip to over \$200,000, this sum representing the receipts from passengers alone, without taking into consideration what was received for carrying the mails. Since the cost of running the boat for one round trip, including fixed charges, is \$100,000, we see that a profit of about \$100,000 was realized in the space of three weeks. It must be remembered, however, that these figures

necessary amount of power. Evidently to secure 30 knots a larger boat would be required, & a larger boat means increased power to drive the increased weight. The increase in power, however, would not be directly proportional to the increase in the displacement, the longer ship being ton for ton easier to drive, because of the refinement of her lines due to her greater length. Nevertheless, by the time we have designed a boat large enough to carry the power corresponding to a speed of 30 knots, we shall have upon paper the mammoth ship represented in our drawings. She will be 930 ft. over all, 87 ft. in beam, & 30 ft. in draught, & will displace about 40,000 tons. Engines of 110,000 h.p. would be required, & even if triple screws were used, it would be necessary to develop 37,000 h.p. on each shaft—a task that would stagger the best of the world's engine builders of to-day. Forty-four double-ended Scotch boilers would be required to supply the steam, & during each day's run of 24 hours 1,710 tons of coal costing \$7,700 would have to be fed into the 352 furnaces. It would require 7,300 tons of coal to carry the vessel to Plymouth & 8,550 tons to take her to Hamburg, the cost of the fuel alone being \$38,000. The ship would have to stow 9,550 tons of coal in her bunkers for a single trip across the Atlantic.

To anyone who has watched the reverse



THE TWIN SCREW STEAMER DEUTSCHLAND OF THE HAMBURG-AMERICAN LINE.

So completely does the motive power fill up the hold that the cargo capacity is reduced to 600 tons, this amount being the maximum that she can carry. As a matter of fact, the Deutschland usually carries no cargo, 10 tons being, we believe, the most she has ever taken aboard. To keep the enormous aggregate of machinery in motion requires the services of 240 engineers, oilers, stokers, etc., & the whole ship requires a crew, including the engineer's staff, of 550 men. The carrying of cargo being out of the question, the four decks above the boiler room are given up entirely to passengers, of whom she can carry 450 first-class, 300 second, & 300 third.

The running expenses of such a vessel are necessarily enormous. To take one item alone, the coal, we find that the cost, for the six days from New York to Hamburg, assuming an average price of \$4.50 a ton, is about \$15,500. In addition to this, & even more costly, are the fixed charges against the vessel, the most serious of which are the depreciation & the interest on first cost, which cost in the case of the Deutschland, amounted to \$3,300,000. It is customary to reckon depreciation in the case of these fast boats at 10% of the first cost, & this for the reason that as soon as they are exceeded in speed by other vessels, they quickly lose their popularity & therefore their earning power. Moreover, the hard driving to which they are

represent the best voyage, & the receipts will not be so high throughout the rest of the summer season. Judging from these figures, it is likely that while for six months of the season she shows a profit, for three months of the year the Deutschland will only about make her expenses, while for the other three months she will probably be in dry dock & refitting for the next season's traffic, during which period the fixed charges will be accumulating against her. Altogether, it is likely that if only a moderate proportion of the heavy subsidies earned be taken into account, placing the boat in this respect on the same basis as her English & American competitors, the Deutschland will show a creditable margin of profit in the year's service. Over & above this there is to be reckoned in the world-wide prestige which undoubtedly accrues to the line which owns the fastest vessel.

As to the possibilities of the future, it is evident that with our present form of hull & type of motive power, we have nearly reached the limit of economical speed. To drive the Deutschland at 30 knots would require about 83,000 h.p.,  $2\frac{1}{4}$  times as much as she now possesses. The accompanying diagram proves that if Scotch boilers & slow-revolving engines were provided in the design of a 30-knot Deutschland, it would be impossible to put into her shell more than one-half of the

bending strains to which a ship like the Deutschland is subjected when she is being driven across the Atlantic seas, it is evident that we have come to a point where it will be necessary to give increased longitudinal strength to any vessel that exceeds the present length by 700 ft. In a four-day liner this might be provided for by running a longitudinal stiffened bulkhead, extending from the keel to the promenade deck, through the vessel between the after engine-room & the forward boiler-room bulkheads. The vessel might be further strengthened by carrying up the side plating to the promenade deck, which is placed one deck higher than in the Deutschland, & by doubling the plating at the bilges & at the promenade deck, as shown in the midship section of the ship.

In conclusion, it is safe to say that such a vessel as this will never be built. We shall cross the Atlantic in four days, but not with a vessel of this type. The higher speed will be attained, not by multiplying the engine & boiler weights, but rather by multiplying pressures & speed, & utilizing every refinement in the way of economizers, superheaters & feed-water heaters, as is being done by Mr. Mosher in his 40-knot craft, the Arrow. If a 30-knot transatlantic steamer makes its appearance within the next few years, it is safe to say that it will be driven by the combination of water-tube boilers, using hot, forced draft,



with fast-running reciprocating engines, using superheated steam, or with turbines of the Parsons type. So great will be the reduction of weights & saving of space achieved by this change, that it will be quite within the possibilities to produce on a displacement not much greater than that of the Deutschland a 30-knot ocean steamer that shall have equal accommodations for passengers.—Scientific American.

**Richelleu & Ontario Navigation Co.**

The following report for the year 1900 was submitted at the annual meeting in Montreal, Feb. 13:

	1900	1899
The gross receipts were.....	\$901,331.80	\$828,322.96
Operating expenses.....	748,105.33	674,626.89
Fixed charges.....	23,903.51	24,966.00
Net profit.....	\$129,322.96	\$128,730.07

Two semi-annual dividends of 3% each, amounting together to \$117,813.93 were paid, leaving \$11,509.03 carried to surplus. The gross receipts show an increase of \$73,008.84 due mainly to increased earnings from steamers, as well as to the first year's operation of the Co.'s hotel, Manoir Richelleu, at Murray Bay, & of the Yonge St. wharf, at Toronto, leased by the Co. The expenses have also been increased by the operation of the hotel & wharf mentioned, but more especially by \$45,000, charged to the year's expenses for new improvements, including the lengthening of str. Bohemian, new feathering wheels for str. Quebec & Hamilton, & increased staterooms to str. Quebec, Hamilton & Spartan. These are outside of the regular repairs & outfit in which is included the rebuilding of the str. Longueuil.

The Co.'s hotel at Murray Bay, although not completed until after the season had commenced, was well patronized. It has realized the fullest expectations of your board in regard to beauty of situation & handsome appointments. It will have the grounds & all its adjuncts, including new golf links, ready for the opening of next season. The hotel at Tadoussac was also well patronized & shows an increasing business.

The Co.'s new str. Toronto has continued to give the most satisfactory results with largely increased earnings. The str. Kingston, now being built for the same route, with more extensive sleeping accommodation, & even more attractive fittings, will be ready for next season's business. The directors have also contracted for another steamer of 340 ft. in length, with 266 staterooms, & the most modern & attractive fittings, for the route between Montreal & Quebec, to be ready for the spring of 1902, to replace the str. Montreal, which will be utilized on another route to advantage.

