

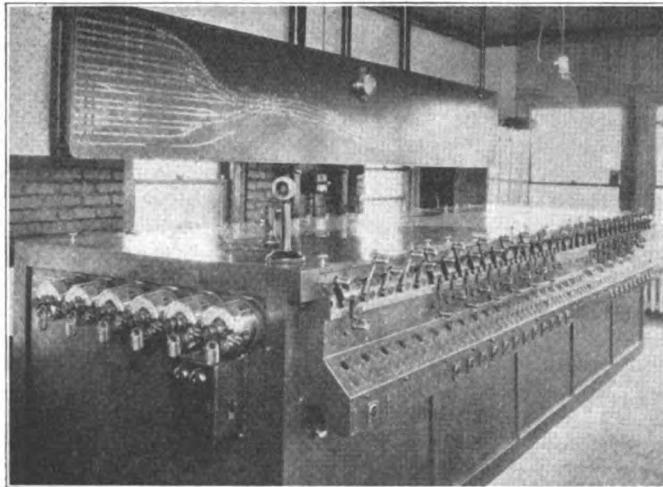
New Reading Interlocking at Camden

Electro-Pneumatic Plant With Alternating Current Control, Includes Unique Train Starting System

By A. H. Yocom

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ON May 14, 1924, the Reading Company placed in service for the use of the traveling public to Atlantic City, a modern ferry terminal at Camden, N. J., as well as an electro-pneumatic interlocking plant, for controlling the movement of trains to and from the 14 station tracks at the new terminal. The

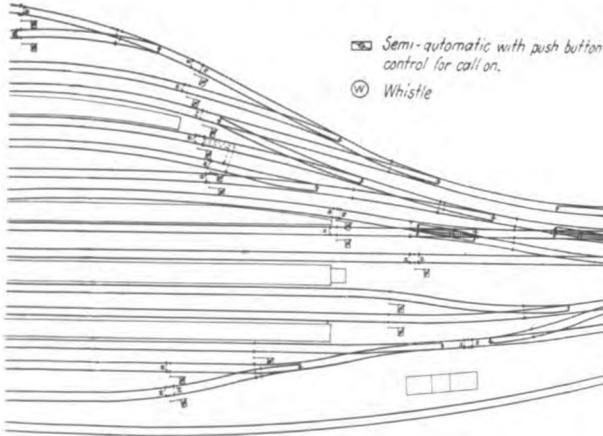


Both the Illuminated Diagram and the Machine are Enclosed with Sheet Metal

territory covered by the plant between the concourse and the first home signal bridge entering the plant is about 0.9 mile. Alternating current control is used throughout the interlocking.

Tower and Machine

Located near the center of the plant is a modern two story red brick tower, with concrete basement, of fire-proof construction throughout. Located on the top floor is the operating machine with sheet-steel case. This is

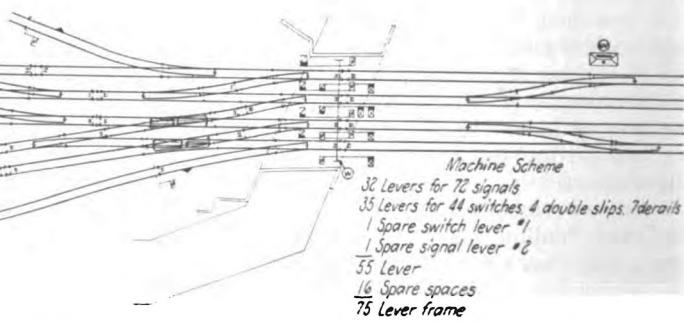


one of the Union Switch & Signal Company's Model-14 electro-pneumatic type, being a 75-lever frame, having 59 working levers for operating the various functions of the plant and 16 spare spaces for future extensions to the plant. This machine is provided with three rows of lever lights extending the full length of the machine, which are used for providing a visual indication to the levermen as to the position of the signals and the condition of the section locking for the switches. The machine is provided with the usual preliminary mechanical locking as well as electric locking, which is accomplished by the use of 110-volt, 60-cycle, armature type magnets.

Suspended from the ceiling of the tower, over and near the back of the interlocking machine is a spotlight-type track model, the case of which is made of sheet-iron with removable back panels to allow the changing of lamps when necessary. This model has painted on it in distinctive contrasting colors, all of the track sections within the interlocking limits as well as the signal and switch symbols with their numbers. In the center of each of the 62 track sections represented on the model, there is a spotlight which is illuminated when the track section is unoccupied.

