

**CIHM  
Microfiche  
Series  
(Monographs)**

**ICMH  
Collection de  
microfiches  
(monographies)**



**Canadian Institute for Historical Microreproductions / Institut canadien de microreproductions historiques**

**© 1996**

## Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming are checked below.

- ☐ Coloured covers / Couverture de couleur
- ☐ Covers damaged / Couverture endommagée
- ☐ Covers restored and/or laminated / Couverture restaurée et/ou pelliculée
- ☐ Cover title missing / Le titre de couverture manque
- ☐ Coloured maps / Cartes géographiques en couleur
- ☒ Coloured ink (i.e. other than blue or black) / Encre de couleur (i.e. autre que bleue ou noire)
- ☒ Coloured plates and/or illustrations / Planches et/ou illustrations en couleur
- ☐ Bound with other material / Relié avec d'autres documents
- ☐ Only edition available / Seule édition disponible
- ☐ Tight binding may cause shadows or distortion along interior margin / La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure.
- ☐ Blank leaves added during restorations may appear within the text. Whenever possible, these have been omitted from filming / Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- ☐ Additional comments / Commentaires supplémentaires:

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- ☐ Coloured pages / Pages de couleur
- ☐ Pages damaged / Pages endommagées
- ☐ Pages restored and/or laminated / Pages restaurées et/ou pelliculées
- ☒ Pages discoloured, stained or foxed / Pages décolorées, tachetées ou piquées
- ☐ Pages detached / Pages détachées
- ☒ Showthrough / Transparence
- ☐ Quality of print varies / Qualité inégale de l'impression
- ☐ Includes supplementary material / Comprend du matériel supplémentaire
- ☐ Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image / Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.
- ☐ Opposing pages with varying colouration or discolourations are filmed twice to ensure the best possible image / Les pages s'opposant ayant des colorations variables ou des décolorations sont filmées deux fois afin d'obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below /  
Ce document est filmé au taux de réduction indiqué ci-dessous.

10x		14x		18x		22x		26x		30x	
	12x		16x		20x		24x		28x		32x

The copy filmed here has been reproduced thanks to the generosity of:

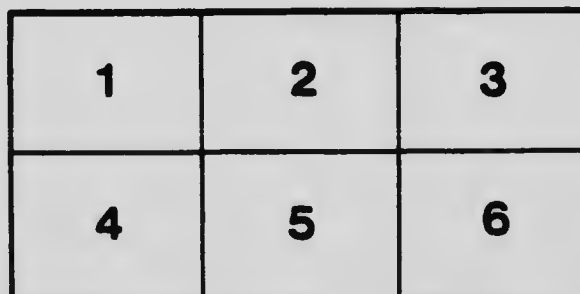
Vancouver City Archives

The images appearing here are the best quality possible considering the condition and legibility of the original copy and in keeping with the filming contract specifications.

Original copies in printed paper covers are filmed beginning with the front cover and ending on the last page with a printed or illustrated impression, or the back cover when appropriate. All other original copies are filmed beginning on the first page with a printed or illustrated impression, and ending on the last page with a printed or illustrated impression.

The last recorded frame on each microfiche shall contain the symbol ➡ (meaning "CONTINUED"), or the symbol ▼ (meaning "END"), whichever applies.

Maps, plates, charts, etc., may be filmed at different reduction ratios. Those too large to be entirely included in one exposure are filmed beginning in the upper left hand corner, left to right and top to bottom, as many frames as required. The following diagrams illustrate the method:



L'exemplaire filmé fut reproduit grâce à la générosité de:

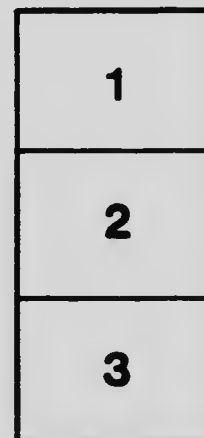
Vancouver City Archives

Les images suivantes ont été reproduites avec le plus grand soin, compte tenu de la condition et de la netteté de l'exemplaire filmé, et en conformité avec les conditions du contrat de filmage.

