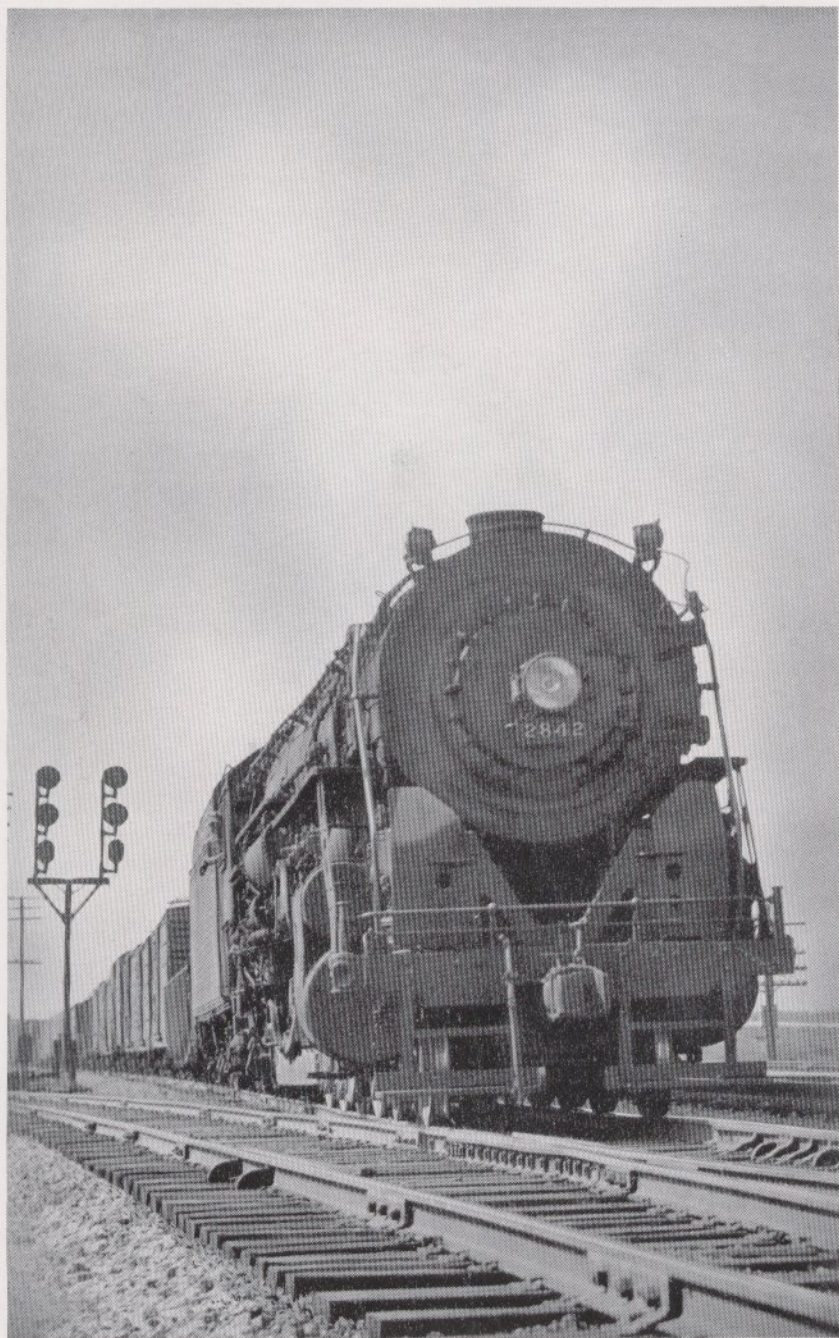


SPEED and SIMPLICITY **in Train Directing**



Bulletin 172





Eastbound New York Central freight on Track 4 entering
Girard Junction interlocking.

SPEED and SIMPLICITY in Train Directing



FIRST **NX** (E**N**TRANCE E**X**IT) INTERLOCKING IN U. S. A.

BULLETIN 172

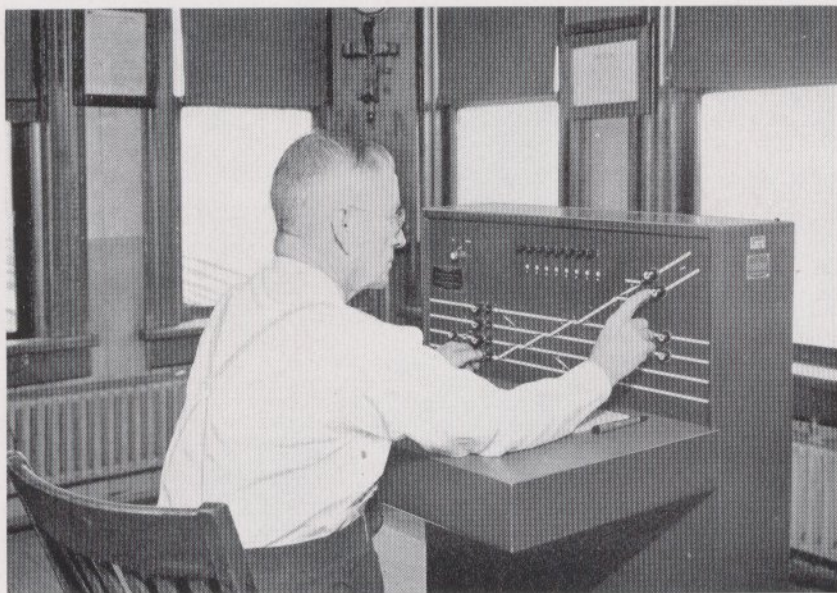
NOVEMBER, 1937

Reprinted November, 1942

GENERAL RAILWAY SIGNAL COMPANY

ROCHESTER, NEW YORK

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General Railway
Signal Company
Rochester, N. Y.



Operator lining up a route from Track 3 to Track 5 on NX control machine.

Printed in U. S. A.

FOREWORD

March 12, 1936 . . . NX (Entrance-Exit) Interlocking was introduced by the General Railway Signal Company to the railroad world. Within a year, work on several important NX installations was begun. (Railway Age, March 12 and 14, 1936 pp. 477-478—Railway Signaling March, 1936 pp. 155-156.)

