The Rock Island Develops

Unique Interlocker

with No Mechanical Locking

Levers for switches and signals form a part of the track diagram—
First plant of its kind

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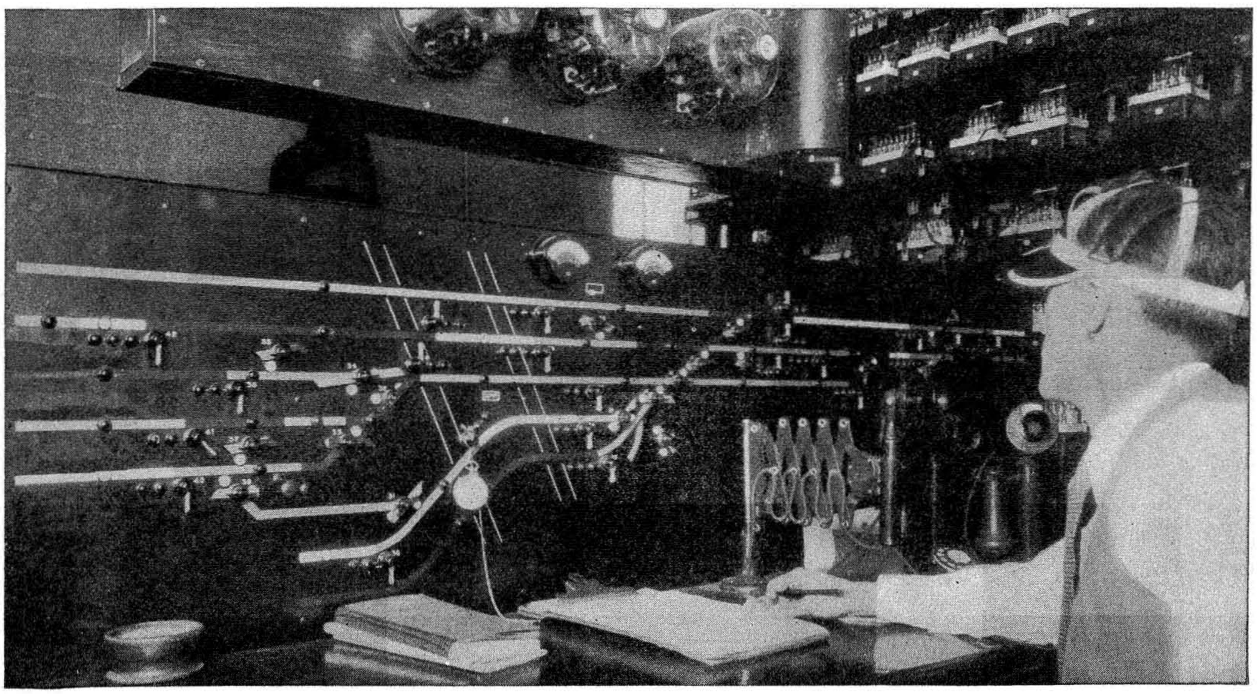
A 42-LEVER electric interlocking plant including a new and novel type of control machine, has recently been placed in service by the Chicago, Rock Island & Pacific at Blue Island, Ill., near Chicago. This development is the result of an effort to accomplish three major things: First, to secure a simple assembly of levers so that the leverman can sit at a desk and operate a maximum-size layout, while using the telephone or making records of train movements; second, to reduce the size of the machine to the absolute minimum so that it can be housed in a small space, and, third, to provide a self-indicating arrangement so that anyone familiar with ordinary railroading can operate the layout and know by glancing at the board exactly what route is lined up and the location of every train within or approaching the plant.

