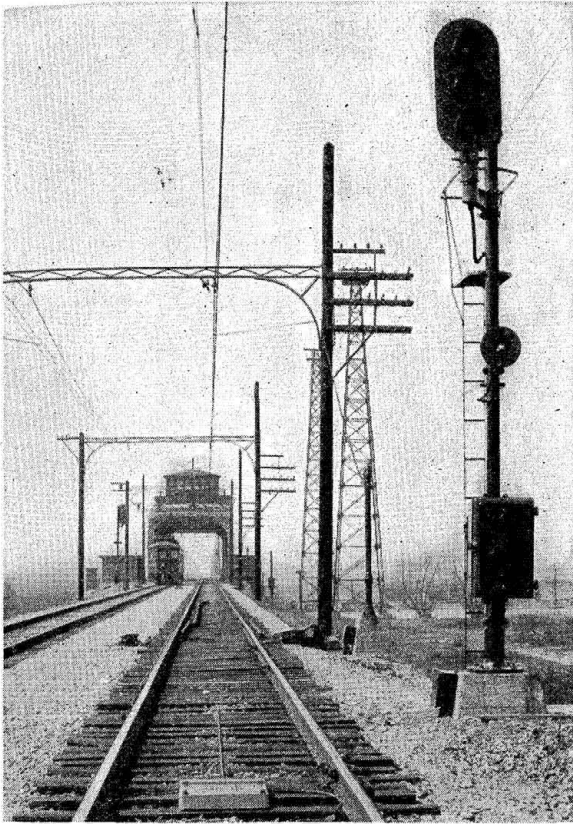


The Chicago, South Shore & South Bend's Signaling Progress



Color-light signal installed at an interlocking plant in modernization project

SEVEN years ago, when the present management took over the Chicago, South Shore & South Bend, there was, on this suburban electric railroad, about 56 miles of single track protected by a-c. semaphore signals, which had been installed in 1914. These signals had received very little attention, from a maintenance standpoint, due to the fact that there was no signal department. Occasionally the signals were looked after by the linemen or section men, but at that time it was not unusual to operate trains, for days at a time, disregarding all signals.

In August, 1925, the new management took over the railroad, and a signal department was organized, consisting of a foreman and two maintainers. A repair crew was organized in September and after two months' work the signal system was in condition to offer dependable service. By that time it was impossible for two maintainers to keep up with the work, so that a third man was employed. In the meantime, a study was being made of the existing signals, as well as proposed systems, consideration being given to increased traffic expected to prevail five years therefrom.

A decision had been reached to change the propulsion power system from 6,600-volts a-c. to 1,500- volts d-c., which necessitated changing the capacity of the impedance bonds. Therefore, although \$57,000 had been spent in rehabilitating the old signal system, it was decided to discard the old control equipment and install new signals.

The signaling construction program started in October, 1926, and continued until March, 1927. The old semaphores were dismantled and new color-light signals were set up to replace them. The relays and im-

Change of Chicago suburban electric railroad's management marked beginning of era of modernization in signaling and interlocking

By B. L. Smith

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pedance bonds were changed and the pole line was rebuilt using new copper line wire, all of this reconstruction being done under traffic.

Until 1927, no signals had been used on the 25 miles of double track west of Gary, but traffic became so heavy that we were forced to signal this territory, which includes two gauntlet bridges and three interlocking plants. Work on this project was started in the early part of 1928 and was completed in the summer of 1929.

Automatic Gauntlet

A unique arrangement of signaling that resembles interlocking in its operation, is used at the two gauntlets on this double track. Westbound trains are given preference over eastbound trains, and in the event that trains enter the approach clearing sections simultaneously, only the westbound train is given the block, this being accomplished by using a slow pick-up relay on the eastbound control. The normal indication of the home signal on each side of the gauntlet is Stop, and that of the approach signals, Caution. The approach control extends two blocks. As a train approaches, the distant signal clears, and in turn the home signal clears, providing that conditions permit.

The gauntlet signals are known as positive signals and are so distinguished by a lunar-white light mounted to the left of and four feet below the red light on the