Alternating Current Track Circuits

The track sections throughout the plant are connected to the secondary of adjustable transformers, which are fed from 110-volt bus lines extending throughout the plant. The track sections are separated into three groups, each group being fed from one of the three phases. The track transformer secondaries are provided with taps and in addition a 5-ohm resistance unit is used for the purpose of supplying correct adjustment of the track sections. All of the track relays, which are of the Model-15 type, 2-element, 2-position, with 110-volt locals, are located in the tower for convenience of the signal selection. Power for the track element of these relays is furnished to the relay by means of No. 14 wire in cable form, between the tower terminal board and the nearest instrument case on over to the relay end of the track section. The rails at the joints are bonded together with two double conductivity type bond wires, with duplex channel pins. Keystone connections are used for



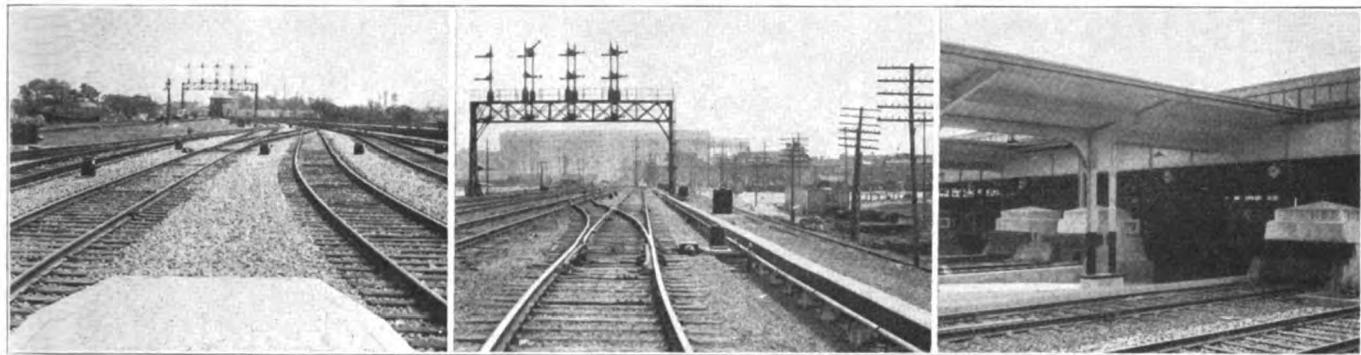
Track and Signal Plan of Electro-Pneumatic Interlocking
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bootlegs at the ends of the track sections. The instantaneous polarity of adjacent abutting sections are staggered.

A Total of 63 Switch Machines

There is a total of 63 style A-1 switch and lock movements used for the operation of 44 signal switches, seven derails and four double slip switches with movable point frogs. Compressed air at a pressure of 65 lb. is used for the operation of the movements and this is controlled by means of the Style-C cut-off valves, mounted separately, having 55-volt, 60-cycle magnets. Switch valve

tion the air line is encased in loam, in a 1 in. yellow pine boxing located 20 in. below the base of rail, and the conduit is 2 in. yellow pine for the main runs, placed 20 in. below the base of the rail, while under the tracks, 3 in. fibre conduit is used. This fibre conduit terminates in concrete junction boxes with cast-iron covers. All cable used underground is Kerite standard specification with a fibre bedding, a bronze tape and an outer fibre covering with submarine finish. The cables are placed in loam inside of the yellow pine boxing. For the section of the work south of the tower, the main air line and trunking, which is cypress, is mounted on stand-



View of Underground Conduit Section
Construction

Pipe and Trunking on Above Ground
Construction

Exit Show Train Starting Signals
at Gates

magnets used on the cross-overs are connected in series and fed from the 110-volt buss on the machine, while the valve magnets on single switches are fed from the 55-volt buss. The controller of the movement, pole changes the current for the control of the Model 15, 3-position, 2-element a. c. relays. The indication transformers are located at the far end of the crossovers and at the single switches. This controller is also supplied with contacts for furnishing a restoring circuit to supply energy for the lock magnet, independent of the operation of the switch lever in the machine. This feature is brought into use to restore the movement to its extreme locked position in case of any incorrect movement of the operating slide bar.