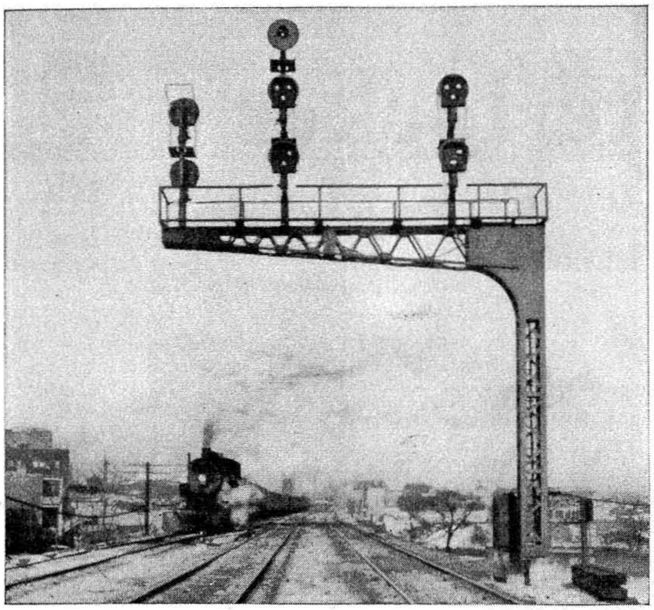
The fundamental changes in this new machine as compared to the conventional type interlocking are: First, the customary mechanical locking between levers, as well as electric locks on the levers, have been eliminated, the locking being accomplished by circuits especially designed for this purpose by the railroad; second, the levers themselves are mounted on the illuminated track diagram, the switches and crossover levers appearing as short sections of the track, and the signal levers resembling semaphore blades. The interlocking machine is, therefore, a unique development and is believed to be original, having been developed by the signal department through the co-operation of the Chicago Railway Signal & Supply Company (now Railroad Supply Company), and the Automatic Electric, Inc. Although the interlocking machine represents a new development, practically all of the detail pieces of apparatus involved are standard devices which have been used extensively for years by the Automatic Electric, Inc., in the automatic telephone and remote-control fields.



A close-up view of the illuminated diagram and levers

Track Layout and Traffic

The complicated track layout and the diversified traffic involved, introduced several problems in the development of the plant. Heretofore, some of the main-line switches had been handled by switchmen, while the yard switches were handled by trainmen. This method not only caused delays and train stops, but necessitated slow speeds in this territory, which introduced delays to other trains and blocked the street crossings.



A view of the eastbound home signals

All of the road freight trains from the west terminate, and all but one of the freight trains leaving for the west originate at the large yard and engine terminal just east of the new interlocking. Also the double-track suburban line, which runs from Chicago via Gresham and Beverly Hills, joins the double-track main line just west of the Blue Island station, and the suburban coach yard lies alongside the freight yard. At a point one mile west of Blue Island there is a junction switch leading to a transfer connection to the Indiana Harbor Belt Line and the Grand Trunk Western. All of these various junction and yard entrance switches and crossovers, as well as the signals involved, are included in the new plant. In addition, a system of either-direction operation by signal indication, on one track of the main line, extends from this point west, a high-speed main-line reverse crossover for this service being included in the plant.

Table Showing the Traffic Through the Plant on January 26

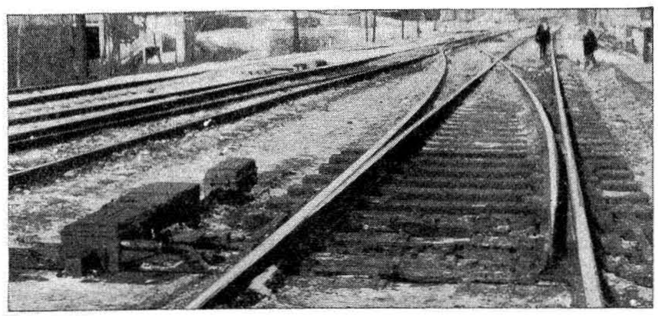
6	Passenger trains via suburban line to or from the west
48	Passenger trains via main line to or from the west
19	Road freight trains into and out of the yards
77	Suburban passenger trains originating or terminating via suburban line
15	Suburban passenger trains originating or terminating via main line
298	Switching movements
31	Interchange movements to or from the G. T. W. and I. H. B.
494	Total average daily traffic

In addition to the 163 regular trains passing through this plant, as shown in the table, there are also numerous switching and transfer movements. Because of the simplicity of the operation of the control machine and the rapidity with which line-ups can be made, this new type of interlocking is particularly adapted for complicated layouts, handling heavy traffic such as is involved in this plant. The operation rendered since the installation was placed in service on December 29, through one of the most severe winters in history, has been entirely satisfactory.

