The NX SYSTEM of ELECTRIC INTERLOCKING

BULLETIN
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• Foreword •

THE following pages describe the latest method of directing trains through terminals, junctions, crossings, and yards. It is a new concept in interlocking developed by this company and it marks a distinct era in this branch of railway signaling.

Interlocking has always been a major branch of railway signaling, especially power interlocking. Electric interlocking, one form of power interlocking, invented by the late John D. Taylor, was first installed at East Norwood, Ohio, on the Baltimore and Ohio Southwestern Railroad, in 1889. In 1900, a company was organized in Buffalo, New York, under the name of the Taylor Signal Company, to manufacture and to install electric interlocking. In 1904, through a merger, it became the General Railway Signal Company. The system of electric interlocking by both of these companies has had a remarkable growth, and Appendix A gives a list of some of the larger electric interlocking plants in this country and abroad.

Shortly after the introduction of Centralized Traffic Control (cTc) in 1927 by this company, the principle of cTc was applied to electric interlocking. This later system embodied the newer type of control machine. Such installations as Linndale, Dayton Union Terminal, and Cadorna are typical illustrations as listed with other similar plants in Appendix B.

The new system presented here and known as NX Electric Interlocking is the latest development of cTc as applied to Electric Interlocking, and is distinguished by its simplified method of operation.

The NX System of Electric Interlocking

The objectives of this new system of electric interlocking are:

To simplify the directing of trains.

To speed up operations.

To minimize the possibility of error in routing trains.

• The New Concept •

THIS NEW SYSTEM bears a marked resemblance to the individual-lever systems now in service on several roads. The one important departure, however, is in the method of setting up routes.

With the individual-lever system, the operator is obliged to analyze the route into specific functions, such as switches and signals. With the new system, advantage is taken of the fact that all routes in a terminal or junction have "entrances" and "exits." If the operator knows where a train is entering and leaving the plant, he has all the information necessary to direct that train by this ENTRANCE-EXIT System. The name ENTRANCE-EXIT, by way of explanation, has been abbreviated to NX, the first syllable of each of the words. This system, therefore, is referred to as "NX Electric Interlocking."

The operator's control board, Figure 1, is a replica of the track layout. At the "entrance" of every route is an "entrance knob," Figure 2. This knob is hol-