There are 19 bridge, one ground and 27 dwarf signals, all of which are of the semaphore type, operated by low pressure movements. Enameled steel blades are used throughout and the night indication is supplied by 5-watt, 12-volt electric light bulbs. There are two lamps for each semaphore, one normally burning with its filament in series with the light-out relay, which controls the circuit for the other lamp when the filament of the main lamp burns out.

Air Line and Conduit System

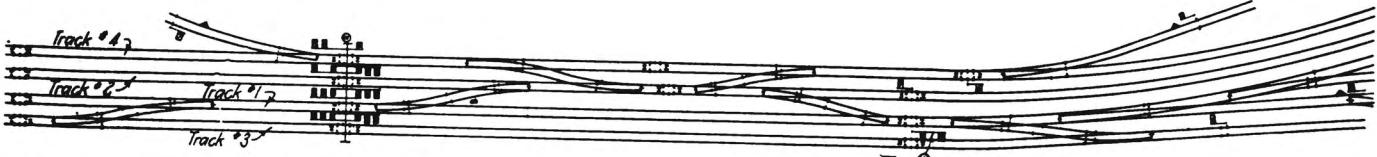
The main air line and main conduit system for the plant are provided in two classes. The section of the

ard A. R. A. pipe carrier foundations, set 5 ft. centers and 6 ft. from the nearest rail. Underground cable of five and seven conductor No. 14 wire was used in this section and all of the air pipe throughout the plant is extra heavy wrought iron, galvanized.

Instrument and Relay Cases

Wherever it was necessary to make branch connections for cables to the switches and wires to the track, sheet-iron instrument cases were located for housing the transformers, resistors and terminals. Sheet-iron terminal boxes of ample capacity with vertical rows of terminals were located 10 ft. from the tower on the north, across the tracks from the tower for the section south, and every 500 ft. where cables are terminated. Between the terminal box near the tower and the tower wall, 3 in. fibre conduit was installed underground in order to eliminate from in front of the tower, all of the usual obstructions which are generally found at the average interlocking plant.

A sectional steel relay case, with glass doors, is located on the lower floor of the tower. These cabinets are arranged in three sections of 12 cases each, and one section of six cases with vertical chase between the various sections for the purpose of installing the wire between the various relays. These chases have removable sheet iron covers and the terminal board is hinged in such a



Showing Switches, Derails, and Signals Included in the Terminal

plant between Jackson street, north of the tower, and the station is of underground construction, while the remaining portion of the plant is of above ground construction. In the underground construction sec-

way that all wires in the rear of the terminal board are accessible. From each of the main sections there are vertical chases for covering the wires between the relay case and the machine. All relays for signal selection,

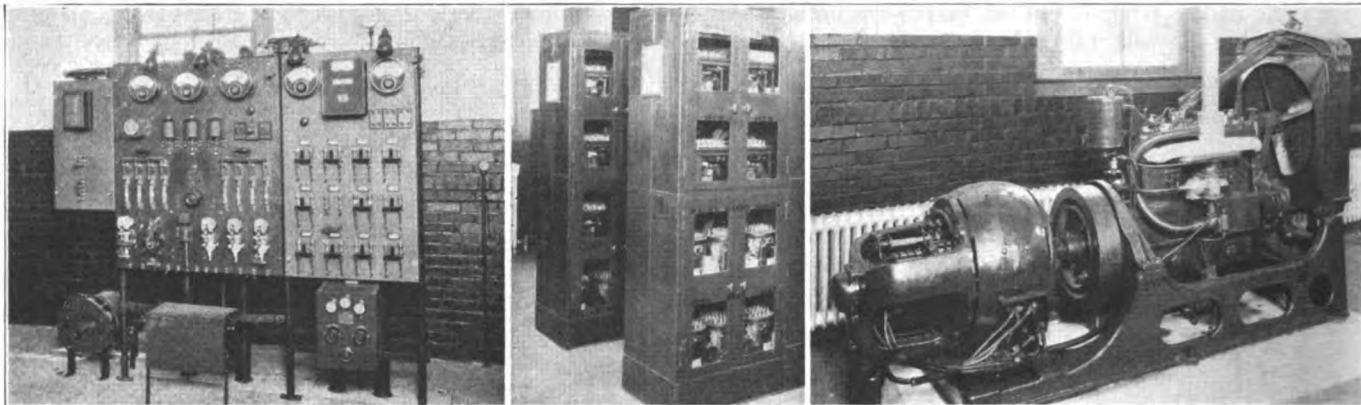
route, sectional and signal locking are housed in these cases, therefore, reducing to a minimum the amount of No. 16 wire used in the selection of the control circuits.