Features of the New Interlocking Machine

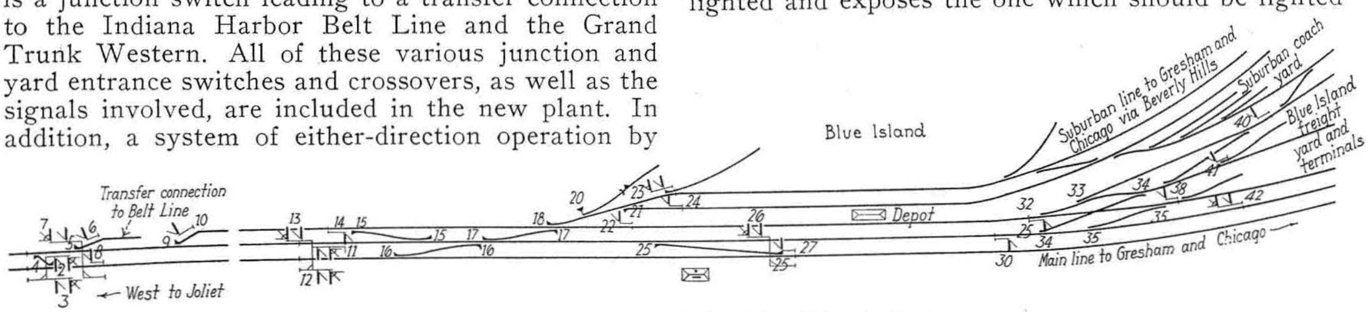
The compactness of the new type machine is evident from the illustrations. In order that the towerman may determine at a glance the location of a train, each of the various track sections on the diagram are painted different colors, the lights in a track section being illuminated when the corresponding section is occupied by a train.

The levers form a part of the illuminated track diagram, each lever being mounted on the diagram in the position corresponding to the location of the respective function on the ground. The switch and crossover levers appear as a short section of the track, being pivoted at the center, and painted the same color as the track section in which it is located. In the case of a mainline crossover, for example, one half of the lever is the same color as the eastbound track section, and the other half the same color as the westbound track section in which the crossover is located. White indicator lights are provided to show whether the switch on the ground operates to conform with the position of the lever. Two separate lights are used for this purpose, being so located on the diagram that in either position, the blade of the the switch lever conceals the one that is not to be lighted and exposes the one which should be lighted to correspond to the existing position of the lever. This arrangement centers the attention of the towerman on the one light in which he is concerned at that time.



The power switch layouts are fitted with heavy plates and adjustable rail braces

The signal levers are likewise mounted on the track diagram, being located in the position cor-