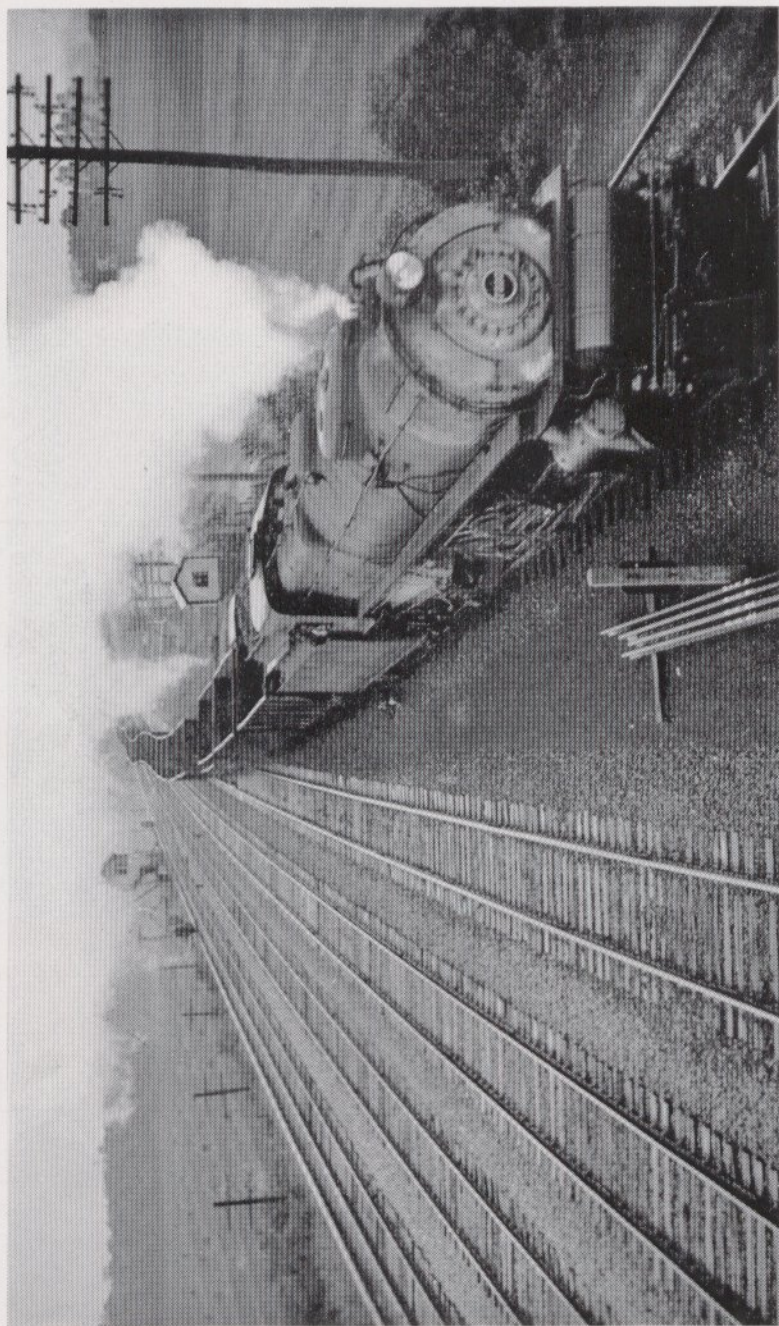
September 23, 1937 . . . the first NX installation to be completed in the United States* was put in service at eight a.m. at Girard Junction, Pennsylvania, on the New York Central System.



*Historically, Brunswick, England was the first NX installation in the world, in service on the Cheshire Lines February 28, 1937. Materials and engineering were furnished by General Railway Signal Company Limited of London, England. (Railway Gazette, April 2, 1937 pp. 656-658.)

NX 7 **NX**

The
NX
SYSTEM
OF ELECTRIC
INTERLOCKING



Southbound Pennsylvania freight crossing over from Track 3 to Track 5.

THE LAYOUT



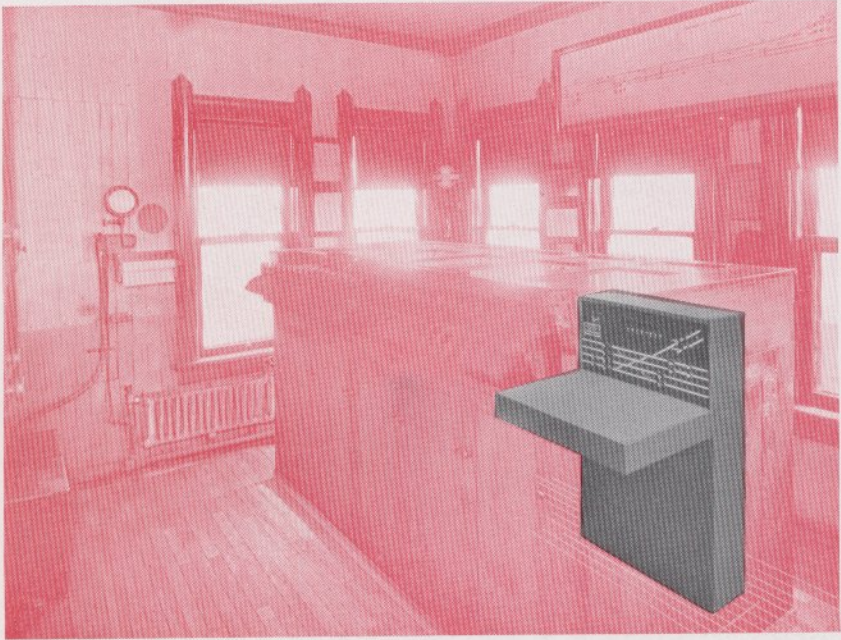
The track layout at Girard Junction.

About seventeen miles west of Erie, Pennsylvania is Girard Junction, where the Pennsylvania Railroad, from the south, joins the four-track main line of the New York Central System. Through this junction passes most of the passenger and freight traffic between Buffalo, New York, and Cleveland, Ohio, and the coal and ore traffic from the south over the Pennsylvania Railroad branch line. Practically all main line movements are at high speed through this plant.

