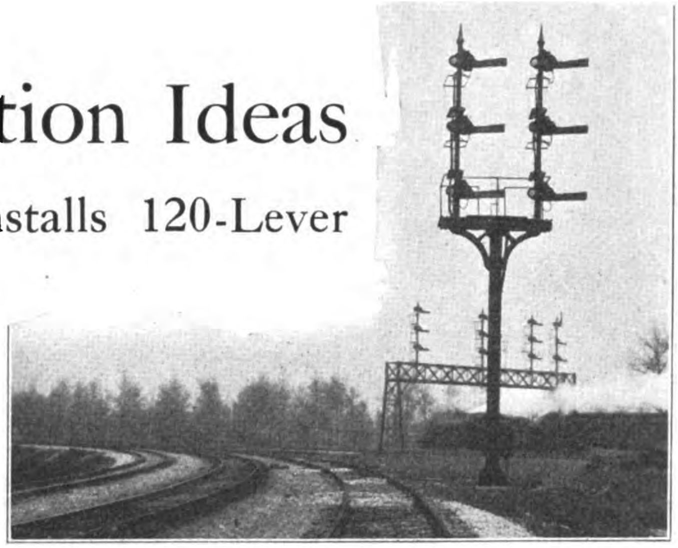
New Interlocking Construction Ideas



Chicago & Western Indiana Installs 120-Lever Plant Using Parkway Cable, Unique Outlets and Novel Charging Apparatus

By F. E. Jacobs

Signal Engineer, Chicago & Western Indiana, Chicago

An electric interlocking with 120 levers has recently been placed in service by the Chicago Western. Indiana near 74th street, Chicago, at the junction of this road with the St. Louis division of the Wabash and the Belt Railway of Chicago. Included in this installation are 19 three-position automatic signals between 55th street and 81st street located on tracks No. 1, 2 and 3, which replace manual block signaling on these tracks. The home signals at the Ford street interlocking were changed from two-arm to three-arm indication and are now semi-automatic.

In addition to the vastly improved train operation and the elimination of train stops, these improvements have eliminated the services of seven switch tenders and nine blockmen. The operation of these new facilities require three levermen and three maintainers, each working eight hours at the 74th street interlocking and one maintainer is employed eight hours on the automatic signals.

The interlocking machine is of the General Railway Signal Company's Model-2 unit type, enclosed in a steel case and has:

29 levers for 29 movable signal arms,
5 levers for 5 movable dwarf signal arms,
14 levers for 14 derails,
9 levers for 9 single switches,
6 levers for 2 single slip switches with M. P. frogs,
15 levers for 5 double slip switches with M. P. frogs,
1 lever for 1 M. P. frogs,

79 working levers.
5 spare levers for switches
5 spare levers for signals
31 spare spaces

120 lever machine frame

Located over the machine is a track diagram having two electric spot-light indicators in multiple for each track circuit. Located on each end of the metal machine case are clock-work time releases used with the approach locking.

The high signals are of Model-2A top-post and are located on signal bridges except those on the Wabash which are on a bracket pole. The signal bridges are the Chicago & Western Indiana standard. Two channel irons are fastened to the lower chord for supporting and fastening the signal mast. In addition, there is a clamp around the mast which fastens to the upper chord of the bridge. The dwarf signals are Model-2A.

Switch machines and switch circuit controllers are Model-5 as shown in the view of a single switch layout. Section locking circuits are used in lieu of detector bars, including route and approach locking for the route governed by the top or middle arm.