Under the deed of trust securing the Co.'s bonds, issued in 1895, \$21,413.33 have been withdrawn & cancelled during the year, making a total cancelled to date of \$97,333.32 out of the original issue of \$571,833.33, leaving \$474,500.01 still outstanding.

The directors report the satisfactory & improved condition of the Co.'s property.

**FINANCIAL STATEMENT, FOR THE YEAR 1900.**

ASSETS.	
Steamers, real estate & buildings, wharves, etc.....	\$2,885,661.32
Coal, stores, provisions, etc.....	68,828.44
Accounts receivable.....	22,749.94
	<u>\$2,977,239.70</u>

LIABILITIES.	
Capital stock.....	\$2,088,000.00
Bonds 5% sterling.....	\$571,833.33
Less cancelled.....	\$97,333.32
In treasury.....	2,940.00
	<u>100,253.32</u>
Bank loans.....	471,580.01
Accounts payable.....	207,723.28
Unclaimed dividends.....	39,534.68
Accrued interest on bonds.....	129.00
Surplus.....	7,908.40
	<u>162,355.33</u>
	<u>\$2,977,239.70</u>

INCOME ACCOUNT.	
Dividend of 6% paid May & Nov. 2, 1900.....	\$ 117,813.93
Carried to surplus, Dec. 31, 1900.....	11,509.03
Net income over & above expenses, fixed charges & interest, for year ended Dec. 31, 1900.....	<u>\$ 129,322.96</u>

In the absence of the President, Senator Forget, Vice-President W. Wainwright occupied the chair & spoke of the business of the past year & the methods the board had used to facilitate & increase business, together with the steps that had been taken to increase the fleet. Not only had old boats like the Longueuil been entirely renovated, but a magnificent new boat would soon be finished, which would far eclipse anything that had yet been seen on the St. Lawrence river. The prospects for business during the ensuing year were, he thought, very bright; personally, however, he was disappointed that the Co. was not able to pay a larger dividend.

J. Joseph expressed the opinion that it would have been better if the large amounts that had been expended on repairs, etc., had been spread over several years. Of course, it came to the same thing in the long run, but he thought shareholders would have been

**C. P. R. LANDS.**

The Canadian Pacific Railway lands consist of the odd-numbered sections along the Main Line and Branches, and in Northern Alberta and the Lake Dauphin District. The Railway Lands are for sale at the various agencies of the company in Manitoba and the North-West Territories at the following prices:

- Lands in the Province of Manitoba average \$3 to \$6 an acre.
- Lands in Assiniboia, east of the 3rd meridian, average \$3 to \$4 an acre
- Lands west of the 3rd meridian, including the Calgary District, generally \$3 per acre.
- Lands in Northern Alberta and the Lake Dauphin District, \$3 per acre.

**TERMS OF PAYMENT.**

The aggregate amount of purchase money and interest is divided into ten instalments, as shown in the table below; the first to be paid at the time of purchase, the remainder annually thereafter, except in the case of the settler who goes into actual residence on the land and breaks up at least one-sixteenth thereof within one year, who is entitled to have second instalment deferred for two years from date of purchase.

The following table shows the amount of the annual instalments on a quarter section of 160 acres at different prices:

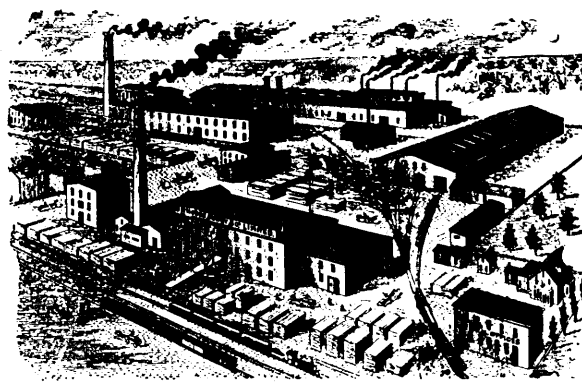
- 160 acres at \$3.00 per acre, 1st instalment \$71.90, and nine equal instalments of \$60.
- 160 acres at \$3.50 per acre, 1st instalment \$83.90, and nine equal instalments of \$70.
- 160 acres at \$4.00 per acre, 1st instalment \$95.85, and nine equal instalments of \$80.
- 160 acres at \$4.50 per acre, 1st instalment \$107.85, and nine equal instalments of \$90.
- 160 acres at \$5.00 per acre, 1st instalment \$119.85, and nine equal instalments of \$100.
- 160 acres at \$5.50 per acre, 1st instalment \$131.80, and nine equal instalments of \$110.
- 160 acres at \$6.00 per acre, 1st instalment \$143.80, and nine equal instalments of \$120.

**DISCOUNT FOR CASH.** If land is paid for in full at time of purchase, a reduction from price will be allowed equal to ten per cent. of the amount paid in excess of the usual cash instalment.

Interest at six per cent. will be charged on overdue instalments.

Write for maps and full particulars.

**F. T. GRIFFIN, - Land Commissioner, WINNIPEG.**



**Car Wheels, Castings, Forgings, &c. AMHERST, NOVA SCOTIA.**

**Rhodes, Curry & Co., Ltd.,**

**Railway and Street Cars**

of all descriptions. Special Cars for Coal, Ore, Lumber, &c., with Ball Bearing Wheels.

**JOHN S. METCALF CO., Engineers, Grain Elevator Builders, 1075 W. FIFTEENTH STREET, CHICAGO, ILL.**

A partial list of elevators which have been designed and constructed by us and under our supervision.

Burlington Elevator, St. Louis, Mo.....	Capacity.....	1,300,000 Bushels
Grand Trunk Elevator, Portland, Me.....	"	1,000,000 "
Export Elevator, Buffalo, N.Y.....	"	1,000,000 "
J. R. Booth Elevator, Depot Harbor, Ontario.....	"	1,000,000 "
Cleveland Elevator Company's Elevator, Cleveland, O.....	"	500,000 "
Erie R. R. Transfer & Clipping House, Chicago, Ill.....	"	100 cars in 10 hrs.
Manchester Ship Canal Co.'s Elevator, Manchester, Eng.....	"	1,500,000 "
Burlington Elevator Co., Peoria, Ill.....	"	500,000 "
Canada Atlantic Railway Elevator, Coteau Landing, Que.....	"	500,000 "
Northern Grain Co., Manitowoc, Wis.....	"	1,350,000 "
Union Elevator, East St. Louis, Ill.....	"	1,100,000 "
Montreal Warehousing Co.'s Belt Conveyer System.....	"	"

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better satisfied if the expenditure account had not been made to look so large.

Col. Henshaw replied that the method adopted was the more conservative, & had been thought by the directors to be the best course to adopt. He might point out that this was the course followed by all large railway & similar corporations to-day, & since the report had been published he had seen several of the shareholders, who had all expressed their concurrence with this conservative policy.