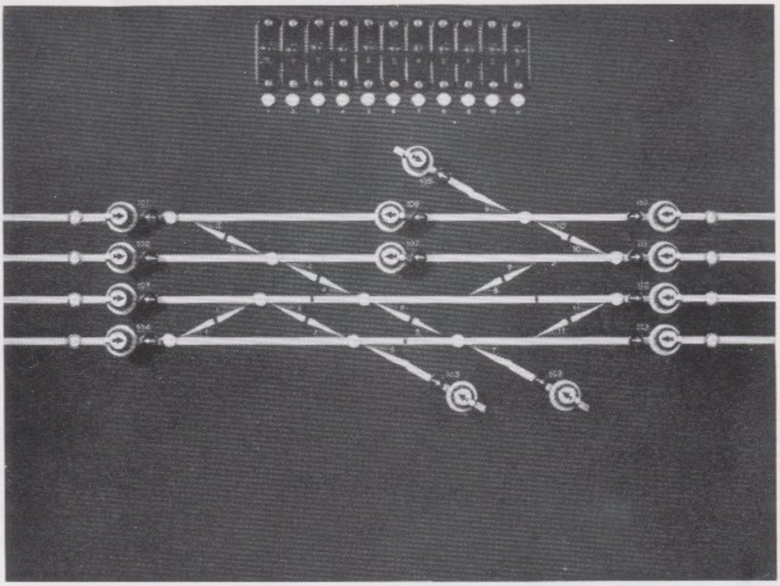


Figure 1. The Control Board

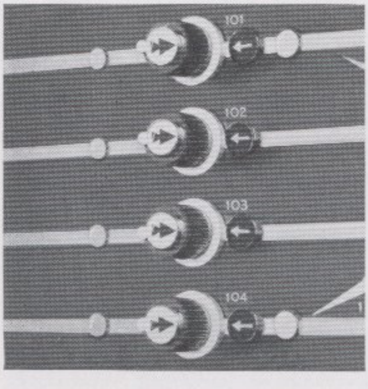


Figure 2.
The Entrance Knobs

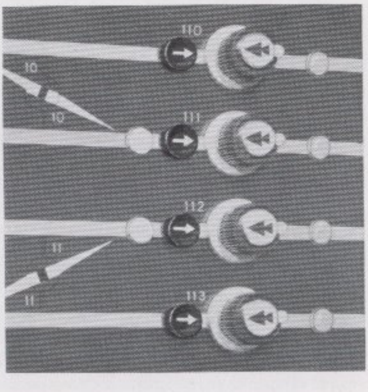


Figure 3.
The Exit Buttons

low, about the size of a quarter, and has a light inside, which illuminates an arrow when the signal clears for that route. The arrow is stationary and shows the direction in which the signal governs.

At the "exit" of every route, Figure 3, is an "exit button." This button, about the size of a dime, has an arrow etched on the surface, indicating the direction in which the train leaves.

At the approach of a train, the operator is informed in one way or another as to its point of entrance. On his control board, Figure 4, he turns the entrance knob at that point. The white marker is rotated upwards to clear a high- or medium-speed signal, downwards to clear a low-speed signal.

Knowing where he should direct the train, Figure 5, he pushes the exit button.

The rest is automatic. Immediately the route lines up. In the field, the switches automatically position themselves, and the signal clears. On the control board, Figure 6, the operator sees his point indicators outline the route. He receives indications that show the switches have operated into correspondence with the control, and have locked up;

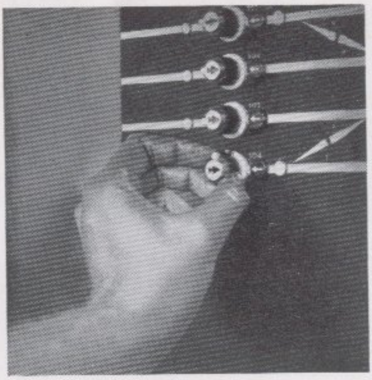


Figure 4.
The Operator Turns the Entrance Knob

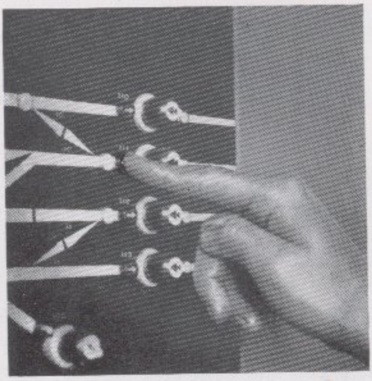


Figure 5.
The Operator Pushes the Exit Button

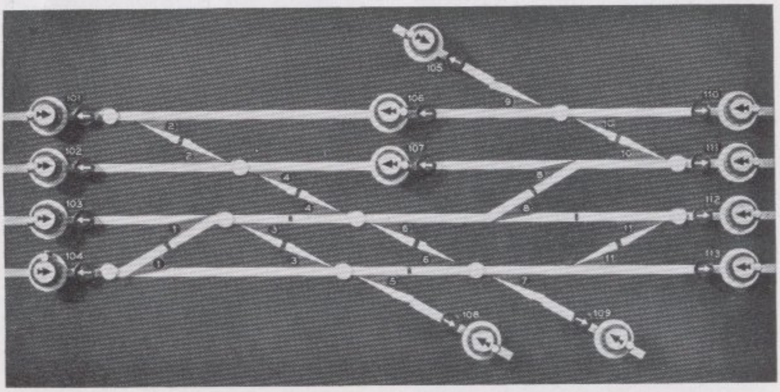


Figure 6. The Point Indicators Outline the Route

and he knows that the signal is clear, Figure 7, when the arrow in the entrance knob is illuminated.

Next, the operator watches the progress of the train through the plant by successive illumination of the track occupancy lights. He can tell at a glance, exactly where the trains are at any time in the control area.