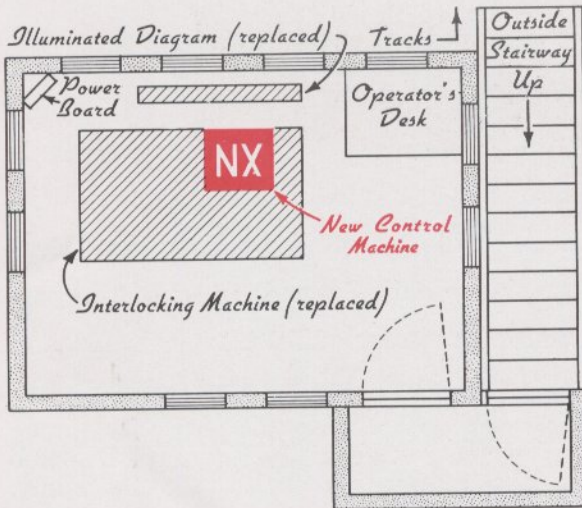
NX 9 **NX**

The
NX
SYSTEM
of ELECTRIC
INTERLOCKING

THE TOWER

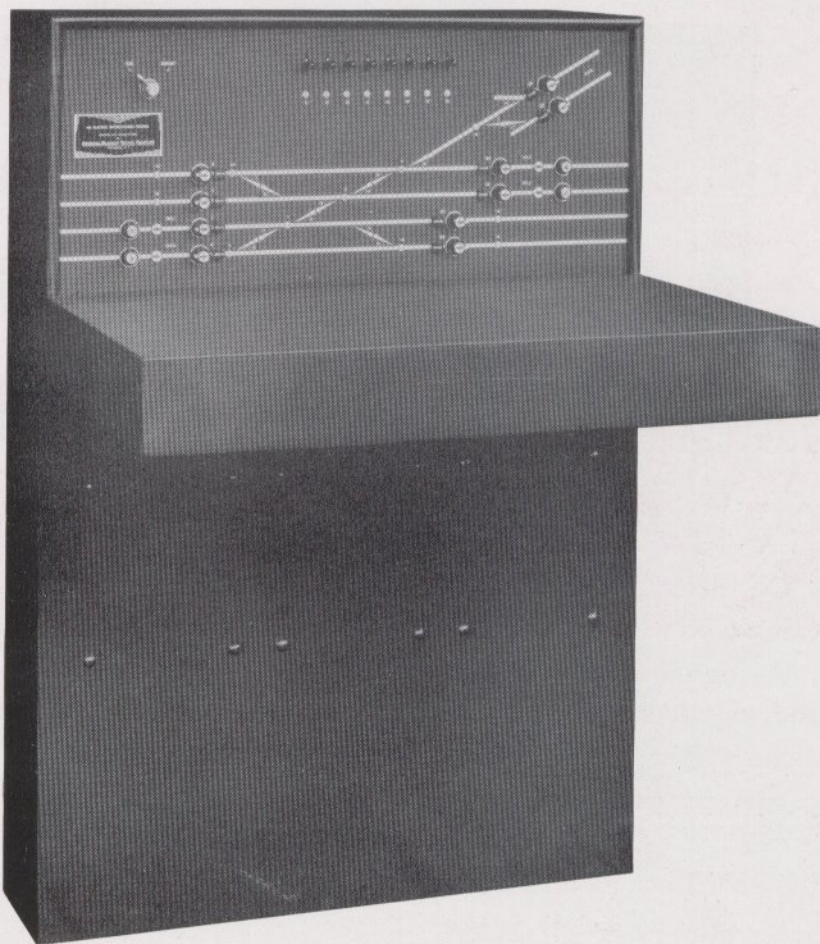


An obsolete interlocking machine is replaced by the new control machine taking one-sixth the floor area.



Plan view of tower showing relative size of new NX Control Machine.

THE CONTROL MACHINE



The control machine is compact.

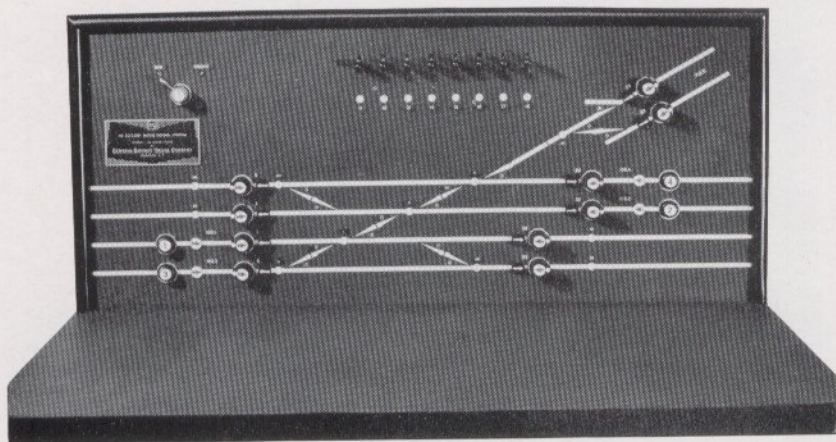
The entire plant is controlled by an operator seated at a control machine. This machine is a sheet metal cabinet, shaped like a desk, on which is mounted a control board.

The machine is 43 inches high, 29 inches wide, and 26 inches deep, which includes the desk. The control board is 13 inches high and 29 inches wide.

NX 11 **NX**

The
NX
SYSTEM
OF ELECTRIC
INTERLOCKING

THE CONTROL BOARD



The control board is easy on the eyes.

On the control board is the track diagram, resembling the track layout. On the diagram, at the *entrance* and *exit* of every possible route through the plant, are *entrance knobs* and *exit buttons* respectively. Besides these, there are indicator lights and test keys which are explained later.

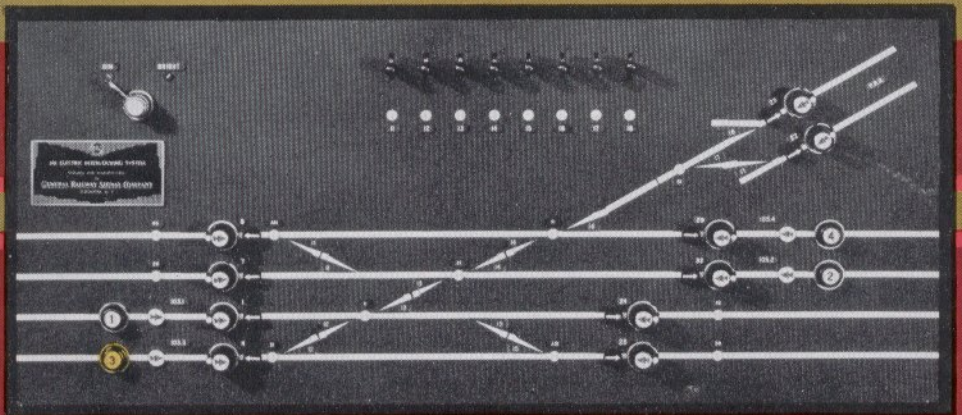
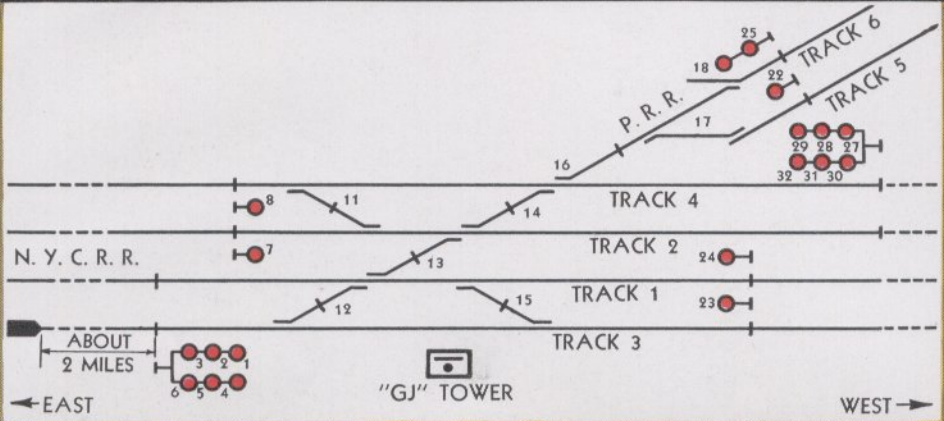
The control board is designed for eye-comfort, all unnecessary lights and glare being eliminated. The surface of the board has a soft, satin-like finish.

A dimming switch is provided on the board for changing the intensity of the indicator lights to suit the operator.