Parkway Cable and Concrete Outlets

Electrical conductors from a lever to the manhole nearest to the unit or the ground controlling switch, derail or movable point frogs, are run in vitrified duct conduit and are made up of three-conductor braided cable of No. 12 B. & S. gage copper. From a manhole to the unit on the ground the cables are made up of three-conductor Parkway cable of No. 12 B. & S. gage copper, laid 18 in. below the bottom of the ties, the purpose being to stay below the frost line. For the SS control, two conductor braided and Parkway cable of No. 14 B. & S. gage copper is used. From

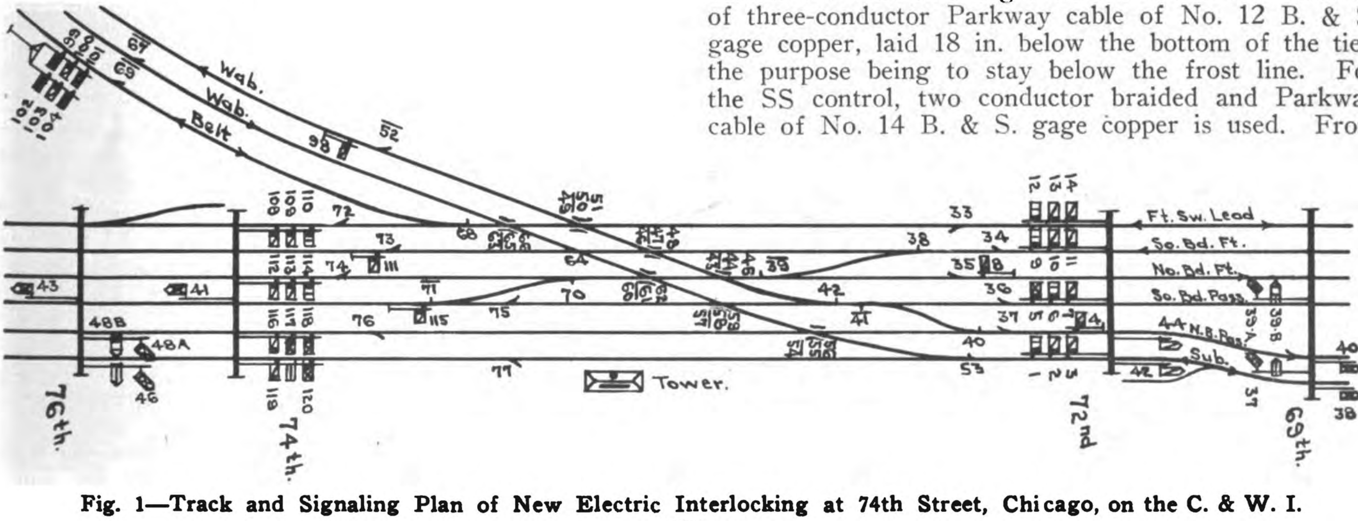


Fig. 1—Track and Signaling Plan of New Electric Interlocking at 74th Street, Chicago, on the C. & W. I.

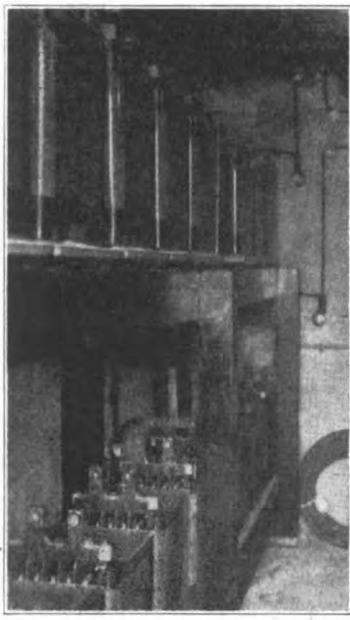
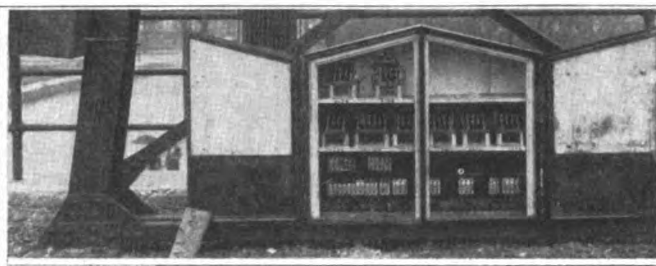
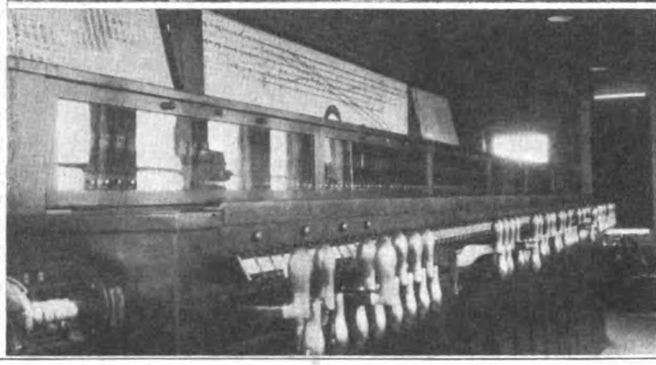