The report was carried unanimously.

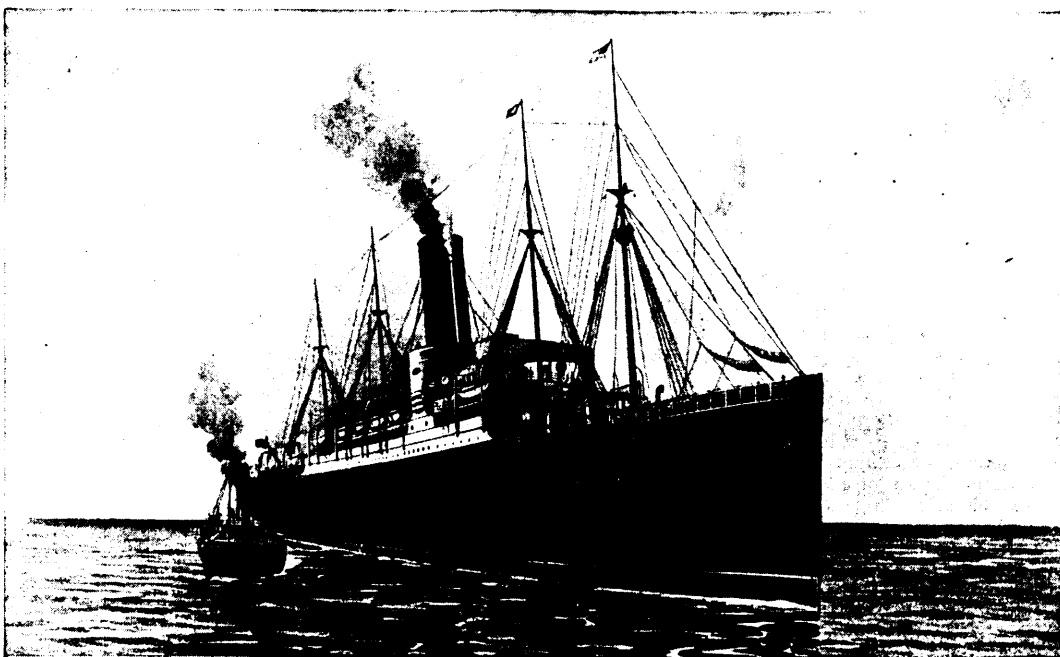
It was resolved that for the purpose of meeting the expenditure for the construction of the str. Kingston, & the Murray Bay Hotel, \$417,600 new stock, one for each five shares of existing stock, be offered to the shareholders at par at the discretion of the directors.

The officers for the current year are:—President, Hon. L. J. Forget; Vice-President, W. Wainwright; other directors, R. Forget, Col. Henshaw, C. O. Paradis, J. K. Osborne, H. M. Pellatt, E. P. Garneau, H. McKenzie, J. Louis, W. Hanson.

**Hamilton, Grimsby & Beamsville Electric Ry.**

At the annual meeting at Hamilton, Jan. 28, the following financial statement was presented:—

<b>ASSETS, DEC. 31, 1900.</b>	
Construction.....	\$280,179 54
Tools & implements.....	1,961 98
Material.....	730 00
Horse & wagon.....	168 00
Furniture.....	790 00
Rents receivable.....	27 33
Outstanding freight, pass., etc	632 88
Coal on hand.....	1,408 63
Lubricants, waste.....	35 86
Unearned insurance, guarantee fire & accident.....	261 26
Clothing.....	206 35
St. Catharines extension.....	77 50
Mail service outstanding.....	90 00
Cash in bank & on hand.....	1,149 41
	<b>\$287,719 63</b>
<b>LIABILITIES, DEC. 31, 1900</b>	
Bonds.....	\$85,000 00
Bank of Hamilton.....	18,323 36
Mortgage.....	2,000 00
Bills payable.....	16,200 00
Dividend, payable Jan. 1, 1901	1,921 25
Wages.....	580 89
Open accounts payable.....	2,617 32
Interest accrued.....	798 34
	<b>\$127,550 16</b>
Capital stock.....	\$153,700 00
Profit & loss account.....	6,469 47
	<b>\$287,719 63</b>
<b>RECEIPTS, YEAR ENDED DEC. 31, 1900.</b>	
Passenger earnings.....	\$37,879 03
Freight.....	7,220 71
Extra baggage earnings.....	352 51
Milk earnings.....	1,015 42
Express earnings.....	2,386 30
Rents receivable.....	138 96
Mail.....	309 00
	<b>\$49,301 93</b>
<b>DISBURSEMENTS.</b>	
Wages.....	\$14,751 12
Coal.....	4,166 33
Water rates & taxes.....	368 97
Advertising.....	91 98
Guarantee insurance.....	12 48
Power house expenses.....	303 12
Rents payable.....	203 00
Repairs o.h. line.....	159 78
Car repairs.....	2,266 10
Repairs to road bed & track.....	600 01
Lubricants & waste.....	293 22
Printing & stationery.....	604 85
Insurance, fire.....	407 90
do accident.....	645 00
Commissions & other co's proportions.....	255 52



THE TWIN SCREW STEAMER INVERNIA OF THE CUNARD LINE.

Horse expenses.....	220 03	
Legal expenses.....	466 75	
Repairs to buildings.....	99 30	
General expenses.....	1,593 16	
Materials used in renewals.....	350 81	
		<b>\$27,859 49</b>
Interest on bonds.....	4,250 00	<b>\$21,442 44</b>
do do borrowed money.....	1,711 81	
Dividends, 4 @ 1 1/4%.....	7,180 00	
		<b>\$13,141 81</b>
		<b>\$ 8,300 63</b>

The business for 1900 was very satisfactory, the increases over 1899 being, number of passengers, 9,000; tons of freight, 1,060; revenue, \$4,631.18. After paying 5% dividend, the balance of net revenue was expended on additional cars, sidings & other improvements to the line.

The officers were re-elected, viz.: President, C. J. Myles; Vice-President, W. J. Harris; Treasurer, H. S. Martin; other directors, L. Bauer, A. H. Myles, R. S. Morris, R. Ramsay; Secretary & Manager, A. J. Nelles.

**Repairing Wabash Engines in the U. S.**

In the House of Commons, Feb. 12, Mr. Ingram asked:—1. Upon how many engines has the Wabash Ry. Co. paid duty on repairs during 1900? 2. What were the numbers on each engine repaired, what were the repairs & the amount of duty paid the Government on each engine so numbered during the year 1900? 3. What was the total amount of duty paid the government by the Co. for the year 1900 on engines repaired? 4. Did the government employ an expert mechanic to value the repairs & new parts supplied to the engines, in order to arrive at the proper amount of duty to be paid? If not, what method was adopted? 5. Did the government or any member of the government, receive any complaint from any quarter regarding the Wabash Ry. Co. being allowed to repair its Canadian engines in the U.S.? If so, what was the nature of said complaints?