HOW A TRAIN IS DIRECTED

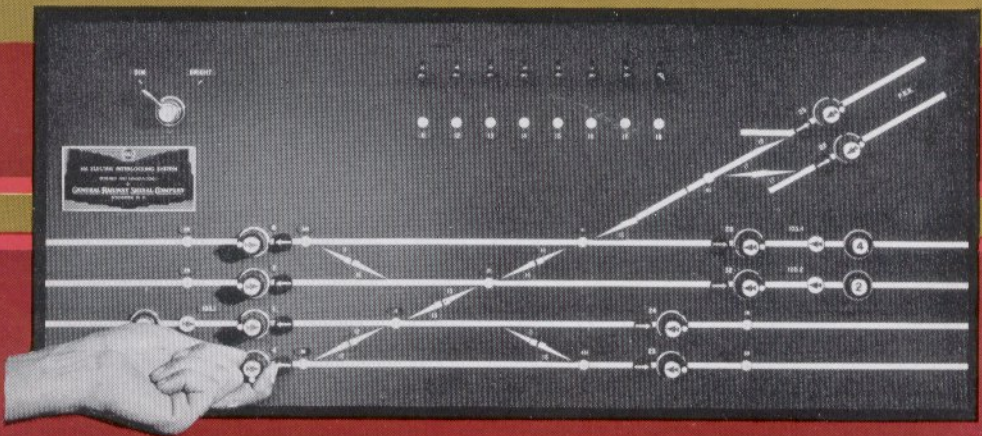
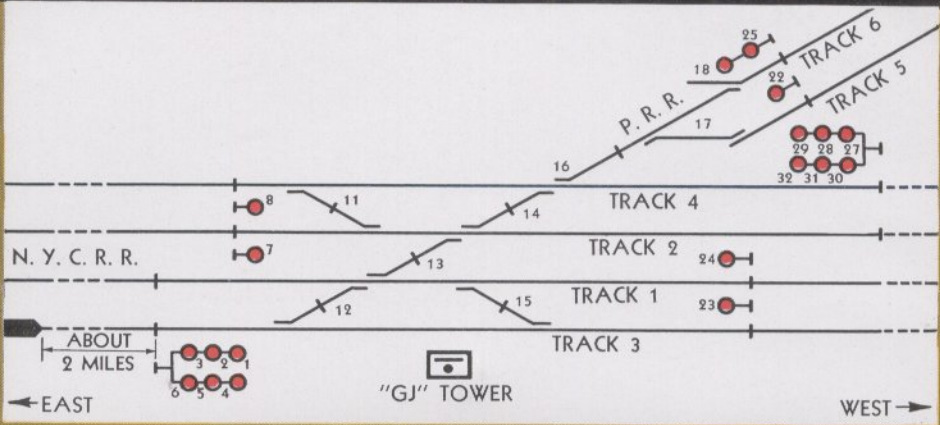
The following pages describe how the operator lines up a route and how information is displayed on the control board for the use of the operator.

THE TRAIN APPROACHES



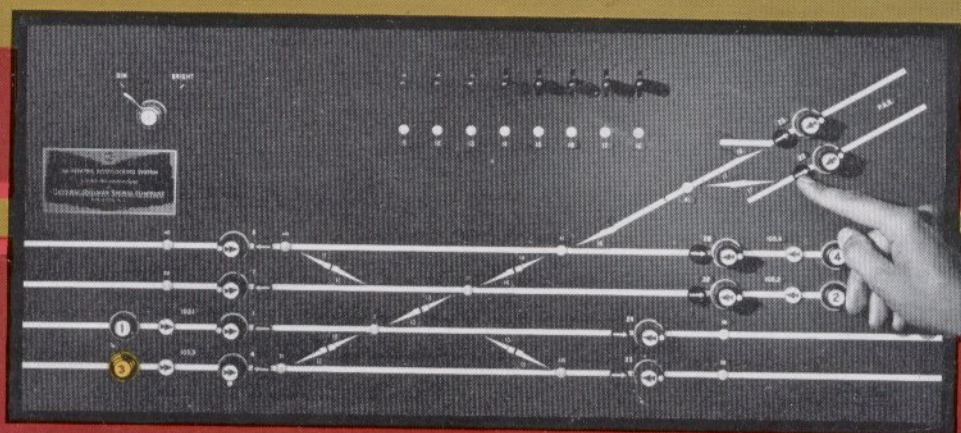
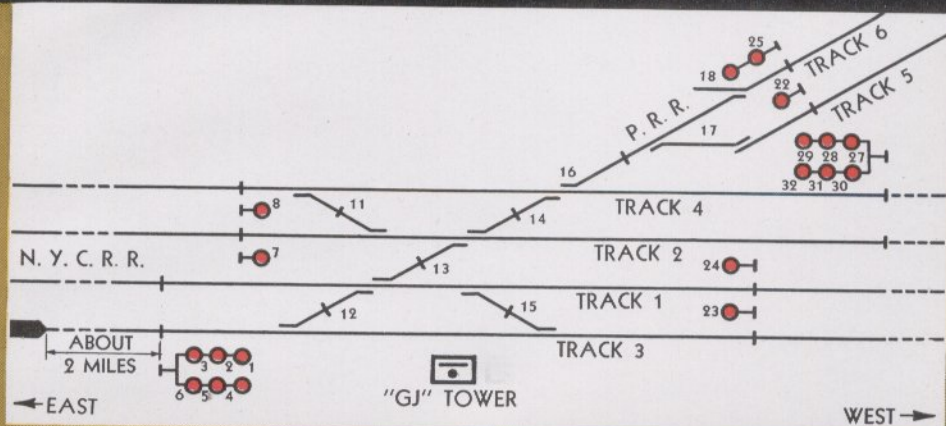
A train is approaching Girard Junction from the east on Track 3. It lights up the approach indicator. By telephone from the dispatcher the operator has received information that he must direct this train out of the plant on Track 5, south over the Pennsylvania tracks.

THE OPERATOR TURNS THE ENTRANCE KNOB



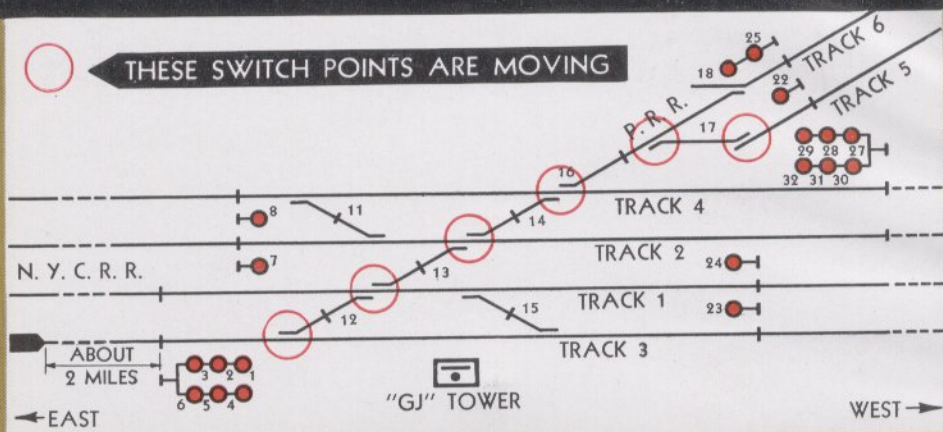
He turns the **entrance knob** corresponding with the point where the train will **enter** the controlled area. This act is known as route "initiation."

AND PUSHES THE EXIT BUTTON

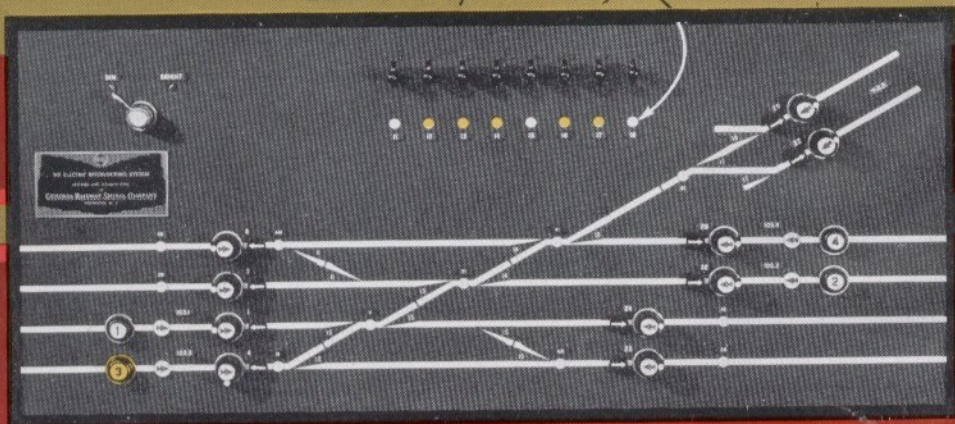


He pushes the **exit button** corresponding with the point where the train will **leave** the controlled area. This act is known as route "completion."