If there are several routes which a train might take from entrance to exit, and another train or a set-up route is blocking the normal route, this system automatically choses a second route without any action on the part of the operator. Thus, for example, in Figure 8, there are two routes from "N" to "X." Assume the normal route is over crossover 6, but one end of the crossover is used by another train or a set-up route, the second route over crossover 3 is automatically chosen by the circuit organization.

Should the operator have to operate the switches one at a time for maintenance and adjustment, he can do so with the "test keys," Figure 9, provided on the control board.

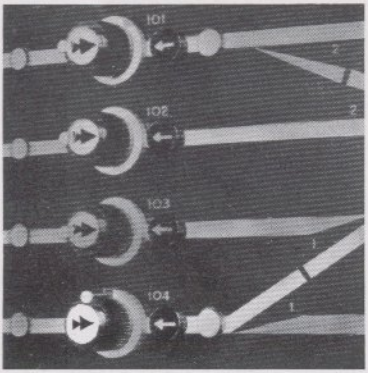
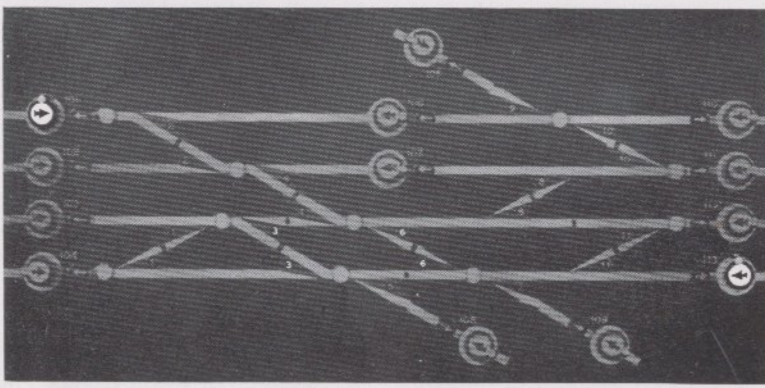


Figure 7.
When the Signal Clears the
Arrow Is Lighted

X



N

Figure 8. Optional Routes

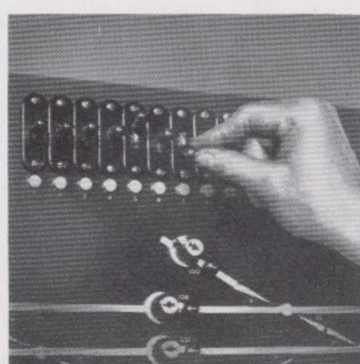


Figure 9.
Test Keys

What is Gained?

1. Simplicity of Operation:

(a) Since the operator can handle many more train movements, the control of a terminal can often be concentrated under one man. This naturally permits simple, smooth, and co-ordinated operation of the entire plant.

(b) The operator never has to think in terms of switches and signals. His sole concern is that of identifying routes by their "entrances" and "exits"; which is, after all, a basic conception.

(c) The operating picture, Figure 10, is so clear on the control board that no separate charts or diagrams are required.

2. Chances of Error in Routing are Reduced:

(a) A complete graphic picture of the track layout and of the conditions existing is always before the operator's eyes. The operator cannot make a mistake in routing unless he wrongly