The Minister of Customs said:—In answer to questions 1, 2, 3 & 4, I would remark that it has not been usual to disclose to the public the details of invoices or of customs duties paid by importers in individual instances, such transactions at the custom house being usually treated as confidential in their nature.

Special returns from various ports would in any event be necessary to furnish the information asked for. The Customs Department is advised, however, that the Wabash Ry. Co. has paid duty on repairs to several engines during 1900. 5. I am informed that no complaint has been received at the Customs Department regarding the Wabash Ry. Co. being allowed to repair its Canadian engines in the U.S., unless the following inquiries, contained in a letter from the member for East Elgin can be so regarded, viz.: Whether the Department of Customs has any agreement with the Wabash Ry. Co. which would give it the right to take its engines or other rolling stock over to its own shops in the U.S. for the purpose of repairs, & if so, how does the Department of Customs arrive at the amount of duty (if any is paid) the Co. should pay on such repairs?

**Hydraulic Power Plant at Massena.**

There is nearing completion at the little town of Massena, N.Y., near the St. Lawrence River, one of the latest & largest of the hydraulic electric power plants, the development of which is one of the most significant features in the world of engineering at the close of the nineteenth century. The earliest of these was the installation of the Niagara Falls Power Co. at Niagara. This plant has a capacity at present of 50,000 h.p., & a second wheel-pit is now being excavated which will exactly double the capacity. Another extensive plant for the utilization of the waters of the Great Lakes is that which is being constructed at the Sault Ste. Marie rapids, where works are in progress for the development of 60,000 h.p.

The ambitious undertaking at Massena contemplates development ultimately of 150,000 h.p., although the works at present in progress are designed for an output of 75,000 h.p., this being the capacity of the present canal. By a study of the accompanying plan of Massena & its surroundings, it will be seen that the natural conditions are remarkably favorable to the development of a scheme like the present one. For several miles in the vicinity of the Long Sault Rapids, in which the St. Lawrence River undergoes a fall of 50 ft., the Grasse River flows approximately parallel with the St. Lawrence at a distance of a few miles from the same, ultimately discharging into that river

below the rapids. At the head of the rapids the level of the St. Lawrence is about 42 ft. higher than that of the tributary stream, & advantage has been taken of this fact to cut a canal across the intervening country & utilize the head of water which is thus secured in a power plant located on the banks of the Grasse River, which is utilized as a tail-race for the discharged waters. The effective head above the Grasse River level at the power house is 35½ ft. As at present constructed, the canal has a surface width of 192 ft., and a depth of 18. The present capacity of the whole scheme is limited by the capacity of Grasse River, which has sufficient sectional area to carry away the tail-race waters for a development of 75,000 h.p. When this point has been passed in the development of the scheme, dredging operations will be necessary in the Grasse River; but it will be possible by dredging out the same & making full use of the capabilities of the canal, as ultimately enlarged, to produce a maximum of 150,000 h.p. The hydraulic electric plant which is now being erected at the power house will have a capacity of 37,500 h.p., & the extension which is immediately to be made will bring up the equipment to a total of 75,000 h.p.

By the courtesy of the St. Lawrence Power Co. a party made up of the representatives of technical journals was recently taken to Massena as guests of the Co. & driven over the work, every facility being extended for a thorough examination of the same. As a result of the very quiet manner in which this Co. has executed a work of this magnitude, surprise was expressed at the advanced stage to which it had been pushed. Of a total estimated excavation of 5,922,000 yards, 4,500,000 had been removed. The canal, which is about three miles in length, has been so far advanced that it is likely it will be ready for use during next spring. The concrete work of the power house is completed & roofed in, & the work of installing the turbines and generators is being actively prosecuted.

The power house, which is being built upon the bed rock of the Grasse River, will ultimately be nearly 700 ft. long, with a width of about 150 ft. The fifteen 6,000 h.p. turbines, or rather sets of turbines (each set consisting of six wheels), which will be here installed, are of the well known Victor type. These turbines will be placed upon horizontal shafts in three sets of two wheels each. This is in marked contrast to the turbines at Niagara, which, with their corresponding generators, are mounted upon vertical shafts. The Niagara shafts are 150 ft. in length, while the horizontal shafts at Massena are but 80 ft. long. The six turbines of each set will develop power sufficient to operate one 5,000 h.p. generator. Such structural differences as there are between the two outfits are due to the difference in the character of the two water-ways, the fall at Massena being less, & the volume of water greater than at Niagara.

The power house will have a height of about 60 ft., giving ample head room for an 85-ton overhead electric travelling crane, which will run throughout the entire length of the power house. In addition to the 15 sets of turbines for driving the large generators, there will here be installed three smaller turbines, operating three direct-current generators, to be used as exciters for the main machines. Direct current is required for exciting alternating current machines, & this may be furnished by small direct-current machine rotating on the same shaft with the large machine, or else separately driven. For the plant of the Power Co., as in practically all other large supply systems, separate exciters are provided, & in this case, as stated, they are operated on separate shafts & by separate turbines.

Each of the enormous main generators, giving an output of 5,000 h.p., will weigh 175 tons. The generators will stand about 22 ft.



above the tops of the foundations, & each machine will measure on the ground 22 ft. by 18. The generator shaft is a continuation of the shaft upon which one set of the turbines is mounted. This shaft carries the revolving field, which is in effect a huge steel wheel, 15 ft. in diameter & 3 ft. wide, cast with 10 massive spokes. This field magnet is designed to rotate at a speed of 150 revolutions a minute, which gives a speed at the circumference of about 1¼ miles a minute. The wheel carries twenty externally projecting pole pieces, & rotates within a large stationary ring built up of thin soft steel disks held by a massive outside cast iron yoke. These thin steel disks constitute the stationary element of the magnetic circuit of the generator. Along the inner face of the ring which is thus built up are provided slots in which are laid the copper conductors of the armature. These copper bars are mica-insulated. The rotating wheel (which, with its projecting pole pieces & copper windings supplied with current from the separate exciting machines, forms the field magnet of the generator) induces an alternating current in the copper windings of the stationary outer ring or armature. It is this current which, at a pressure of 2,200 volts, will give an electrical output of 5,000 h.p. This current is carried to a main switch-board, the various machines being connected therewith by means of a set of massive copper bus-bars.

The method by which the output of 75,000 h.p. will be controlled possesses unusual interest, on account of its simplicity. One man, by manipulating a series of electric buttons, arranged on a small stand, will be able to control instantaneously the whole output of 75,000 h.p. Running the length of the power house will be a raised platform, in the middle of which will be built a central controlling stand, made desk-fashion & semi-circular in shape, so that an engineer stationed at its center will have within reach the controlling apparatus of the entire station. This controlling

### The Canadian Pacific Railway Company.

Dividends for the half year ended 31st December, 1900, have been declared as follows:

On the Preference Stock two per cent.  
On the Common Stock two and one half per cent.  
Warrants for the Common Stock dividend will be mailed on or about 1st April to Shareholders of record at the closing of the books in Montreal, New York and London respectively.