THE ROUTE INDICATORS LINE UP



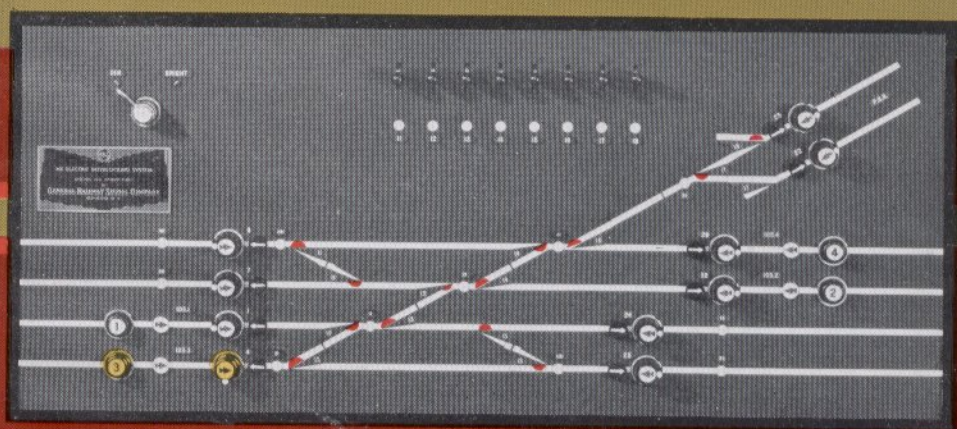
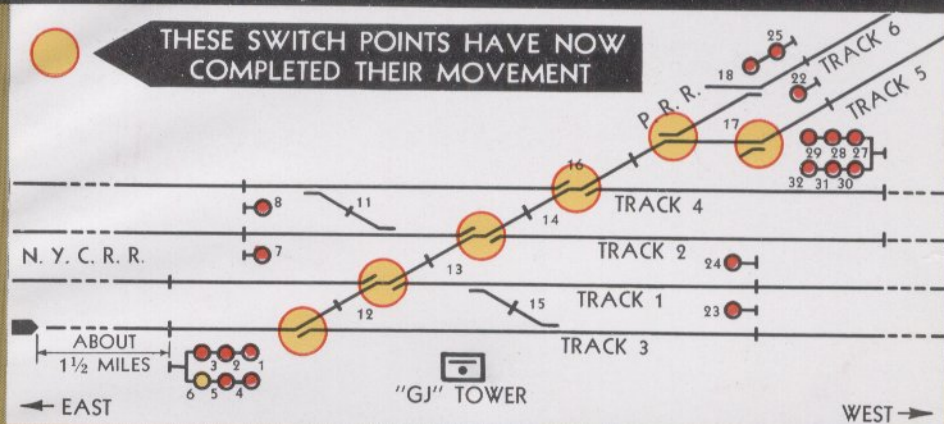
Switch-Correspondence Lights



The route indicators snap into position, thus producing a vivid picture of the route called for. Without any further action on the part of the operator, the switch points begin their movement.

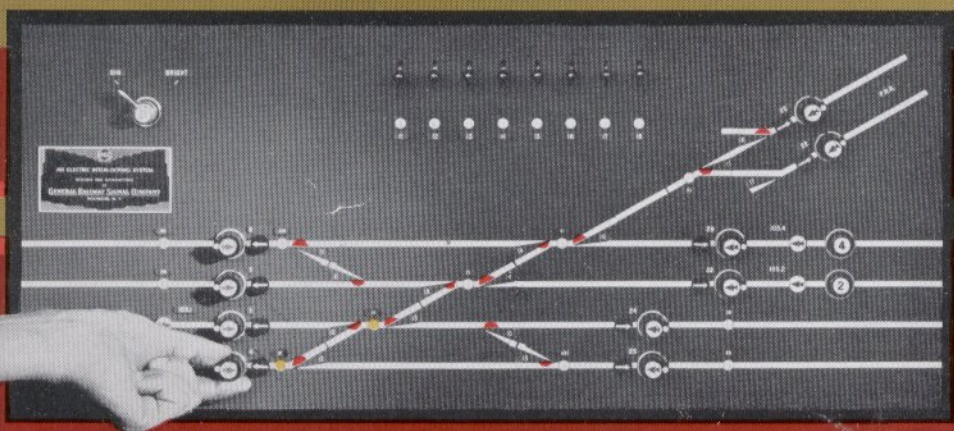
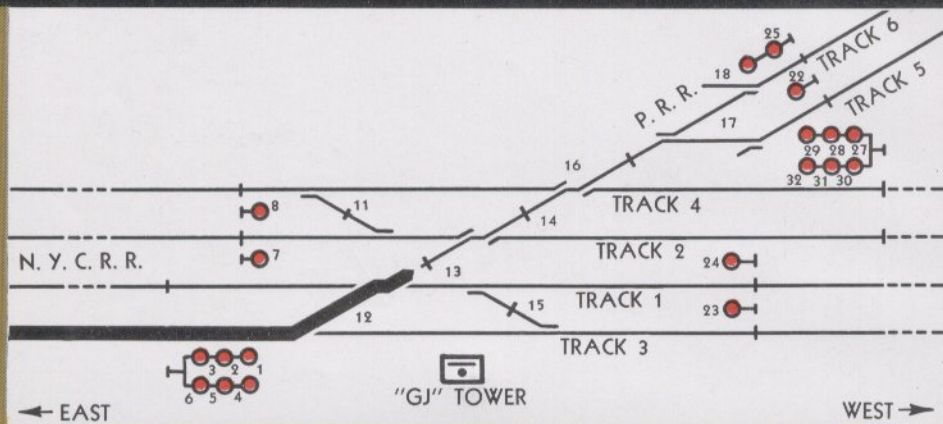
While the switches are moving into correspondence with their control, their respective correspondence lights are lighted.

THE SIGNAL CLEARS



After the switch points have completed their movement, the signal clears. The operator is informed of this by a light in the entrance knob. Small red lights, called "lock lights," associated with the route indicators, appear, indicating those switches which are locked.