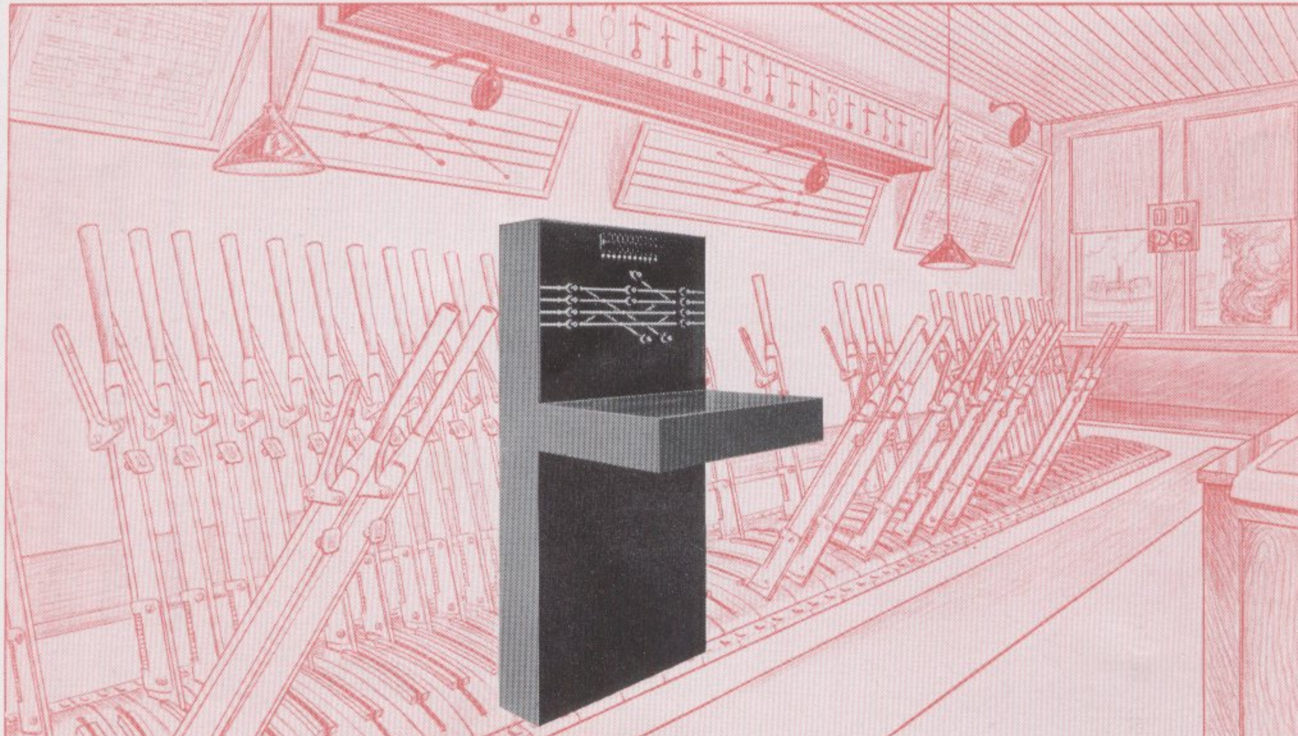


Figure 10. The Separate Charts, Indicators, and Diagrams Used with the Earlier Forms of Interlocking are Replaced by the Control Machine

identifies the "exit" of a route, which case is improbable.

(b) Conflicting routes cannot be set up. All the locking is done electrically; a "proceed" indication cannot be given unless the route is clear, properly lined up, and all conflicting signals are at "STOP."

(c) Every operating means is concentrated on the control board so that the operator can give his full attention to the operating details. Greater concentration of effort reduces the chances of error in routing the trains.

3. Operating Speed is Increased and Delays Avoided:

(a) The operator makes fewer movements to set up a route. Hence, the time of setting up the route is shorter. With earlier forms of interlocking, four or five switch levers may have to be positioned before the signal is cleared.

(b) The operator, with the earlier forms of interlocking, has to wait for the indication from the