The Preference Stock dividend will be paid on Monday, 1st April, to Shareholders of record at the closing of the books at the Company's London Office, 1 Queen Victoria Street, London, E.C.

The Common Stock Transfer books will close in London at 3 p.m. on Friday, 22nd February, and in Montreal and New York on Friday, 8th March. The Preference Stock books will close at 1 p.m. on Saturday, March 2nd. All books will be re-opened on Tuesday, and April.

By order of the Board,

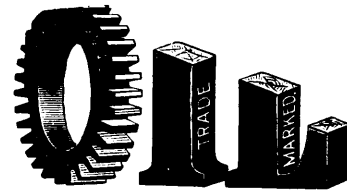
CHARLES DRINKWATER,

Secretary.

Montreal, 11th February, 1901.

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stand will carry a number of marble slabs or tablets (one for each generator), upon which will be mounted small controlling keys. These keys are arranged on the interlocking system, & they will operate, by means of local battery circuits, a series of compressed air valves & pistons. The latter will, in turn, control a series of 15 switching stands, one for each generator, equipped with the necessary cutouts & switches. The stand will be located under the raised platform, & approximately opposite its corresponding generator. Each stand will carry three-pole carbon shunt circuit breakers, in series with which will be three-pole double-throw switches. The circuit-breakers & switches are controlled by means of compressed air, as previously stated, from the central controlling stand operated by the engineer. Stands similar to the switching stands are provided for the different outgoing circuits. The operator thus has under his eye at every moment the huge generators themselves, their corresponding switches & indicating instruments, & in reach of his fingers are the electric buttons, by means of which the entire plant is regulated & controlled.

The current thus generated will be used for a variety of purposes. It is adapted for use in operating induction motors, which, because of their ideal simplicity of construction & operation, are coming widely into use in place of the more delicate & complicated direct current motor for general power service. It can be used for lighting & heating, & for electrolytic work, as well as in a great variety of electro-chemical processes, such as the manufacture of aluminium, calcium carbide & other products which have been made commercially available only through the application of electric power at extremely low cost, as furnished by such means as the Niagara & the St. Lawrence plants. For some of these purposes the high tension alternating current has to be transformed into low pressure direct current, & this is readily done with very small loss, by means of the modern rotary converter.

Massena is an unusually good centre for such a purpose, as its facilities for transportation are excellent. The Grand Trunk & New York Central lines intersect here, & the Vermont Central & the New York & Ottawa come within a short distance of the town. Large lake vessels may be admitted to the power company's canal, thus affording direct communication by water with the lake system. If necessary, in the future, a lock may be constructed which will pass vessels from the canal into the Grasse River, & thence back into the St. Lawrence River. Such a plant as this affords ideal facilities for the transmission of the electric current over great distances, as is done from the central power plant at Niagara, but it is not the intention of the St. Lawrence Co. to so transmit it; but rather to furnish the power at such low rates that manufacturing establishments will find a strong incentive to locate in the vicinity.

### The Canals of Canada.

By Waldon Fawcett.

The tremendous commercial & industrial development which has lately been inaugurated in many different directions in the Dominion is chiefly & directly traceable to the opening of the system of enlarged canals, which has made possible the introduction of vessels of moderate draught in the trade of what is known as the St. Lawrence route. It has been realized for some years that Montreal & other points on the lower St. Lawrence River presented admirable facilities as export ports for grain, just as it has been appreciated that the iron industry of Canada needed little fostering to yield rich returns; but activity in both directions has been considerably retarded by inadequate facilities for water transportation.

That the importance of a waterway linking the Great Lakes & the Atlantic, & the benefit which it would confer, not alone upon Canada, but upon the entire region bordering on the Great Lakes, has been realized, is attested by the immense interest which has been mani-

course the Welland & St. Lawrence waterways. These two systems, together with those portions of the St. Lawrence River where no improvement has been necessary & the chain of Great Lakes & their connecting rivers, gives to Canada what is unquestionably the most remarkable uninterrupted course of inland water communication in the world, a stretch of almost 2,400 miles extending from the Straits of Belle Isle to the ports at the head of Lake Superior.

The project of a Canadian waterway of a uniform depth of 14 ft., extending from the Great Lakes to the Atlantic coast, was first seriously considered in 1872, & it is probably due largely to the fact that plans prepared about a quarter of a century ago have been carried out without alteration or amendment, that the canals just completed were not made somewhat deeper. At the time the scheme was first mapped out the immense, steel, freight-carrying steamers now in service on the lakes were unthought of, even as a remote possibility, & it was supposed that a channel capable of accommodating vessels drawing 13 or 14 ft. of water would meet all the requirements of any trade which might be developed

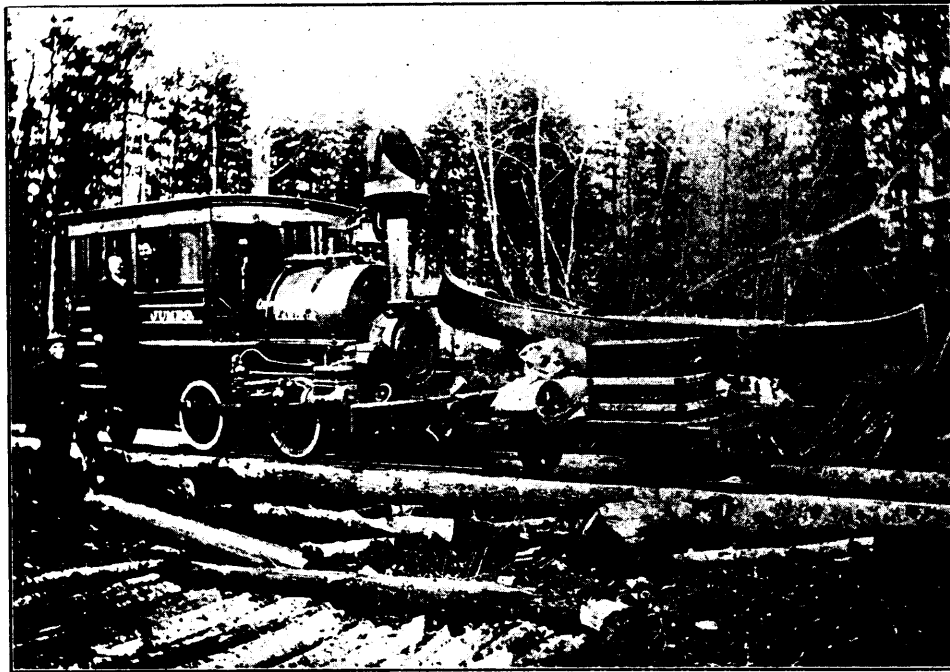
in this part of the continent. Long before the system was completed the mistake was discovered, but it would have been manifestly useless to make the new canals deeper unless a like improvement could be introduced in those first constructed, & so the original uniform depth was adhered to.