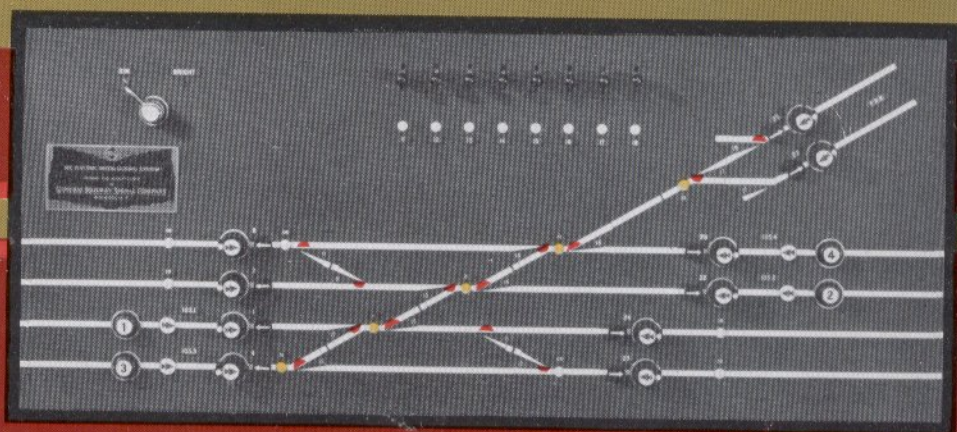
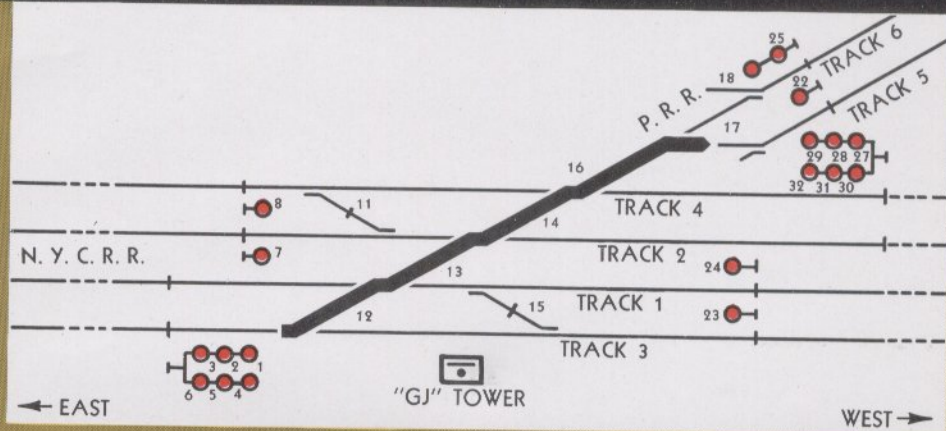
THE TRAIN ACCEPTS THE SIGNAL



If the operator wishes to hold the route for a following train, he leaves the entrance knob in its turned position.

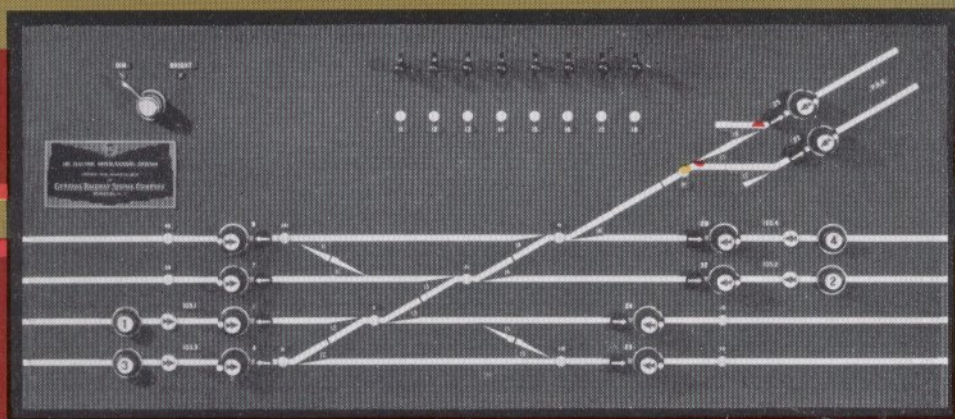
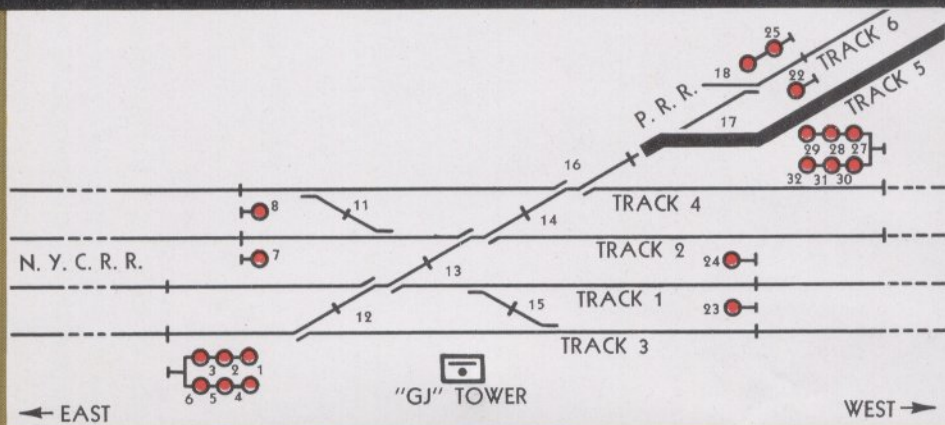
If the operator wishes to restore the route after the train has left, he turns the entrance knob back to its normal position as shown. This sets the signal to **stop**, thus extinguishing the light in the entrance knob.

THE LIGHTS SHOW THE TRAIN MOVEMENT



Successive illumination of the track-occupancy lights indicates the movement of the train through the plant.

THE ROUTE IS RELEASED BY SECTIONS



If the operator manually restores the route (by turning the entrance knob back to normal), the red lock lights are extinguished as the rear of the train leaves the successive sections of the route. This indicates that the switches in these sections are unlocked and that the operator is free to set up new routes over them.

THE NX QUESTION BOX

1. How can the operator choose between the giving of a low-speed signal, such as a "call-on" signal, and a high- or medium-speed signal with the one entrance knob, without any additional units on the control board?



If the operator wishes to give a *low-speed* signal, he turns the entrance knob so that the white marker on the knob is in the position *below* the knob.

If the operator wishes to give a *medium-* or *high-speed* signal, he turns the entrance knob so that the white marker on the knob is in the position *above* the knob.



2. Why must the operator manually restore the route by turning the entrance knob back to its normal position? Why was no provision made to let the train automatically restore the route?



At Girard Junction the operating conditions are such that it is usually desirable to leave routes lined up for following trains. Turning the entrance knob provides this facility.

3. Can you make the train automatically restore the route?

Yes; under many operating conditions it is very desirable to provide automatic route restoration. When it is provided, the operator has only to *push* the entrance knob (instead of turning it) and then push the exit button. The train automatically restores the route.



4. Can you have both automatic and manual route restoration?

Yes; and it is done with the same entrance knob, thus not requiring any additional units on the control board. If the operator desires *automatic* route restoration he *pushes* the entrance knob and the exit button. If he desires *manual* route restoration he *turns* the entrance knob and pushes the exit button.

The entrance knob is so arranged that the operator cannot both turn and push it at the same time.

5. Suppose the operator *turns* the wrong entrance knob or pushes the wrong exit button. What must he do to cancel the route?



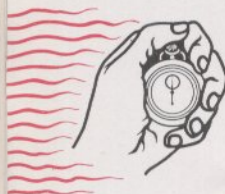
He simply *turns* the entrance knob back to normal, and starts anew.

6. Suppose the operator *pushes* the wrong entrance knob or exit button. What must he do to cancel the route?



He simply *pulls* the entrance knob, releases it, and starts anew.