Emergency Communicating System

A complete local telephone system is provided throughout the plant for the use of the train crews, station-master, levermen and maintainers. Conveniently located near the signal bridges are weatherproof telephones, and

signals at 0-5 deg. Approach locking is released by a back contact on the track relay for the first section in advance of the home signal, or by a reverse contact on a clock-work time release which is mounted on the end of the machine. None of these releasing features are effective unless the distant signal has assumed the caution position and the home signal has assumed the stop position.

All high semi-automatic signals and call-on signals



Automatic Control Panel Stands with
Switchboard

Section of Steel Relay
Cabinets

Emergency Gas Engine Driven, Generating
Set

in each of the instrument cases there are jack boxes for the maintainers' use in attaching portable phones. There are four air whistles, controlled electrically, located at the tower and each signal bridge, for emergency use when the levermen desire to communicate with the train crews. These whistles are so arranged that they can be operated separately or all of them operated from a master button.

Circuits Provide Call-on Features

All signals are controlled by the selection of the circuits over contacts on the levers in the various positions and over normal or reverse contacts on the KR relays, which are operated from circuit controllers on the switch movements. This means that if all switches in a route over which a signal governs are not in the locked position, the signal will not indicate proceed.

The circuits are so arranged that the bottom arm on the ground signal, and the suspended signals on the bridges, in addition to being used for diverging routes, function as call-on signals for all routes, including governing routes against traffic. These signals are 2-position and the call-on indication is controlled from a mechanical stick push-button controller located on the machine, directly under the signal lever. This push-button controller is restored to the normal position by the operation of the signal lever to the normal position. Three-position control is provided for all home signals, except those governing movements into the station tracks. The control of the dwarf signals is two-position.

Each switch lever is provided with an electric lock, which prevents the lever from being moved when the track circuit within which the switch is located is occupied. All routes are provided with sectional route locking, so arranged that a train in clearing each section does not release the locking affecting that section until the signal lever governing the route over which the train is proceeding is restored to the full normal position.

Approach locking is provided for all high signals and is effective when a train is in either the first or second block approaching the signal. These circuits are taken over the distant signal at 0-45 deg., and over the home

are provided with signal repeater indicators in the tower. This is accomplished by means of a lamp behind a red glass, mounted under the levers, which indicates red when the signal position does not correspond with the position of the lever. Home and distant signal approach sections are provided with track indicators on the model board and a high resistance single stroke bell is provided for giving an audible warning when a train enters the approach track section.

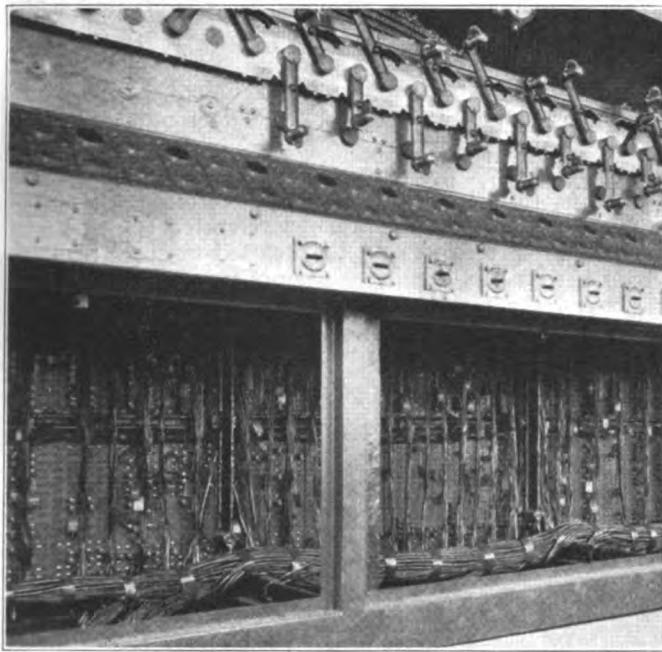
Train Starting System

A complete system of train starting signals is provided for all tracks in the train-shed, this consisting of signal units of the light type suspended from the roof truss of the concourse of the main building, with red and green lenses for giving information to the train crews and gatemen. In addition to these signals, red and green spotlights for the levermen's information are located on the model board at the end of each of the 14 station tracks. The lamps in the spotlights are in series with the lamps in the starting signals and are controlled by snap switches located within easy reach of the gatemen. Red lights are displayed when the gates are open for loading passengers, and green lights indicate when the gates are closed and the train is ready to leave the station.