Fig. 2—Section of Storage Batteries





Above, Fig. 3—Outside Relay Case
Below, Fig. 4—Track Diagram Over Machine

Fig. 5—The Tower Has Platform Outside of Windows

the levers controlling a group of signals on one pole or to each group of three adjacent dwarf signals, the control wires are made up of a cable in a similar manner to the above except that No. 14 B. & S. gage copper is used. Single conductor No. 8 B. & S. gage copper Parkway cable has been used for the leads to the track. Dry jute, ordinarily used to make a cable round, was eliminated where it was possible to do so, substituting therefore an extra wire or wires. Wires smaller than No. 14 B. & S. gage have not been used except for local wire between relays, lamps and other similar apparatus in the tower.

Vitrified duct conduit enclosed in a 4 in. wall of concrete was run parallel to the tracks within the interlocking limits with a connection leading to the tower, and with concrete manholes located near a group of units and on each side of the subway bridges. On account of the depth being limited at the subway bridges, 3 in. galvanized pipe laid in concrete was used as a conduit over these bridges.

The cables coming out of any one manhole are run across the tracks in the same trench as far as practicable. Three feet of surplus cable is left underground at each operating unit. The Parkway and braided cable are brought into a junction box in the concrete manhole for jointing, using molded copper connectors. This box serves as a housing for the fuses and resistance units as well.

The end of the two and three-conductor Parkway cable leading to the switch machine and switch circuit controller are brought up from underground in a vertical concrete riser, thence through 1½ in. double metal strip flexible conduit and the coupling is fastened to the riser with stove bolts. See Fig. 7. The steel armor is removed from the end of the cable at a point near the top of the concrete riser and a squeeze connector, similar to Fig. 6, is fastened around the steel armor at the point where it terminates. The wires are carried on up into the mechanism case.

The Parkway cables for the track leads are installed in a similar manner as above except that treated wood risers with metal caps are used. The terminal for the track connections are shown in Fig. 8.

The Parkway cable run from a manhole to the signals is supported on the signal bridge by messenger cable and metal clamps. On the ends leading to the relay box, the armor is removed near the point at which it enters the box. A squeeze connector is fastened to the end of the armor and the nipple end is brought up through a hole in the bottom of the relay box and is fastened in place with hexagon jam nuts on the inside and outside of the box. The wires with the lead covering are brought up into relay box. A wall of concrete is installed adjacent to the cables at the point where they come up out of the ground to protect them from being hit and damaged by the ends of ties or rail when being renewed.

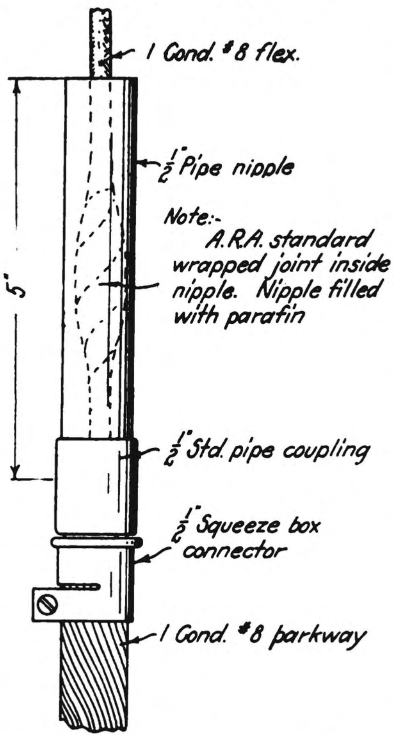


Fig. 6—Method of Protecting Splice of Parkway Cable With Regular Conductor

Large Wire Chase in Tower

In the tower there is a chase made up of transite board with angle iron supports to carry a maximum of approximately 700 wires. This chase is fastened beneath the floor on which the machine rests, extending the full length of the machine, and from the center of the machine along the ceiling to the track wall, then downward on the wall to the point where the vitrified duct enters the tower.