Les exemplaires originaux dont la couverture en papier est imprimée sont filmés en commençant par le premier plat et en terminant soit par la dernière page qui comporte une empreinte d'impression ou d'illustration, soit par le second plat, selon le cas. Tous les autres exemplaires originaux sont filmés en commençant par la première page qui comporte une empreinte d'impression ou d'illustration et en terminant par la dernière page qui comporte une telle empreinte.

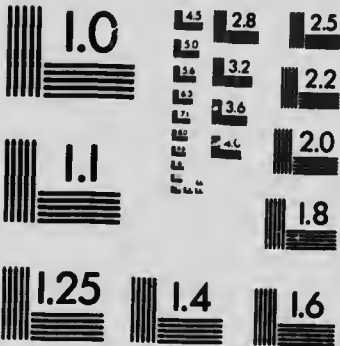
Un des symboles suivants apparaîtra sur la dernière image de chaque microfiche, selon le cas: le symbole ➡ signifie "A SUIVRE", le symbole ▼ signifie "FIN".

Les cartes, planches, tableaux, etc., peuvent être filmés à des taux de réduction différents. Lorsque le document est trop grand pour être reproduit en un seul cliché, il est filmé à partir de l'angle supérieur gauche, de gauche à droite, et de haut en bas, en prenant le nombre d'images nécessaire. Les diagrammes suivants illustrent la méthode.



# MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



**APPLIED IMAGE Inc**

1653 East Main Street  
Rochester, New York 14609 USA  
(716) 482 - 0300 - Phone  
(716) 288 - 5969 - Fax

Series

2

THE SYDNEY E. JUNKINS COMPANY LTD.