Power for the normal supply is obtained from the company's power house in the Ferry building, at 440-volts, 60-cycle, 3-phase, and is delivered to three 440-volt to 110-volt, oil cooled transformers, over 5-conductor bronze covered cable, underground between the power house and the tower. Each wire is No. 2 A. W. G. strand, three wires being used and the remaining two are spares for emergency use. For testing purposes this cable is cut at every 500 ft. and the wires joined together with solderless connectors with insulators, these connections being made in instrument cases. The transformers in the tower are mounted on one of the basement walls, and the 110-volt secondaries are installed in conduit between the transformer and the tower switchboard. The switchboard is arranged with double-pole knife switches for controlling the bus wires for the various

sections of the plant and is supplied with the usual watt-hour meters, volt meters and ammeters.

In order to furnish emergency power for the plant providing the main supply is out of service, a Matthews Engineering Company's gasoline electric generating set is cut into service automatically. Providing an outage occurs on any phase of the normal line, the automatic contactors on the switchboard become de-energized and



Panels Removed Showing Terminal Board for Machine

in turn energized by means of the d. c. engine starting battery contactors, which start the engine in the same manner as an automobile is started. It requires about 18 sec. for the engine to come to full speed, at which time the starting battery is cut off and the alternator delivers power to the interlocking busses. When the normal supply is resumed the engine set is automatically disconnected from the busses.

This work was installed by the Union Switch & Signal Company, under contract, in accordance with Reading Company's specification, under the direct supervision of the signal engineer's office.

Derailement at Long Island City

AN eastbound passenger train of the Long Island Railroad moving at moderate speed, was partially derailed at Tower H, Sunnyside Yard, Long Island City, about 5:30 p. m. on July 30, by the premature throwing of a switch under the seventh car; and this and the two following cars of the train were thrown violently to one side. The first of these fell against a standing electric locomotive and was partly overturned. One passenger was killed and 36 were injured. The locomotive which was struck was waiting to move to the track on which the passenger train was running, and the helper on this locomotive, who had been sent to throw the switch after the train had passed, appears to have lost his head. The switchstand is of the triple lock type, fastened by an electric lock which is controlled by the signalman in Tower H. The helper had telephoned to the tower and, on his request, the towerman had unlocked the switch. The wreck occurred at 5:31 p. m. and the train carried about 700 suburban passengers destined for points on the Port Washington branch.

This collision occurred within the limits of New York City and a report on it was issued by the New York State Rapid Transit Commission on August 1. The Commission holds the engine helper and the towerman responsible and also says that the railroad company is blameworthy for not having issued more complete instructions governing the operation of this switch. It says, however, that both the towerman and the locomotive helper "complied with the regulations, except the general regulation which requires that due caution be observed at all times." The commission recommends that the railroad be required to install an "electric automatic locking device" at all main line passenger traffic switch points within the limits of the city of New York.

The locomotive helper and the towerman were arrested and held by Magistrate Conway under bail of \$25,000 each on charges of homicide.

Sudden Ravings

AMONG our little petty hates,
We find the bird who *vacilates*
(For he never hits the mark)
Before he can a thought project;
He is sure to disconnect—
The battery from his spark.

II
Without any reason, rote or rhyme:
He thinks, to think, takes lots of time
(Because he's filled with doubt)
And all the factors *pro* and *con*
Are mentally debated on
Until they are worn out.

III
He shifts about from foot to foot:
He simply just can not stay put
(His bean is full of kinks)
He's like a pendulum on the swing;
We've got to shoot him on the wing.
To find out what he thinks.

IV
He is the goat who drives his bus
Around, in front and over us
(Then loiters on the trail)
And when we toot and try to pass,
He shoves both hoofs upon the gas
And flaunts a sassy tail.

V
There should be locking, in between,
The different functions—of his bean
(So before ideas scoot)
He is forced to really set
A line up which will only get
One predetermined route.

VI
And when we think that he will do
Some little thing we want him to
(We find we're out of luck)
Because his mind will then recede
And when we try, this mule, to lead—
He'll reverse himself and buck.

VII
He wobbles out across this earth
And plots a sine-wave from his birth
(To where that "Reaper Grim")
Decides to save us further grief
And offers quick and sure relief
By simply croaking him. —W. H. F.