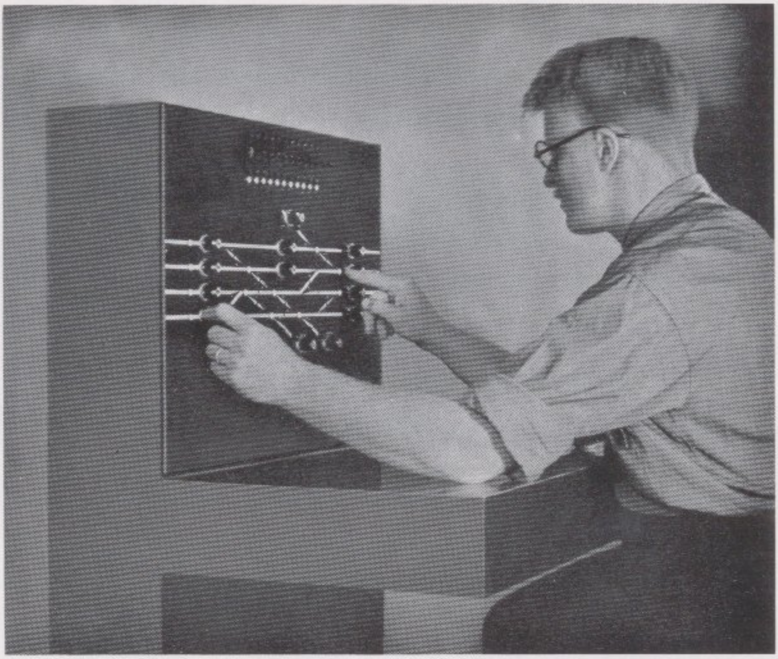


Figure 11. The Control Machine Is Compact

function to show that it has responded completely to his lever movement, before he can complete the lever stroke; all of which takes time. With the NX system the route is lined up instantaneously on the control board.

(c) The time lag, caused by the operator when he has to think of the route as "this switch reverse" and "that switch normal," is eliminated, all because the operator knows the route entrance and exit, and he associates these two facts with the entrance knob and exit button subconsciously.

4. An Operator is Easily Broken In:

(a) This system has considerable value in training new operators because the concept of "route entrance and exit" is fundamental. A novice can operate the control board after being shown only once how to set up a route.

(b) Once an operator is familiar with NX operation, he can be called upon, in times of emergency, to operate an NX Electric Interlocking plant anywhere.

5. The Control Machine is Compact and Complete:

(a) The control machine, Figure 11, is comparatively small. It can be installed in a small room, as there are no accessories such as manipulation charts and track diagrams.

(b) The control board is so complete in itself that the operator need never see a train from the time he enters the control room to the time he leaves. He has all the information he needs at his command.

From those railroad executives who are interested in facilitating train movements, in concentrating the control of an interlocking, and in speeding up operations at a busy terminal or junction, we invite correspondence and inquiries through our nearest District Office.

DISTRICT OFFICES

NEW YORK OFFICE
230 Park Avenue, New York, New York

CHICAGO OFFICE
421 Peoples Gas Building, 122 South Michigan Avenue
Chicago, Illinois

ST. LOUIS OFFICE
2044 Railway Exchange Building, 611 Olive Street
St. Louis, Missouri

AFFILIATED COMPANIES' OFFICES

Sidney
AUSTRALIA

Tientsin
CHINA

London
ENGLAND

Singapore
FEDERATED MALAY STATES

Paris
FRANCE

Calcutta
INDIA

Bologna
ITALY

Tokyo
JAPAN

Stockholm
SWEDEN

Wellington
NEW ZEALAND

Oslo
NORWAY

Cape Town
SOUTH AFRICA

Buenos Aires
SOUTH AMERICA

• Appendix "A" •

The following is a list of some of the larger Electric Interlocking installations designed and manufactured by the General Railway Signal Company:

ATCHISON, TOPEKA AND SANTA FE RAILWAY—Tower "A", Fort Worth, Texas; Mission St., Los Angeles, Cal.; San Bernardino, Cal.

ATLANTA JOINT TERMINALS—Tower "A", Atlanta, Ga.; Tower "B", Atlanta, Ga.

BALTIMORE AND OHIO RAILROAD—12th St., Washington, D. C.; Rhode Island Ave., Washington, D. C.

BIRMINGHAM TERMINAL—Tower "N", Birmingham, Ala.; Tower "S", Birmingham, Ala.

BOSTON AND ALBANY RAILROAD—Boylston St., Boston, Mass.; Allston, Mass.; Springfield, Mass.

CANADIAN PACIFIC RAILWAY—Windsor St. Terminal, Montreal, Que.

CENTRAL OF GEORGIA RAILWAY—Macon Jct., Ga.

CHATTANOOGA UNION STA. CO.—Chattanooga, Tenn.