WINNIPEG :: VANCOUVER



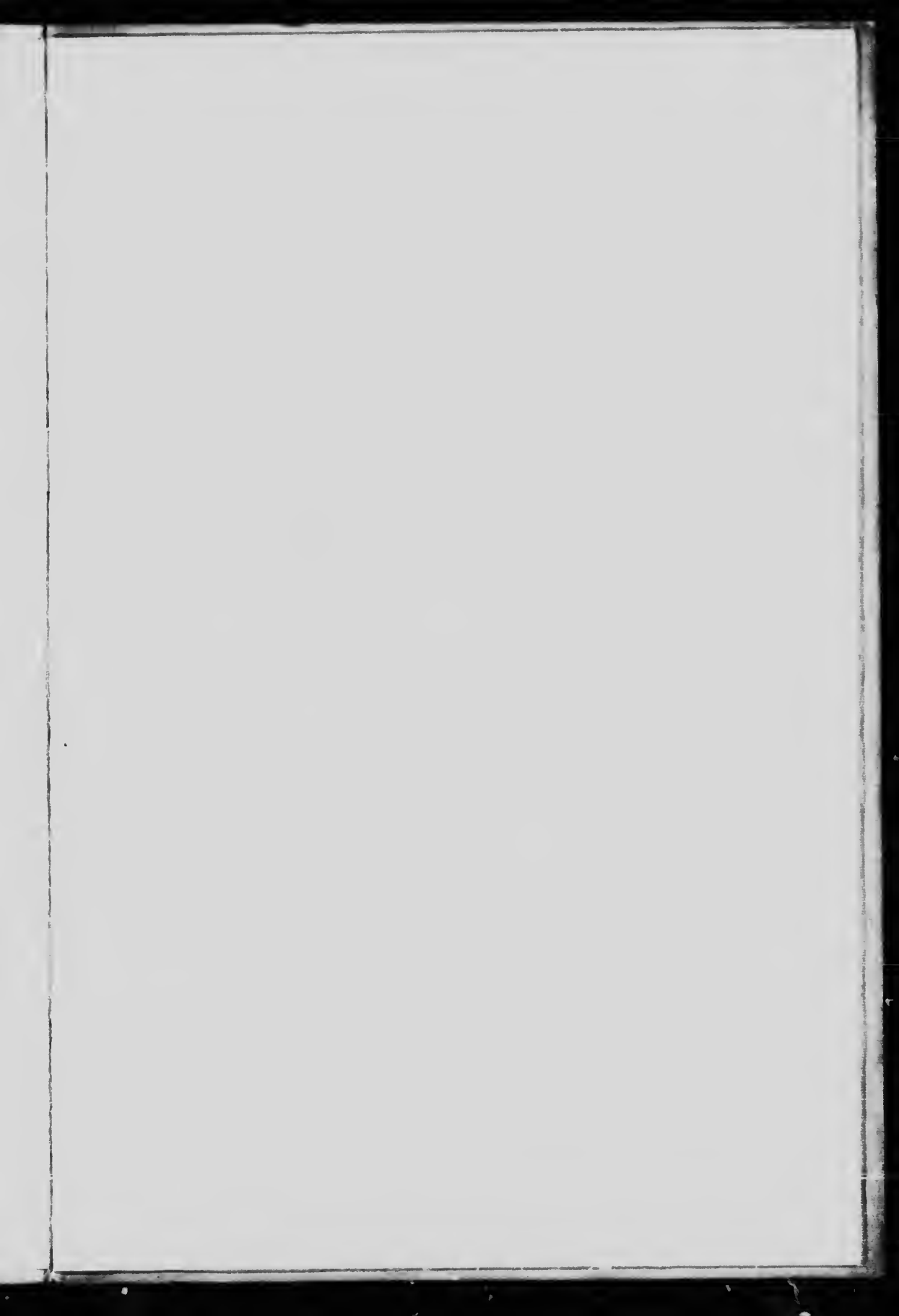
ENGINEERING

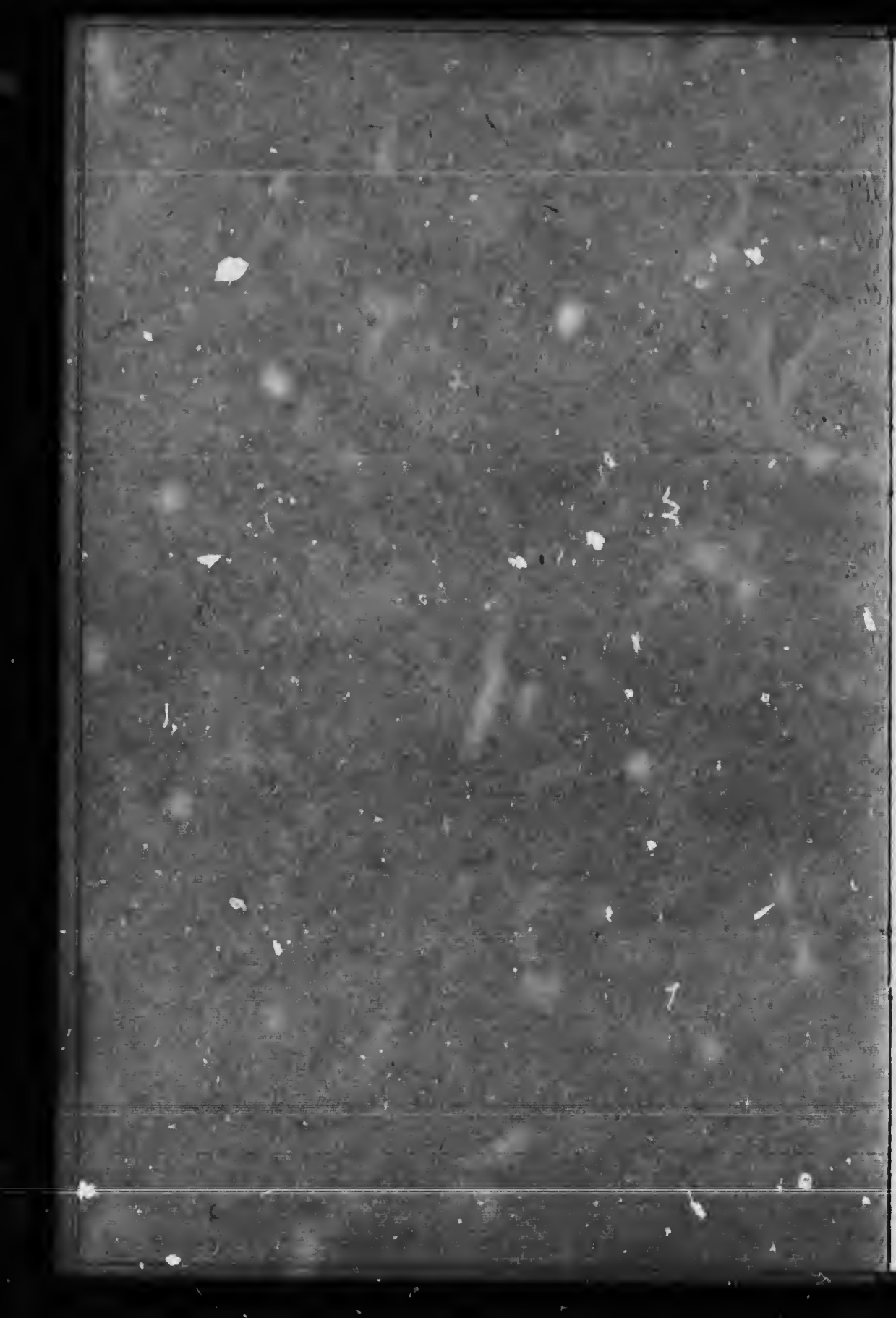
AND

CONSTRUCTION

NOTES









## FOREWORD

---

To the STEAM OR ELECTRIC RAILWAY EXECUTIVE

WHO MANUFACTURES TRANSPORTATION;

And needs repair shops, car barns, engine, freight and passenger terminals, yards, tracks, tunnels, bridges and docks.

To the CENTRAL STATION EXECUTIVE

WHO MANUFACTURES POWER AND LIGHT;

And needs power plants, transmission lines and sub-stations.

To the INDUSTRIAL EXECUTIVE

WHO MANUFACTURES GOODS;

And needs factories, warehouses and service facilities.

To the BANKER

WHO MANUFACTURES CREDIT;

And needs reports, valuations and estimates.

To the GENERAL BUSINESS MAN

WHO MANUFACTURES SERVICE;

And needs various types of counsel, buildings, plant and equipment.

We ask your consideration as ENGINEERS AND CONSTRUCTORS:

1. To furnish engineering counsel.
2. To prepare plans, designs, specifications and estimates.
3. To furnish, install and equip complete with our own forces the many structures and facilities that you use in the production of service, credit, goods, power and transportation.



Canadian Pacific Railway Company, Extension to Pier "D"  
Completed Pier.

The growth of modern engineering construction work has been founded on the principle of complete service, that is the doing at first hand by one organization of all, or practically all, the things needed for the production of a complete undertaking.

Coincidentally there have been evolved more flexible and effective contract arrangements between client and engineer constructor for the doing of work, the general aim being to centralize responsibility, to limit but assure profits, to reduce friction and misunderstanding and in general to substitute mutual co-operation for individual self interest.

The following pages describe work performed by this Company under the above mentioned methods.



Canadian Pacific Railway Company, Extension to Pier "D." General view during construction

## PIER "D" EXTENSION VANCOUVER, B.C.

---

A pier stretching hundreds of feet out into the water, each row of piles similar to the preceding row, looks like an easy thing to build. It is,—in spots. Other spots are difficult and the whole structure, which is incidentally one of the largest piers on the Pacific Coast, presented a variety of engineering problems.

In the first place the pier accommodates three distinct kinds of traffic, coastwise, trans-Pacific and miscellaneous cargo boats. This means that the facilities for handling different classes of passengers and freight differ materially.