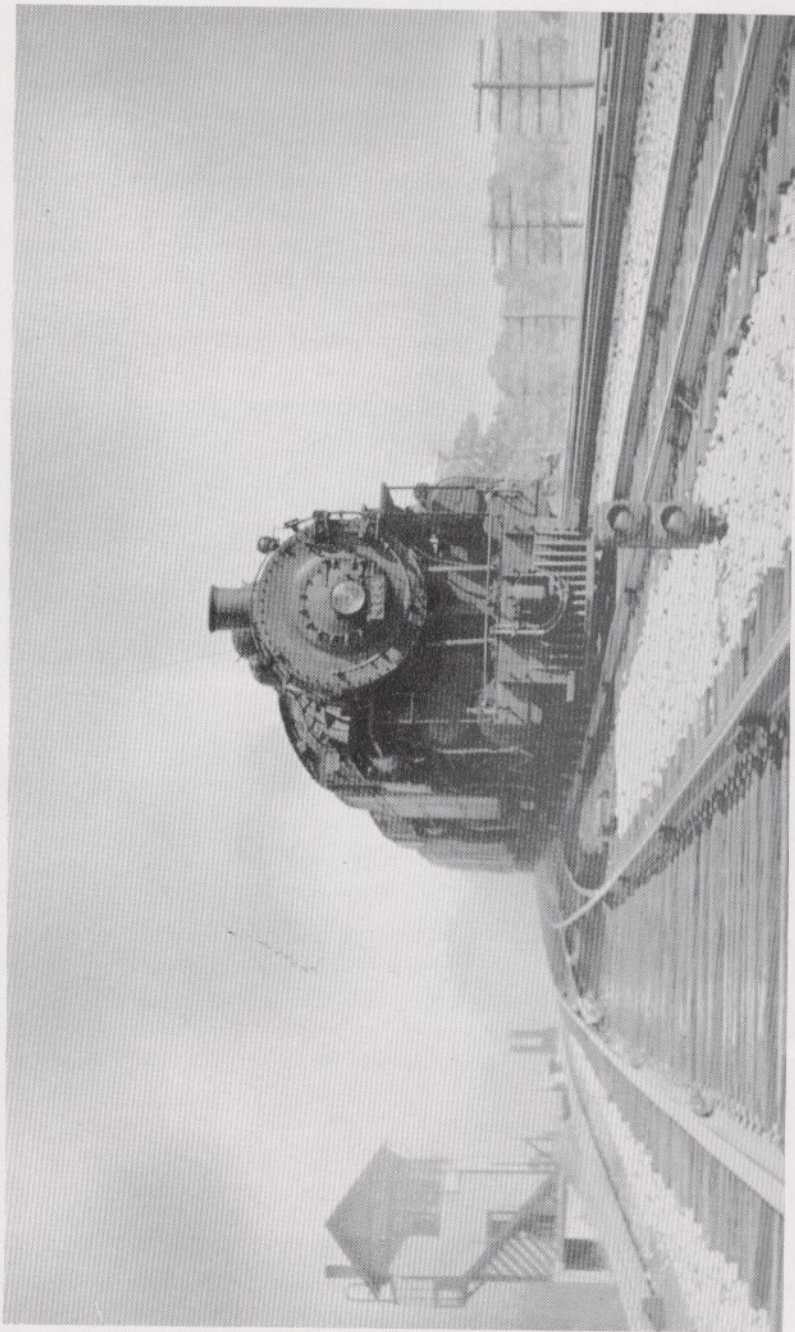
7. Is there any particular time interval that the operator must observe from the time he operates the entrance knob to the time he operates the exit button?



No timing is necessary.

8. Must the operator observe the sequence of operating the entrance knob first and then the exit button?

No; operation does not depend upon sequence. He may even push the exit button and hold it in until after he has operated the entrance knob. It is natural and logical, however, that he form the habit of operating the entrance knob first and then the exit button.

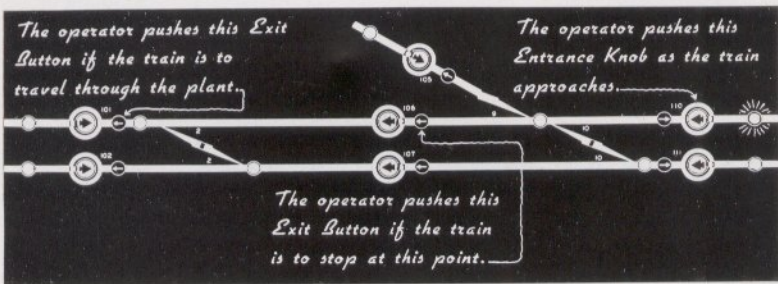


Westbound New York Central passenger on Track 1. Girard Junction tower in left background.

9. Suppose there are one or more intermediate signals in a route with their corresponding entrance knobs and exit buttons. Must the operator operate them all to set up a route from end to end?

No; provision may be made so that the operator merely operates the entrance knob at the entrance to the route and the exit button at the end of the route. He may, however, complete the route at any intermediate signal by operating the exit button at the corresponding point.

At Girard Junction there are no intermediate signals.

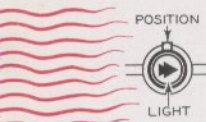


10. How does the operator know that he has initiated a route, and that the signal is clear?

At Girard Junction the initiated condition is disclosed by the position of the entrance knob. The light in the entrance knob lights when the signal clears.

Provision may be made so that the light in the entrance knob flashes as soon as the operator initiates, and becomes steady when the signal clears.

Or, two colors of light may be projected from the entrance knob, one to indicate the initiated condition, the other that the signal is clear.



11. Do you have any other means for indicating the route other than by means of the movable route indicators?

Yes; we can provide "Line-o-Lite" or "Points-o-Lite." In either case the line or succession of points of light indicates the route set up. These lights are made to change color as the train travels

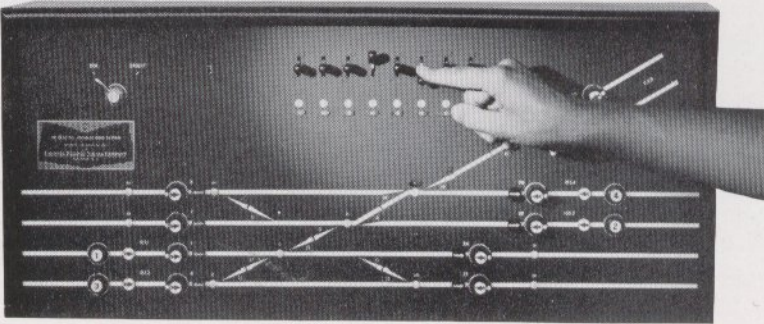
over the route, going out as the route is restored. In the line or points of light, the light associated with a switch is made to flash while the switch is moving into the position corresponding with the route, becoming steady when the switch operates into correspondence.

12. Can the operator control the switches individually?

Yes; "test keys" are provided on the control board to enable the operator to control the switches individually, as he may desire to do under special conditions. Since they are not commonly used, they need not be associated closely with their respective switches.

The operator cannot move a switch with its test key if there is a route lined up over it.

It is an interesting fact that the operator may line up a route or a part of a route by means of the test keys. He may then clear the signal by operating the entrance knob and the exit button, but the route called for must be in accordance with the positions of the switches as determined by the test keys.



Test key manipulation.

13. How can the operator tell if the switches are in correspondence with their control?

A switch-correspondence light is provided on the control board beneath each test key. This is lighted whenever the switch is out of correspondence with the position called for by the route lined up or by the operation of the test key.