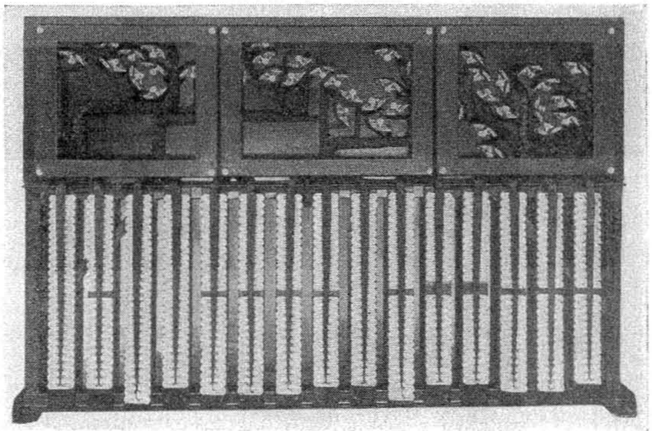


Track and signal plan of the Blue Island plant responding to the location of the corresponding signal on the ground. Each signal lever is a short arm resembling a semaphore blade, and is painted yellow corresponding to the standard semaphore. Small lights repeating the indication of the signal are mounted close to each signal lever. For repeating the "stop" indication of all signals a red light is illuminated, while for indicating the "proceed" indication, a yellow light is illuminated for a slow-speed signal and a green light for a high-speed signal.

With the control machine constructed as just explained, a leverman sitting at the desk can easily reach and operate any of the levers without leaving his chair, in fact, one man could handle a much larger layout. As there is no mechanical locking or electric locks, the leverman can operate the switch levers in any sequence that he may choose, thus eliminating any delay in waiting for each switch to go over and indicate. No manipulation chart is needed, for the diagram is a duplicate of the tracks themselves, and the leverman can readily follow the track to move the switches, thus setting up the route he desires.

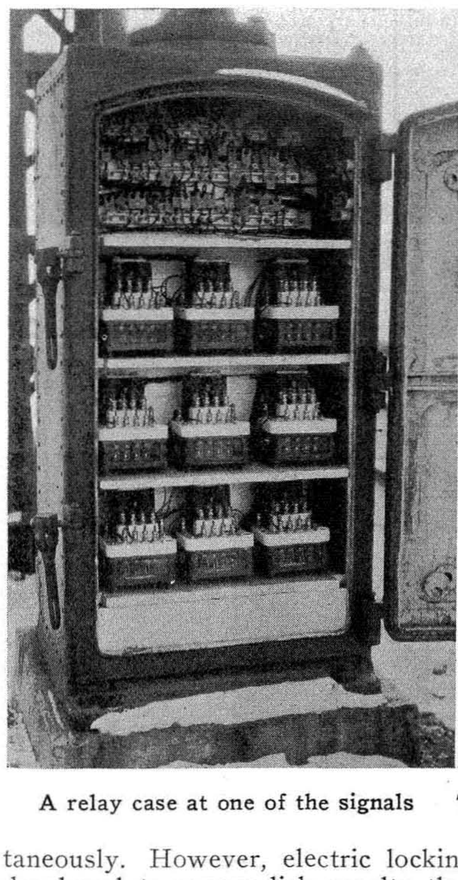
Basis for Eliminating Mechanical Locking

Prior to the use of electric circuits, mechanical locking between levers in an interlocking machine was essential to insure that the switch levers were lined up to complete any certain route and that signals for conflicting routes could not be cleared simultaneously. However, electric locking, as originally developed to accomplish results that could not be done with mechanical locking alone, in the first place duplicated the protection afforded by mechanical locking, as well as providing additional safety features. We consider that the mechanical locking is not only unnecessary, but also undesirable, therefore, it was eliminated in our new development at the Blue Island plant.

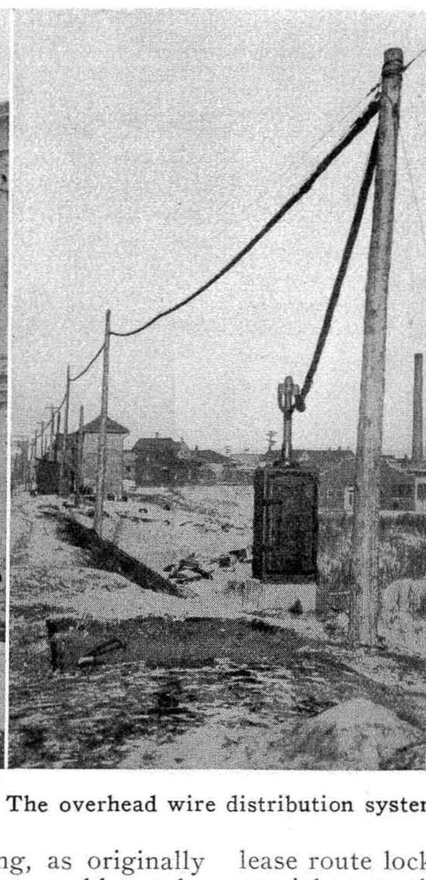


A rear view of the interlocking machine with the lever covers in place, but with the terminal covers removed