Again, the Vancouver Harbor floor shelves off rapidly and is overlaid with soft material for a considerable depth. As a result to reach hardpan at the outer end of the pier, piles 130 ft. long had to be provided,—equivalent in height to a ten story or more building. Since water and mud offered no end or side support for the piles, it was first necessary to put in a fill on the pier site, the result being that the weight of the fill gradually displaced the soft mud and settled the fill over the hardpan. When equilibrium was reached, a small amount of fill representing the approximate weight of the pier and cargo itself was dredged off. Frequent soundings adjacent to and over the filled area showed what was taking place under water and when settlement of the fill had stopped pile driving was begun.

Another problem arose from the fact that Vancouver Harbor waters are full of teredo. All piles were therefore treated with creosote pressed into the outer surface after the sap and water had been boiled out. The greatest care was used to keep the creosoted protection intact after treatment and until the pile was driven into place.

Some of the longer piles after creosoting weighed several tons and their handling and driving required special equipment. Two floating drivers and one skid driver were used. About 3,000 piles were driven. The position of all piles was given by transit.



Canadian Pacific Railway Company, Extension to Pier "D".  
Showing continuous sliding doors on East side.

The caps, stringers and deck timber ran into many hundreds of thousands of feet and were given a creosote treatment somewhat lighter than the pile treatment, to prevent decay. These timber were barged alongside the dock and lifted into place by a travelling derrick which ran across the dock and which could be moved forward on its own rails, as the work progressed. (See page 4).

Pneumatic equipment for drilling holes, driving drift bolts and doing a variety of miscellaneous work was installed, gaining time and saving money.

The shed structure is of wood with 82 ft. centre trusses which were framed on the ground and then lifted complete into place. The roof is of laminated wood covered with three ply asbestos roofing. A promenade runs around its outer edge. The floor of the shed is of Australian hardwood.

A standard gauge railroad track on one side of the pier permits carload freight to be delivered direct alongside the boats, or to be unloaded direct from boat to car. As a minor problem it was necessary in order to install this track to cut out the existing supports of an entire corner of the pier superstructure and plaza, to crib this up and to substitute a new 75 ft. steel girder for the old support.

A depressed railroad track runs down the centre of the pier shed so that freight can be trucked directly from pier floor into the cars. To minimize fire hazard, no steam locomotive comes on the pier. A small problem was to get freight cars on and off the pier without a locomotive or the use of idlers. An electrically driven car haul does this work.

The equipment required to handle different classes of passengers and freight varies widely. Electric freight elevators running both vertically and also with aprons swinging in and out to reach the ships' side serve the coast boats. Long inclined slips adjustable to any height serve the miscellaneous cargo boats. Trans-Pacific freight is transferred ordinarily by the ships slings. To facilitate direct passage from boat to shed the wall on one side of the pier is made up of a succession of sliding doors overlapping each other and so arranged that any desired opening, both as to width and location, can be made by simply rolling the doors or in fact, the wall out of the way. (See page 6).

Coastwise passengers come and go over a combination of ramps and stairways. Trans-Pacific passengers are served by a three stage moving

platform which runs along the railroad track previously mentioned, and which can be set at any point and for any deck level. This device has since been widely copied. By these means passengers are kept entirely away from where cargo is being handled.

Electric lighting, motor equipment, water supply and fire protection, fuel oil lines, lift bridges over the depressed track, re-arrangement of old ramps, moving and reinstallation of old equipment and the building or re-building of offices, all introduced a great variety of problems.

The complete pier is about 950 ft. x 160 ft. A two story structure at the shore end houses the various ticket offices, waiting rooms, baggage rooms, customs offices, and offices for the operating departments of the shipping service.



## THE SYDNEY E. JUNKINS COMPANY LTD.

ROYAL ALEXANDRA HOTEL, - WINNIPEG

605 METROPOLITAN BUILDING, VANCOUVER



### CONTENTS OF PREVIOUS SERIES.

#### SERIES I.

THE DOMINION BANK, CALGARY

RAILWAY MAINTENANCE, KENORA, DIVISION