To permit bringing the wires up from the chase to the machine, three holes have been left in the floor, size 4 in. by 30 in., located alongside of the roller combination board, and the three other holes are located alongside of the machine terminal board.

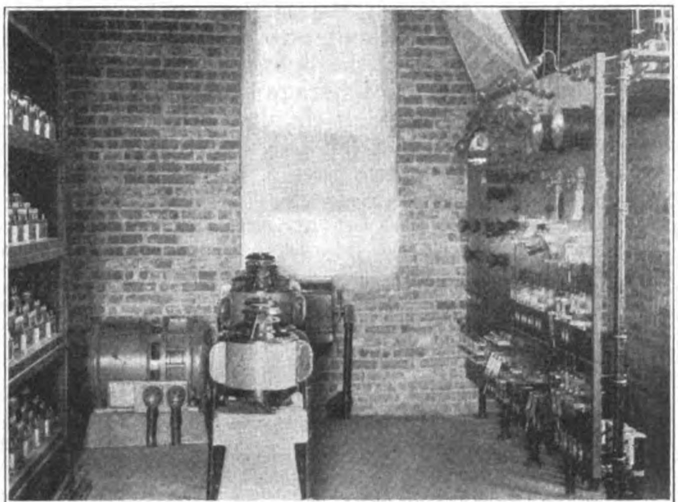
The interlocking tower is three stories and is of steel, brick and concrete construction except for the wood window sash, frames and doors. The ground floor is of special construction and entirely of concrete, being the foundation for the other two stories and a retaining wall supporting the fill for the tracks, which are elevated at this point. The second (track level) and upper story are of brick. The space of the ground floor is used for storage batteries, for the heating plant and for coal storage. The second (track level) story is used for the power switchboard, motor generators, relay racks and toilet room. The upper story is used for the interlocking machine, operating switchboard, operator's desk, telephones, etc.

The power plant consists of three motor-generators and a 400 a. h. battery of 57 cells of Exide storage batteries. One machine has a 15 h.p., 220-volts, 3-phase, 60-cycle, motor direct connected to a 50-amp., 100-175-volt generator for charging the 57-cell battery at the normal charging rate or for feeding the interlocking machine. The second machine has a 1 h. p., 220-volt, 3-phase, 60-cycle motor directly connected to a 3 amp., 100-130-volt generator for floating the 57 cell battery under normal operating condition.

Two batteries each of 6 cells with 400 a. h. capacity are used, one for supplying the track circuits and one for supplying the lever locks. One motor-generator for this set of battery has a 2 h. p., 220-volt, 3-phase, 60-cycle motor directly connected to a 50-amp., 17.5-volt generator for charging at the normal charging rate and there are also motor-generators with 1 h. p., 110-volt, 1-phase, 60-cycle, motors that are directly connected to 3 amp., 100-130-volt generators for floating these batteries under normal condition. The track diagram and lever lights are fed from either the low voltage battery or the 50-amp. low voltage generator or from a transformer having 12-volt secondary and 110-volt primary connections. Miniature instruments are used to read both the charge and discharge of the low voltage batteries.