CHICAGO AND ALTON RAILROAD—Corwith, Ill.

CHICAGO AND NORTH WESTERN RAILWAY COMPANY—Kedzie Ave., Chicago, Ill.; Clinton St., Chicago, Ill.; Lake St., Chicago, Ill.; Division St., Chicago, Ill.; 74th St., Chicago, Ill.; Canal Jct., Ill.; Washington St., Milwaukee, Wis.

CHICAGO, BURLINGTON AND QUINCY RAILROAD—Lincoln, Nebr.; Aurora, Ill; Union St., Chicago, Ill.; Galesburg, Ill.

CHICAGO, ROCK ISLAND AND PACIFIC RAILWAY—So. Englewood, Ill.; Joliet, Ill.

CLEVELAND, CINCINNATI, CHICAGO AND ST. LOUIS RAILWAY—Pana, Ill.

CLEVELAND UNION TERMINALS COMPANY—Cleveland, Ohio

DENVER UNION TERMINAL COMPANY—Tower "A", Denver, Colo.; Tower "B", Denver, Colo.

ERIE RAILROAD—Binghamton, N. Y.

HOUSTON BELT AND TERMINAL RAILWAY—Houston, Texas

Appendix "A"—Continued

ILLINOIS CENTRAL SYSTEM—16th St., Chicago, Ill.; 67th St., Chicago, Ill.; Randolph St., Chicago, Ill.; Richton, Ill.

LEHIGH VALLEY RAILROAD—Buffalo Terminal, N. Y.; Musconetcong Tunnel, N. J.; Union St., Allentown, Pa.; So. Bethlehem, Pa.

MICHIGAN CENTRAL RAILROAD—West Detroit, Mich.; 15th St., Detroit, Mich.; 20th St., Detroit, Mich.

MADRID, ZARAGOZA AND ALICANTE RAILWAY—Mora, Spain

NASHVILLE, CHATTANOOGA AND ST. LOUIS RAILWAY—Aulon, Tenn.

NEW SOUTH WALES—Meeks Road Jct.

NEW YORK CENTRAL SYSTEM—Tower "A", Grand Central Terminal, New York, N. Y.; Tower "B", Grand Central Terminal, New York, N. Y.; Tower "C", Grand Central Terminal, New York, N. Y.; Tower "D", Grand Central Terminal, New York, N. Y.; Tower "V", Grand Central Terminal, New York, N. Y.; Tower "D", Spuyten Duyvil, New York, N. Y.; Tower "HM", Harmon, N. Y.; Utica, N. Y.; Croton River, N. Y.; Suspension Bridge, N. Y.; Tower 47, Buffalo, N. Y.; Rochester, N. Y.; SS 48, Buffalo, N. Y.; SS 49, Buffalo, N. Y.; MO Tower, Mott Haven, N. Y.; 16th and Clark Sts., Chicago, Ill.; Toledo, Ohio; Clark Jct., Ind.; Indiana Harbor Draw, Ind.; Ashtabula, Ohio; Tower "A", Sandusky, Ohio; Stanley Tower, Ohio; Berea, Ohio; Collinwood, Ohio; South Bend, Ind.

NEW YORK CITY, BOARD OF TRANSPORTATION—Concourse Yard, New York, N. Y.

NEW YORK RAPID TRANSIT CORPORATION—8th Ave. and 38th St., New York, N. Y.; Tower "B", New York, N. Y.; Tower "B", Coney Island Yard, N. Y.

PENNSYLVANIA RAILROAD—Willows, Ill.; Ford St., Chicago, Ill.

SOUTH AUSTRALIAN—Adelaide Station, Australia

SOUTH EASTERN AND CHATHAM—Victoria Station, London, England.

TERMINAL RAILROAD ASSOCIATION OF ST. LOUIS—Relay Station, East St. Louis, Ill.; No. Market St., St. Louis, Mo.; Valley Jct., Ill.