14. Are the red lights, which are associated with the movable route indicators, intended as supplemental route indications?

No; these red lights are called "lock lights," and are lighted whenever their respective switches are locked, i.e., when they cannot be moved.



This accounts for the fact that the red lights in two crossovers and a derail (as shown in the folded insert) are lighted although they are not in the route. They are actually locked, in that they cannot be moved either by a route called for over them or by the operation of their test keys.

15. When are the lock lights illuminated?

At Girard Junction the lock lights are illuminated when the signal clears, thus indicating the electric locking of the switches.

It is also possible, and in many cases desirable, to illuminate the lock lights as soon as position of their respective switches is called for either by a route set up over them or by the operation of the test keys, rather than wait until the signal clears. The lock lights, in this case, indicate the equivalent of mechanical locking of the switches, as well as the electric locking.

16. Suppose there are two or more possible routes between an entrance point and an exit point. How can the system be depended upon to select between them?

The matter of optional routes is considered when designing the plant. That is to say, an order of preference is established between the possible routes. There may be even more than two options, and the preferred route in one direction may differ from that in the other direction.

Thus, when initiation and completion take place, the system automatically selects the preferred route if it is available. If the preferred route is obstructed, as by another route set up over a portion of this preferred route, or by a train which is traveling over a portion of this preferred route, the system automatically selects the next best available route.

If the operator wishes to use an optional rather than the preferred route, he places an artificial obstruction, as it were, in the preferred route by operating a test key so as to call for a switch position not consistent with the preferred route, but which is consistent with the desired optional route.



NX reduces train stops and delays.

NX 19 **NX**

The
NX
SYSTEM
OF ELECTRIC
INTERLOCKING

NX ADVANTAGES

NX Is Simple

The entrance-exit principle, on which NX is based, is fundamental. This is the first concept an operator has when lining up a route with any system. But with NX he need not break down this simple route concept into switches and signals. This greatly simplifies operation.

The control board is easy to understand and simple to operate. There are no separate charts or diagrams, hence a simplified operating picture.

To set up any route demands the minimum of physical and mental effort. The operator can do more with less fatigue, he can handle a large plant with all the speed, smoothness, and coordination that characterizes modern operation.

Because of its simplicity this system has considerable value in the training of new operators. A novice can operate NX after being shown only once how to set up a route. When an operator is familiar with NX operation, he can be called upon, in times of emergency, to operate an NX plant anywhere.

NX Is Sure

The operator can be reasonably expected to identify the two ends of a route, and operate a knob and a button associated with the entrance and exit of that route. Hence the chances of error in lining up routes are reduced to a minimum.

It is impossible to set up conflicting routes. Every route lined up receives the maximum of interlocking protection and any attempted line-up of a conflicting route cannot disturb a route already lined up.

A complete graphic picture of the track layout and of the conditions existing is always before the operator's eyes. He can check himself at any time by a mere glance at the control board. All those elements unnecessary to actual routing have been eliminated so that the operator can give his full attention to train operation.

NX Is Speedy

The operator makes two simple movements to line up a route. Hence he takes less time than when he has to operate several levers.

The operator wastes no time in breaking the route down into "this switch reverse," "that switch normal," "this signal clear." Route "entrance" and "exit" is all that he is interested in. These two facts are associated with the entrance knob and the exit button subconsciously.

NX Is Compact

A layout of the most complicated character can be condensed into a simple picture on the control board. No additional charts, diagrams, indicators, etc., are necessary.

The control machine requires little floor space. The floor supporting it may be of light-weight construction.

NX Is Flexible

It can be applied to any form of power interlocking.

The one design of entrance knob gives the option of automatic route restoration or manual route restoration, and low-, or medium-, and high-speed signal control.

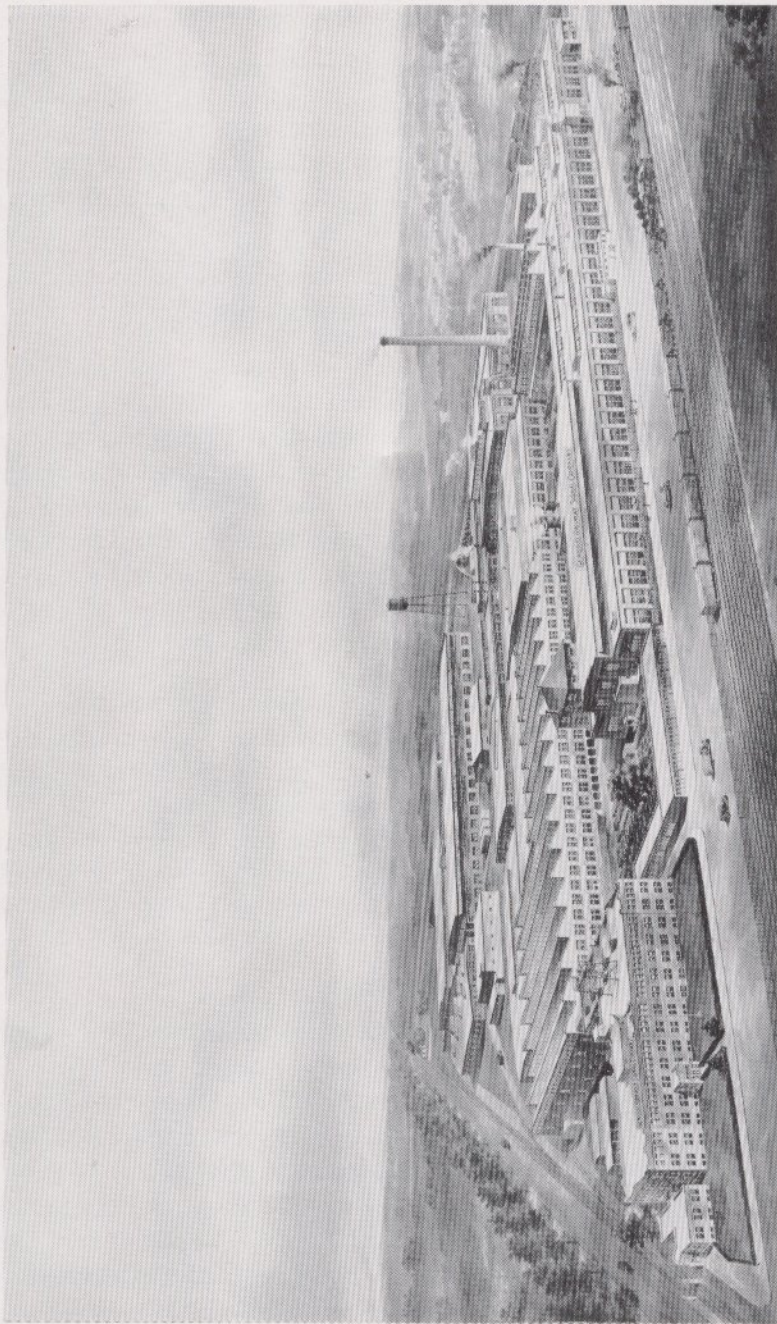
The system automatically chooses alternate routes when the customary or preferred route through the plant is not available.

NX Gives Complete Information

The complete operating picture is in miniature before the operator all the time.

He sees what routes are lined up, what routes are not available, and what routes he may yet use. A glance discloses just where every train is located in the controlled area.

In fact, 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 before him.



Works of the General Railway Signal Company, Rochester, New York.

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.

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