Automatic Signaling Completes Installation

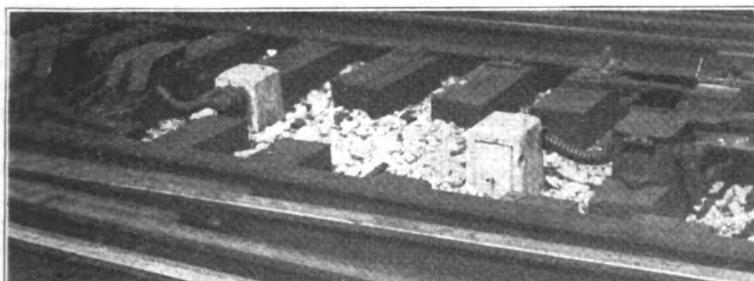
The automatic block signal installation was made along the lines similar to the interlocking. Five cell KHX-7 storage battery charged with a Magnar battery charger, including a light relay for the 10-volt signal lamp, are used at each signal location. Two cells of



Above, Fig. 10—Motor Generators and Switchboard
Below, Fig. 11—Portion of Relay Cabinet to Left

the batteries are used for each track circuit and are charged by a non-tune rectifier. These batteries are located in a Massey Type-B battery well.

Current, at 110-volts, single-phase, 60-cycle is taken from the railroad company's subway lighting circuit for charging the signal batteries and for lighting the signal



Above, Fig. 7—Typical Concrete Riser and Hose Connection
Below, Fig. 8—Track Outlet at Rail

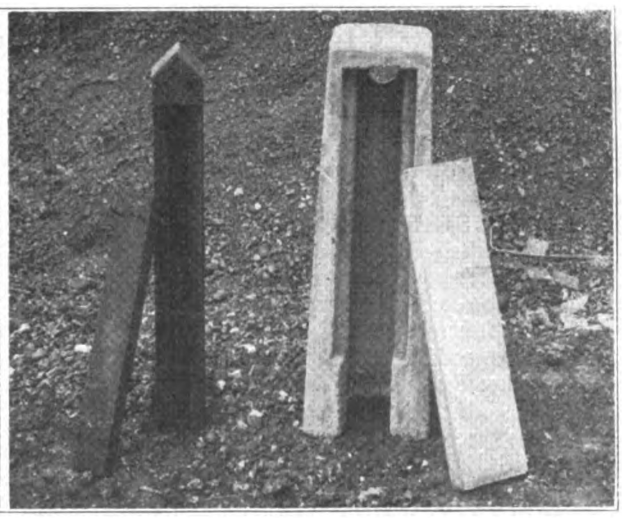


Fig. 9—Display of Trunking and Concrete Riser for Parkway Cable

lights. The current on the subway light feeder is turned on from about sunset to sunrise. In case it goes off, with the use of the light relay, the signals are lighted by the five cells of storage battery.

For the signal controlling circuits the following cable was used: 9,964 ft. (in ten lengths) of 21-conductor Parkway cable; 1 conductor is No. 10 B & S gage, solid 3/64 in. wall; 20 conductors are No. 16 B & S gage

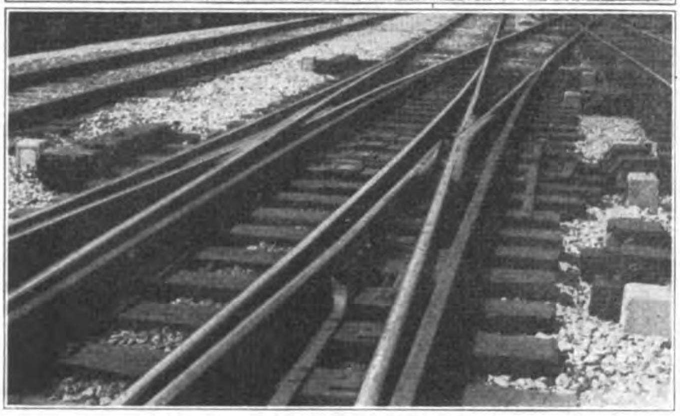


Fig. 12—Above—Typical Switch Layout
Fig. 13—Below—One of the Slip Switches

solid, 3/64 in. wall; tracers, tape, 3/32 in. wall lead, jute, 2¼ in. by .030 in. steel tapes and tarred jute overall. At the subway bridges the underground cable was brought up out of the ground in a substantial concrete riser, then across the street in a 2 in. galvanized pipe, which was hung in hooks, hooked on the subway bridge. The ends of the 2 in. pipe were brought into the concrete riser, allowing ample free space for the 2 in. pipe to expand and contract without injurying the cable.