TEXAS AND PACIFIC RAILWAY—Fort Worth, Texas

TORONTO TERMINALS RAILWAY COMPANY—Cherry St., Toronto, Ont.; Scott St., Toronto, Ont.; John St., Toronto, Ont.

UNION PACIFIC RAILROAD—Tower "A", Omaha, Nebr.; Tower "B", Omaha, Nebr.

• Appendix "B" •

The following is a list of the larger Electric Interlocking installations, using the cTc type of control, as designed and manufactured by the General Railway Signal Company:

Boston and Albany Railroad
- Brookline Junction, Mass.
- West Pittsfield, Mass.

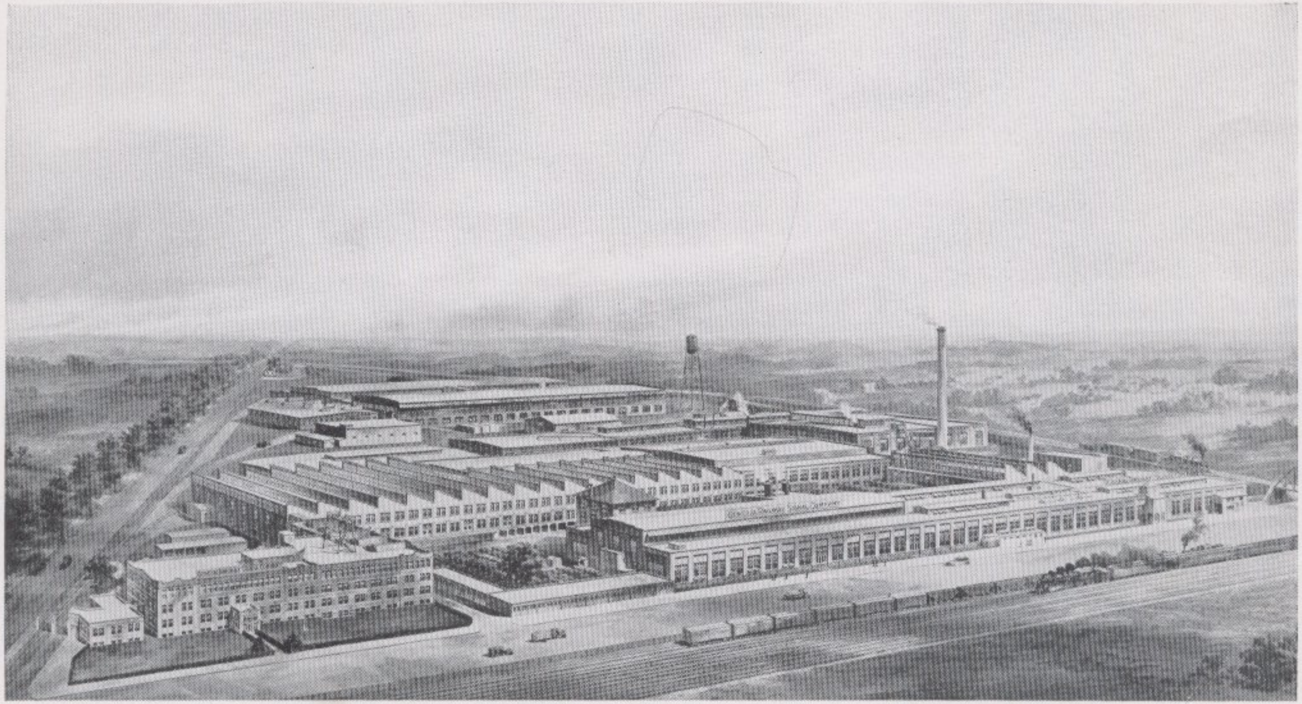
Canadian Pacific Railway
- Cadorna, Que.
- Trois Rivieres, Que.

Cleveland, Cincinnati, Chicago and St. Louis Railway
- 65th St., Cleveland, Ohio
- Linndale, Ohio

Dayton Union Terminal Company
- Dayton, Ohio

Madrid Metro
- Sol II

New York Central Railroad
- Syracuse Station



Works of the General Railway Signal Company, Rochester, N. Y.

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