The St. Lawrence system proper consists of six canals, ranging in length from one to 14 miles. With the Welland Canal, which goes to make up the seven artificial waterways between Lake Erie & the sea, the canals have an aggregate length of over 70 miles. In this distance there are 53 locks, overcoming a height of 533 ft. To bring the locks to their present uniform dimensions of 270 ft.

in length and 45 ft. in width, more or less extensive alterations had to be made on each one; nor did a single one of the locks have, originally, the desired depth.

The canal system of the St. Lawrence River is necessary to enable vessels to make the ascent of 207 ft. from the level of the river at Montreal to Lake Ontario & to avoid the dangerous rapids which are found at various points. The menace which these have constituted to navigation interests has been well illustrated by experiences during the interval when the improvements on the canals were uncompleted. Upon occasions when the demand for lake-built craft for Atlantic coast service was urgent, the Standard Oil Co. & other interests allowed several vessels which were of too great draught to pass through the canals to "shoot the rapids." This proved an extremely hazardous proceeding, & several of the craft were either lost or seriously damaged.

The largest, the most lately completed, & decidedly the most interesting canal of the St. Lawrence system is the Soulanges, which in the details of design and construction may be



THE COMBINED GOLD MINING CO.'S RAILWAY IN NORTHWESTERN ONTARIO.

festated in the investigations of the Deep Waterways Commission appointed by the U. S. Congress a few years ago to compare the advantages of the various routes exclusively in U.S. territory, for a navigable channel from fresh to salt water. Canada has felt the necessity of such an avenue of communication far more keenly than the U.S., for not only has she practically no shipping on the Great Lakes, but almost the only outlet for the product of the grain fields of Manitoba—one day to become the greatest cereal-producing region in the world—has been found in rail lines. On the other hand, however, Canada had what the U.S. with its immense lake fleet & network of railroads had not, a natural waterway to the coast, which with a moderate expenditure could be adapted to the traffic of ships of fair size throughout its entire length.

Although the Canadian system of canals has only just been brought to the point where it is proving a factor in the utilization of the natural resources of the country, the Dominion Government has, since Confederation in 1867, spent more than \$75,000,000 on the various canal systems, the backbone of which is of

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1. **The Province of Ontario.**
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3. **The Provinces of New Brunswick, Nova Scotia and Prince Edward Island and Newfoundland.**
4. **The Province of Manitoba and the Northwest Territories.**
5. **The Province of British Columbia.**

The Company makes contracts for the display and distribution of matter in any or the whole of these districts, and invites enquiries for terms and full particulars of the service.

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Brockville, Westport & Sault Ste. Marie.	Inverness & Richmond.	Pontiac Pacific Junction.
Buctouche & Moncton.	Irondale, Bancroft & Ottawa.	Prince Edward Island.
Canada Atlantic.	Kent Northern.	Quebec Central.
Canada Coals & Ry. Co.	Kingston & Pembroke.	Quebec & Lake St. John.
Canada Eastern.	Kootenay Ry. & Nav. Co.	Quebec Southern.
Canadian Northern.	L'Assomption.	Salisbury & Harvey.
Canadian Pacific.	Lake Erie & Detroit River.	Shore Line, N. B.
Caraquet.	Lotbiniere & Megantic.	Spokane Falls & Northern.
Carillon & Grenville.	Maine Central.	Sydney & Louisburg.
Central Ontario.	Michigan Central.	South Shore, Que.
Central of New Brunswick.	Midland of Nova Scotia.	Temiscouata.
Central of Nova Scotia.	Montfort & Gatineau Colonization.	Tilsonburg, Lake Erie & Pacific.
Central Vermont.	Nelson & Fort Sheppard.	Thousand Islands.
Cumberland Ry. & Coal Co.	New Brunswick & P.E.I.	Toronto, Hamilton & Buffalo.
Dominion Atlantic.	Newfoundland.	Victoria & Sidney, B.C.
	New York & Ottawa.	

taken as typical of the most approved practice in waterway construction in the Dominion. The Soulanges is 14 miles in length, & not only overcomes the difference of 82 ft. between the levels of Lake St. Francis & Lake St. Louis, but enables vessels to avoid 16 miles of dangerous rapids. This canal cost \$5,250,000, is operated by electrical power, & is claimed in point of equipment to be the most modern in the world. Vessels may traverse the waterway by day or night, & it is a remarkable fact that the canal has only two curves & that the entire fall of 82 ft. is overcome by four locks.

One of the chief points of novelty in the Soulanges is the introduction of concrete to a large extent in the walls & foundations of the locks. In the locks of the Welland & most of the other Canadian canals the backing is of masonry, but in this latest canal the mass is concrete faced with stone. Each of the locks has a lift of  $23\frac{1}{2}$  ft. and is 350 ft. in

tain an uninterrupted flow is passed through a supply weir of large dimensions provided with four sluices & debouching into a channel or raceway behind the guard lock. This is continued to the lower end of that structure, where it joins the main canal. The sluices, which are of the vertically operated steel shutter type, so common in Europe, are operated by electricity, as are also the locks & bridges. All of the 40 sluice-gates along the canal are submerged, & no water for supply is passed over the breast walls.

One of the most interesting mechanical features of the canal is found in the application of electrical power to the operation of the gates. Owing to the height of the wells at the lower entrance & the solidity of the gates, each large leaf weighs fully 90 tons in the air. Preliminary experiments with a dynamometer on one of these when in place showed that a force of fully 3,000 lbs. was required to move

from Lake Erie to Lake Ontario, is almost 27 miles in length & has a total rise of about 327 ft. It was opened in 1883 for vessels drawing 12 ft. of water, & four years later for vessels with a draught of 14 ft.

The locks of the Welland & St. Lawrence Canals are, as has been stated, 270 ft. long from the miters of the gates, and 45 ft. in width, but this does not convey a strictly correct idea of the largest size of vessel which may lock through, this being dependent upon the model of the bow & stern of the vessel. A vessel that is sharp forward at the deck line & narrow at the stern can lock several feet longer than one that is nearly full beam of the locks. The reason why a steamer of narrow beam may lock through longer is found, of course, in the fact that she may be swung to one side of the lock & one gate opened, & then to the other side of the lock while the other gate is being opened.



ROTARY SNOW PLOW AT WORK ON TUNNEL MOUNTAIN, WHITE PASS AND YUKON RAILWAY.

length, 46 ft. wide and  $42\frac{1}{2}$  ft. high. At the upper end there is a breast wall about 23 ft. high of solid masonry. The water to fill or empty the lock is conveyed through tunnels in the side walls which are 25 ft. apart at the base. Control is effected by means of sluices, placed in wells behind the recesses for the gates, & operated from the coping of the locks. From the tunnels the water is introduced to the chamber of the lock by twenty cast iron pipes, each of  $2\frac{1}{2}$  ft. diameter, ranged 10 on either side. The means of escape is, of course, by the same avenue. The lock is filled in about five minutes, & under ordinary conditions a lockage can be made in from 12 to 15 minutes.