Rear-End Collision on N. Y. C. Caused by Disregard of Signals

On January 25, 1924, there was a rear-end collision between an express train and a freight train on the New York Central, near Waterloo, Ind., which resulted in the death of one employee, and the injury of five mail clerks and five employees. An abstract of the report of the Bureau of Safety follows:

In the vicinity of the point of accident this is a double-track line over which trains are operated by time-table and an automatic block-signal system. Train orders are used only for movements against the current of traffic.

The automatic block signals are of the two-arm, two-position, lower-quadrant, semaphore type, displaying night indications of red and yellow, green and yellow, and double green, for stop, caution and proceed, respectively. The signals involved in this accident are signals A72.1, located 4,500 ft. west of WB interlocking tower at Butler, Ind., and signals A73.1, A74.1 and A76.1, located one, two and four miles, respectively, west of signal A72.1. The accident occurred at a point approximately 275 ft. west of signal A76.1. The weather was clear at the time of the accident, which occurred at 9:55 p. m.

Westbound local freight train symbol 61 consisting of 36 cars and a caboose, hauled by engine 5955, left Butler at about 9:20 p. m., and at a point approximately 4¾ miles west of Butler, while traveling at a speed of about 15 or 20 miles an hour, the rear end was struck by train 2nd No. 43.

Westbound express train 2nd No. 43, consisted of one combination baggage and express car, one refrigerator car, three mail cars, one baggage car, and one Pullman club car, and was in charge of Conductor Elliott and Engineman Bertch. This train arrived at WB tower at Butler at 9:44 p. m., where the operator, under direction of the dispatcher, had set the interlocking home signal at stop to afford train 61 additional time to clear at Waterloo; at 9:49 p. m. the signal was cleared and train 2nd No. 43 was permitted to proceed. It passed signal A72.1, which indicated a clear block, passed signals A73.1 and A74.1, which the evidence indicates were displaying caution and stop indications, respectively, and at a point approximately 275 ft. west of signal A76.1, which signal was also displaying a stop indication, struck the rear of train 61, while traveling at a speed estimated to have been about 50 miles an hour.

The engine, tender, first car and the forward trucks of the second car in train 2nd No. 43, were derailed, part of the derailed equipment swerving to the left and fouling the eastbound track; this equipment remained upright. The caboose of train 61 was demolished and the car ahead of it overturned. The employee killed was a brakeman of train 61.

Engineman Bertch, of train 2nd No. 43, said he brought his train to a stop at the interlocking home signal at WB tower at Butler on account of that signal being set against his train, and after waiting five minutes the signal cleared and his train left that point at 9:49 p. m. He saw and called the indication of the next block signal, signal A72.1, which he said was clear. Shortly afterwards the headlight of an eastbound train made it impossible for him to see the track or signals ahead, and after that train had passed, the smoke and steam blowing across the track, together with flying snow, obscured his view for several seconds. About this time he saw the whistling post near the state highway crossing and sounded the whistle signal, but did not realize he had passed two block signals without having observed their indications. He had previously dimmed the headlight on his engine and immediately after the eastbound train had passed he turned the headlight on fully, and as soon as the view had cleared he saw the markers of a caboose about 500 or 600 ft. distant and applied the air brakes in emergency, but the speed of his train, which he estimated to have been about 50 miles an hour, was too great and the intervening space too small to reduce its speed materially before the collision occurred. He said there was nothing about the engine to distract his attention from a proper observance of signals, and could not account for his having missed the two succeeding signals after passing signal A72.1, near Butler.

Conclusions

This accident was caused by the failure of Engineman Bertch properly to observe and obey automatic block-signal indications. The report of the Bureau of Safety closes with the statement that had an adequate automatic train-control device been in use on this line intervening to take control of the train when the engineman failed to observe and obey the signal indications, this accident undoubtedly would have been averted.