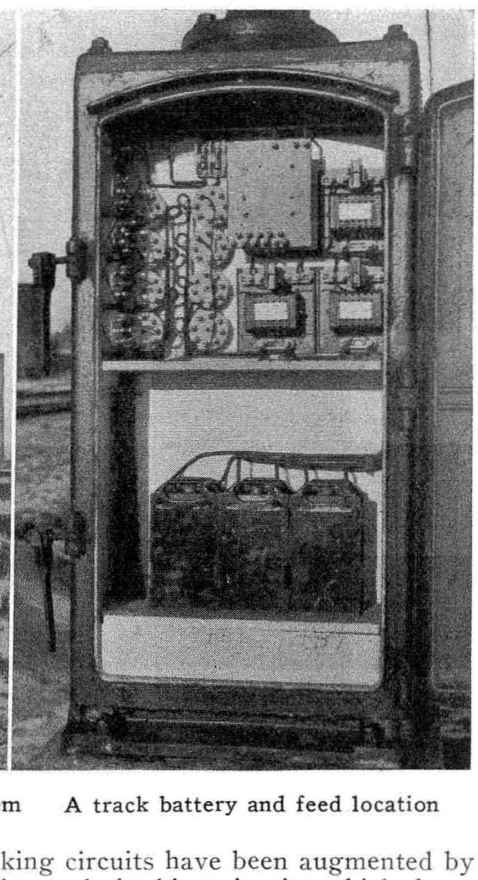
Further, it should be noted that no electric lever locks are used on this machine, the detector, route, and approach electric locking being effected by controlling the circuit for the relays which control the individual functions. This new arrangement thus effects the most direct protection, rather than depending on an electric lever lock to prevent the operation of a lever which in turn has direct control of the function. The ordinary electric detector and release route locking circuits have been augmented by special protective and checking circuits which, however, we now consider desirable on any plant. A unique circuit arrangement provides that if a switch lever should be moved purposely or inadvertently when the route locking is in effect, that switch instantly becomes "dead" and so remains until the lever is restored to its proper position, all signals directing movements over this switch are placed at the "stop"



A relay case at one of the signals



The overhead wire distribution system



A track battery and feed location

indication and the time release has been operated.

Among the other advantages of this new type of control is the fact that the interlocking machine requires only a small floor space, thus reducing the size of the tower building and the land area required for the tower. Therefore, the tower constructed at Blue Island is considerably smaller than our former standard for a plant of this size.

Details of Construction

As the interlocking machine is small and located in the bay window at the front of the tower, this left a large area on the second floor vacant, thus leaving plenty of space for all of the tower relays in one end of the same room with the control machine, which was a great help to the wiremen during the construction, as well as to the maintainer when testing or looking for trouble. The relays are the wall type, mounted with shock-absorbing springs, on heavy racks made of 2-in. by 8-in. boards attached to 2-in. angle-iron uprights. Solid insulated wires run out through holes in the boards to the relay terminals.

No operating power switchboard is used, a small-sized Weston voltmeter and an ammeter being mounted just above the control machine. The 110-volt, d-c. power circuit for the switch machines is controlled through an ordinary Square-D type double-pole, single-throw, fused switch mounted near the machine.

The power switch machines are the Union Switch & Signal Company's Model M-2 equipped for 110-volt d-c. operation, the 110-volt feed circuit being extended to the Type-F controllers, mounted on a concrete base near each switch machine. The switches are fitted with heavy tie plates and Morden adjustable rail braces on four ties.