The question of the provision of an adequate water supply in all parts of the canal at all times has been solved by the provision of commodious side channels. At the intake at Lake St. Francis the water designed to main-

tain an uninterrupted flow is passed through the water at the rate of 15 ft. a minute. This movement was effected by attaching a horizontal operating bar or strut to the gate about half way between the heel and miter. On the side of this strut a rack of sufficient length was fixed into which a pinion was geared & driven by electrical power. A system somewhat similar has been in use on the North Sea canal for several years. It might be noted in conclusion that three small rivers, tributaries of the St. Lawrence, pass under the Soulanges Canal through iron pipes.

The second most important canal of the St. Lawrence system is the Cornwall, which is  $11\frac{1}{2}$  miles in length, overcomes a lift of 48 ft. & ends at the town from which it derives its name. The Welland Canal, although as explained not in the St. Lawrence system, constitutes a most important link in the chain of communication which the new waterways have opened up. The Welland, extending

It will thus be appreciated how vessels ranging all the way from 240 to 270 ft. represent the maximum capacity of the locks for craft of different types. Generally speaking, however, it may be stated that the vessels especially adapted for traffic on the St. Lawrence route are each capable of carrying, on an average, 68,000 bush. of wheat or 3,000 tons of iron ore.

There have been a large number of these vessels constructed within the past two years, & the ship yards of the Great Lakes being unable to supply the ships as rapidly as desired, several contracts were placed abroad. The majority of the vessels thus far constructed are designed especially for the grain trade, a U.S. syndicate having planned to build great elevators at Montreal & ship at least 25,000,000 bush. grain via that route each year. The new canal system is also serving as an impetus to the ship-building industry on



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1882	1,134	12,058 86	2,967 93	2 61	11.00
1883	2,210	9,493 68	10,857 65	4 91	4.73
1884	2,558	13,914 31	23,081 85	9 01	4.23
1885	3,642	26,576 99	29,802 42	8 18	7.76
1886	5,804	28,499 82	53,981 28	9 30	4.85
1887	7,811	50,014 67	81,384 41	10 44	5.78
1888	11,800	80,018 16	117,821 96	9 98	6.43
1889	17,349	116,787 82	188,130 36	10 84	5.85
1890	24,604	181,846 79	283,967 20	11 54	5.18
1891	32,303	261,436 21	408,798 20	12 65	6.40
1892	43,024	344,748 82	580,597 85	13 49	6.25
1893	51,484	392,185 93	858,857 89	15 76	5.47
1894	70,055	511,162 30	1,187,225 11	16 94	5.47
1895	86,521	685,000 18	1,560,733 46	18 03	5.67
1896	102,838	820,941 91	2,015,484 38	19 60	5.56
1897	124,685	992,225 60	2,558,832 78	20 52	5.56
1898	144,000	1,170,125 14	3,186,370 36	22 12	5.67
1899	163,610	1,430,200 33	3,778,543 58	23 09	6.30
1900	180,717	1,543,498 11	4,483,359 07	24 81	6.30

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 Or Any Officer or Member of the Order.

the Great Lakes, several vessels for Atlantic service having been constructed on the inland seas within the past year.

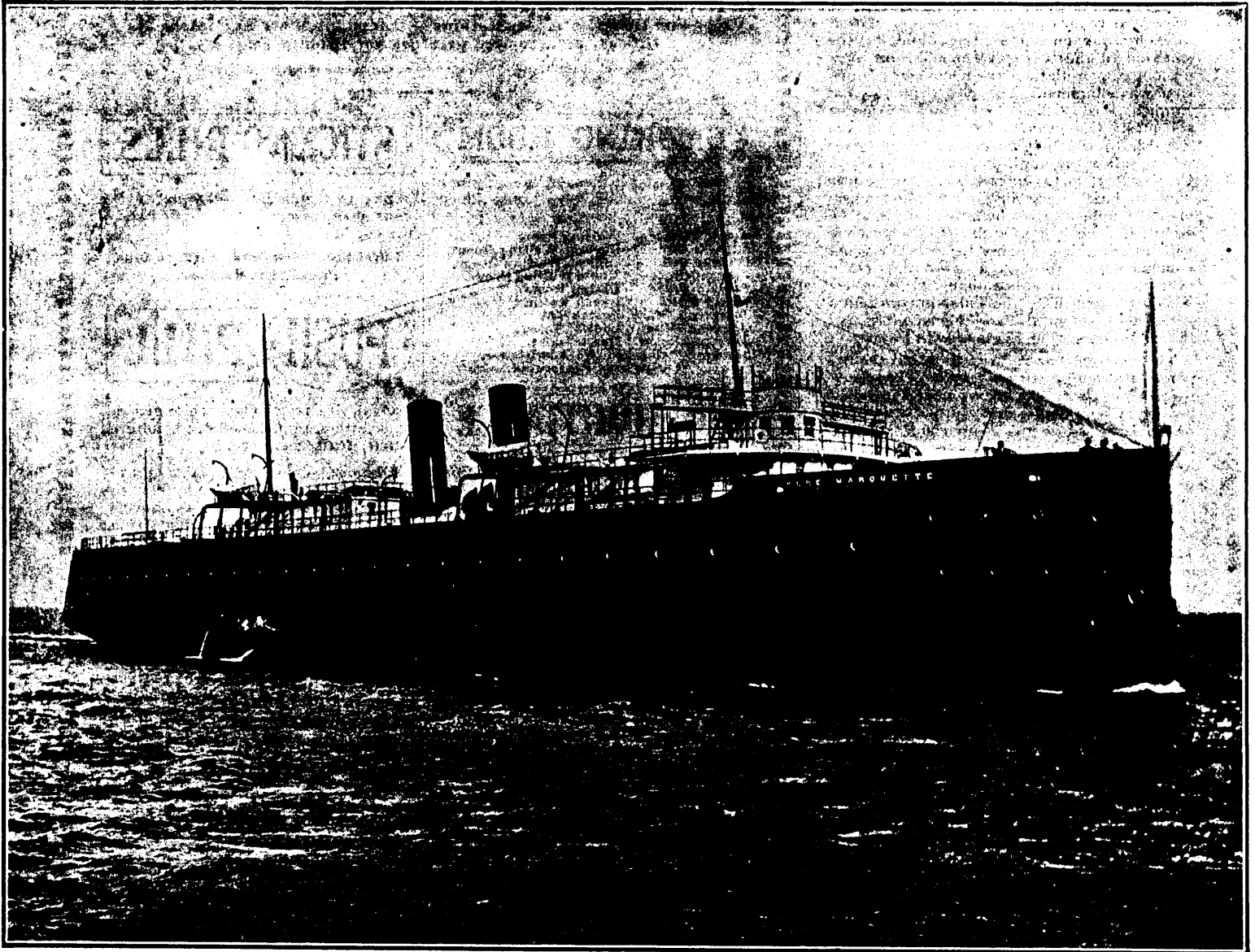
### Telegraphing & Telephoning Simultaneously.