The signals are the Chicago Railway Signal & Supply Company's (now Railroad Supply Company) color-light type and are equipped with the chromatic type lenses with adjustable lamp sockets which permit the use of ordinary commercial automobile type lamps. These bulbs are rated at 10-volts, 18-watts, and are operated on about 8 volts. These lamps are low in first cost and give a long life. The relays and switch circuit controllers, relay housing and rectifiers were also furnished by the Chicago Railway Signal & Supply Company (now Railroad Supply Company).

Storage Battery Power Supply

The 110-volt, 120-a.h. main operating storage battery is of the Edison type. The line and track batteries are part Edison and part Exide types. All batteries are on a-c.-floating charge from Kuprox rectifiers.

The long wire leads from the tower to convenient distributing points along the track, are of rubber-covered braided wire supported in Copperweld cable rings from Copperweld stranded messenger. All underground wire is either Trenchlay cable furnished by the Standard Underground Cable Company or Parkway cable furnished by the Okonite Company. The combination of loose aerial wire and underground armored cable has been standard with us for several years, and we have found it one of the most economical practices we have ever developed.

This plant was installed by the Chicago Terminal Division signal construction forces under the direction of J. P. Zahnen, signal supervisor, according to plans prepared in the signal engineer's office.

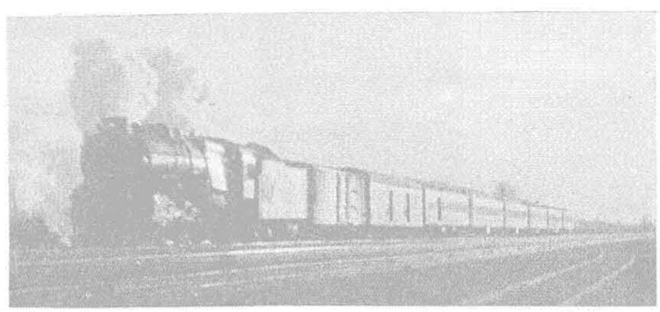
Failure to Read Orders Cause of M-K-T Collision

FAILURE to interpret train orders properly, together with disregard of the rear-end flagging rule are given as the two contributing factors that led to the rear-end collision between two freight trains on the Missouri-Kansas-Texas, at Savonburg, Kan., on October 31, 1929. In the vicinity of the accident, this is a single-track railroad, over which trains are operated by time-table and train orders; no block system is in use. The two trains involved in the accident were southbound freights; No. 99, the local freight train, standing at the station, was run into by freight extra No. 868, while the latter was traveling at a speed of 43 m.p.h.

The report of the Bureau of Safety states that this accident was caused by the failure of the engineman of the second train, freight extra No. 868, to read all of the orders affecting the movement of his train. As a result, his train was moving at a high rate of speed when it approached the station at Savonburg, where train No. 99 was occupying the main track without flag protection. The report continued:

"The evidence in this case indicated clearly that for several years it had been the practice on this line to relieve the crews of local freight trains from the necessity of protecting their trains, while occupying the main track at stations, the evident purpose being to enable the flagman to be used in connection with the station work. This practice was carried out through the issuance of orders directing the train involved to occupy the main track at all stations unprotected by a flagman against following extras. * * *

"The form of protecting order used in this case, although not strictly in accordance with the instructions issued by the vice-president and general manager in 1924, has been in use for years and appears to have been well understood. There was a conflict of opinion between the witnesses, however, as to where the rear end of a train could be standing and still be at the station within the meaning of the order. * * * The providing of proper flag protection, however, is one of the most fundamental principles of railroading, and when some substitute is adopted, then the utmost care should be exercised in its application. In the case here under consideration, differences of opinion could lead easily to the creation of a dangerous situation, and particularly would this be the case if the number of extra trains in operation were larger than is the case on this particular division. If the use of this form of order is to be continued, then the necessary instructions should be issued to insure that all concerned have a uniform understanding of it. * * *"



Passenger trains must not be delayed