The Rysselberge system of telegraphing & telephoning simultaneously over a single wire is meeting with considerable success in Germany, the Berlin fire brigade being equipped with it. There are 15 brigade stations in Berlin, each of which is served by a special network of fire alarms. From these stations un-

derground wires radiate in all directions, each wire being connected with a great number of alarm pillars. The alarms are arranged for automatic working, & to each is fitted a key for telegraphing to the station. As it is, however, a very great advantage to be able to maintain during the progress of the fire a good connection between the alarm pillars nearest the fire & the brigade station, exhaustive trials have been made with a specially adapted telephone which have resulted in the general introduction of the same. To the Morse apparatus at the station a stand is attached, from which a microtelephone fitted with a battery switch & a second receiver are suspended. The remaining apparatus is enclosed in a flat box & placed under the table. This box contains an induction coil, a condenser, & a circuit key. As it would be expensive to equip each of the fire-alarm posts with telephone apparatus, a portable set is used, which may be attached to the posts by means of a plug & socket provided for the purpose. Such a portable set is carried by each of the brigade carts, there being some eighty now in use. The brigades' cycles are also equipped with sets which are very compact in design. Experience with the system has shown that the switching in of the telephone apparatus in no way influences the telegraph service. During simultaneous telegraphing & telephoning a

regularly, but on one occasion it was late 10 minutes, owing to the wreck of a hay wagon which was on the road. It is an experiment made by the Union Traction Co. to test the maintenance of high speed & the evenness of schedule time. Every trip is carefully watched by experts—the state of the metal, the thermometrical & barometrical conditions being noted, as well as the humidity & fog at the various stations. Automatic instruments for recording the speed, etc., are arranged on the back platform. The weight of the car, newspapers & four persons occupying it is 10½ tons.

The Midland Ry. of England has recently



FLINT AND PÉRE MARQUETTE R. R. CO.'S CAR FERRY STEAMER, PÉRE MARQUETTE. SEE JAN. ISSUE, PG. 1.

slight knocking is perceptible in the telephone, which, however, does not destroy the audibility.

### Miscellaneous Notes.

A fast trolley car is being tested in Philadelphia. It takes newspapers in the early morning to Chestnut Hill, 14¾ miles away. It runs at a rate of 35 miles an hour, including a stop at least every three-quarters of a mile. Occasionally it has run a mile in a minute & an eighth, & it has made the entire distance in 25 minutes, including stops, which is the same time as the express trains make for the same distance. It maintains its schedule time

purchased four American sleeping cars. Each car measures 59 ft. 10¼ ins. over the buffer beams, & 13 ft. 1 in. in height from the rail level to the top of the roof. The bogies upon which the car is built were constructed by the Midland Ry. at its own shops, & differ somewhat from the prevalent American pattern. The fittings for the vacuum brake were also supplied by the railway. The car was despatched to England in sections, & the parts reassembled at the railway works. The car is divided, one portion of it being provided with five staterooms, each of which is supplied with bed, folding washstand & usual appurtenances. The remaining portion of the car is a general saloon, & is only converted

into a sleeping apartment at night by making up the berth between the two seats. All the berths are on the same level, the Co. having abandoned the idea of placing one berth over the other. A smoking saloon & buffet are attached. A charge of \$1.25 is made for the use of this saloon in addition to the railway saloon.

Ever since telephone communication has been established between London & Paris, it has been constantly rumored that attempts were being made by the English & Belgian governments to inaugurate a similar service between London & Brussels. It is announced that in Feb. Brussels will be connected with the English capital by the telephone. There have been several obstacles in the way which have prevented realization of this scheme. Great difficulty was encountered in obtaining the sanction of the two governments, but after prolonged negotiations the necessary permission was obtained. The electricians of the English Post Office had two alternative schemes. One was to lay a cable from the English to the Belgian coast; & the other was to utilize the Anglo-French wire as far as Calais, & then to extend to Brussels over wires on land. According to present arrangements it appears that the latter plan is to be adopted, since it has been found impossible with existing instruments to transmit vocal communication through a submarine cable over a greater distance than twenty miles. This is the length of the cable in connection with the London to Paris telephone, & also the cable connecting England with Ireland.

The first electric railway in which the tri-phase alternating current system has been used in Germany has been recently installed between Oberammergau & Murnau, its length being about 15 miles. The road, starting from the latter station, is comparatively level for the first few miles, but further on a 3% grade is reached, extending over four or five miles. The highest point of the line is between Saulgrub & Altenau, which is 2,500 ft. above sea level & 438 above the starting point. The line ends at Oberammergau; the terminal station is not far from the theater in which the Passion Play is represented. Hydraulic power is used to operate the road, a fall in the Ammer river being utilized. The station is

located at Kammerl, about 10 miles from Murnau; the fall gives 1,000 to 1,500 h.-p. A dam has been constructed across the river, & the water is brought to the station by a canal 1,500 ft. long, terminating in sheet iron tubes of large diameter. Three turbines or 500 h.-p. each are used to operate the alternating current generators. For the road the trolley system is used, with overhead line. The road

has been planned so that steam engines may be used; this will be necessary to provide for the great traffic at the time of the Passion Play, which occurs every 10 years. During these periods the road will be operated by steam, & connection will be made with the main railways, so that the international express trains may be run. At ordinary times the road will use electricity.

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Freight Office.	Ladies' Waiting Room.
General Offices.	Men's Waiting Room.
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Smoking Room.	Men's Toilet.
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Trespassers Prosecuted.	

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Size 10 x 2½ inches. Oblong, oval ends, white ground, blue letters, lined & tipped, hollowed:

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Luggage Room.	Private.
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Refreshments.	No Road.
Exit.	Boarding House.
Fire Escape.	Private Board.
Lavatory.	Dressmaking.
Ladies.	Fresh to Day.
Women.	Teas Provided.
Gentlemen.	Please Shut the Gate.

Size 14 x 3 inches. Oblong, oval ends, white ground, blue letters, lined and tipped.

No Admittance.

### STICK NO BILLS

Size 18 x 3½ inches. Oblong, square ends, white ground, blue letters, lined & tipped.

Furnished Apartments. Stick no Bills. Please Shut the Door.



Oval, size 2 x 3 inches, white ground, blue letters, tipped, hollowed, lettered **Push, Pull**, as above.

Oblong, square ends, size 3 x 1½ inches, white ground, blue letters, tipped, lettered **Push, Pull**, as above.

Perpendicular, square ends, size 12 x 3 inches, white ground, blue letters, lined & tipped, lettered perpendicularly, **Push, Pull**.

Oblong, square ends, size 12 x 3 inches, white ground, blue letters, lined and tipped, lettered horizontally, **Push, Pull**.

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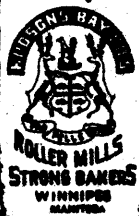


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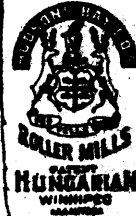
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