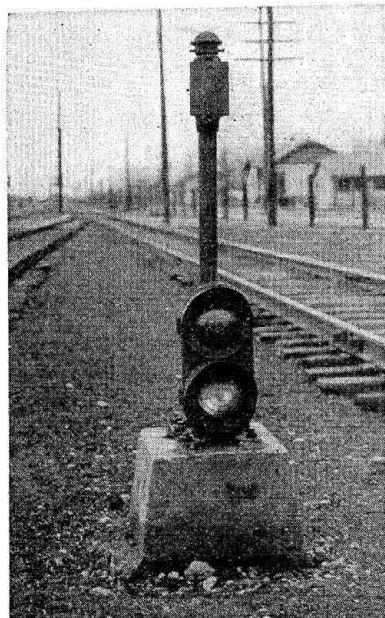


Map showing the territory served by the South Shore Line

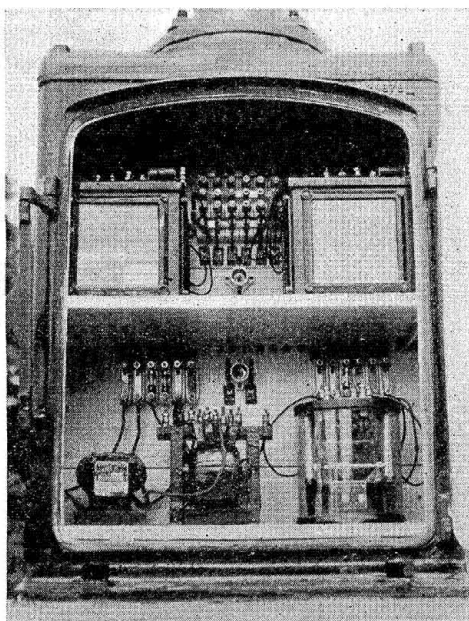
signal. When the signal is at Stop, a train must not pass it except when preceded through the gauntlet by a flagman. Another feature of the control is that trains are passed through in the order of their approach.

An interchange track was built to connect the west-

ward main with the Wabash. Since this track comes into the main line on the incline to one of the gauntlets, about 200 ft. in the rear of a home signal, a somewhat complicated problem was presented, as far as train operation was concerned. In order to avoid delays or the possibility of shunting a gauntlet signal in the face of an opposing train, an indicator was placed at the switch and a dwarf signal was installed back of the fouling point. When a train is about to come out of the interchange track and onto the main line, a trainman must look at the push-button indicator, and if it shows that there is no train in the approach section on either main line, he may then open the switch. When the switch is open, the dwarf signal will clear, allowing the train to come out onto the main line.



Dwarf signal and push-button case



Typical case wiring



Center-of-street flashing-light signal

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Special Control

To enable the handling of the large number of cars coming from this interchange track, and to save time and prevent unnecessarily long switching moves, a center track has been installed about 1,500 ft. east of the gauntlet.

This track is connected to both main lines at either end. The switch leading to the westward

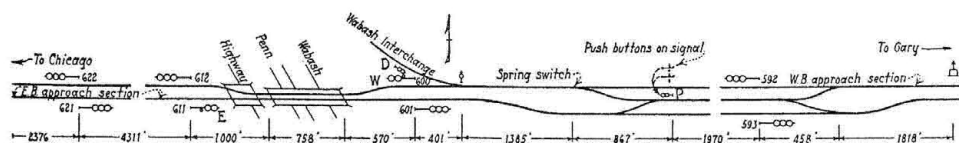
main line is a spring switch lined for the center track and is fitted with a No. 20 turnout. A westbound freight pulling out of the Wabash interchange, after using the indicator and getting a clear signal, goes out onto the westward main and moves eastward against traffic through the spring switch and into the center passing track. The train is now headed east. When in the clear, the engine is cut off, runs around the train,

that the gauntlet signal will clear, a dwarf signal was placed at the fouling point on the center track.

Spring-Switch Signaling

In connection with this, there is a short cable-post on the right side, at the west end, of the center track, on which two push-buttons are mounted in a small case. When a train is ready to leave the center track, one of the crew pushes the button marked "Set-Up", which lines up the route for this train to move over the gauntlet if no other train moving in the opposite direction has entered the approach section. The dwarf signal clears as soon as the gauntlet signal clears, and the route cannot then be taken by an opposing train. The train can then pass over the gauntlet at full speed, because the switch leading to the main line is of the spring type, as previously explained. If the train does not go out after using the button marked "Set-Up," the crew can push a button marked "Restore", thus changing the set-up back to normal. This arrangement was put in because it was necessary for a freight train to be under way in order to make the gauntlet grade.

In order to cut down running time on single track, the passenger trains meet at certain passing sid-

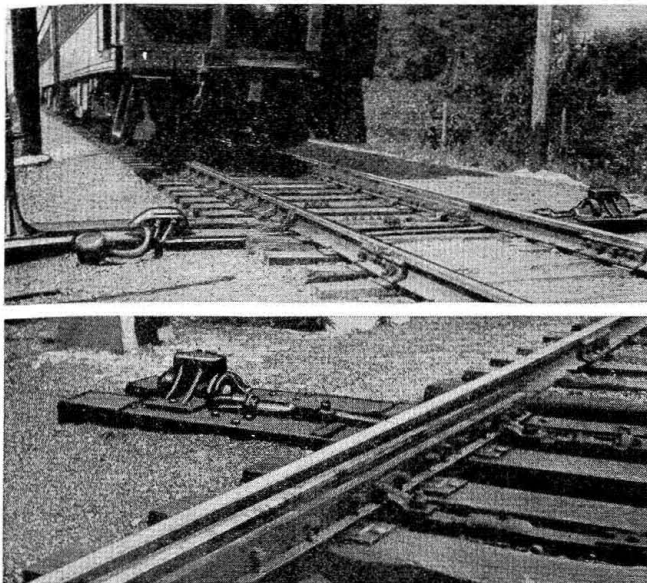


Track layout showing gauntlet interlocking and signaling for interchange track and center passing track

ings where spring switches and No. 20 turnouts are used. The switches are set so that trains in one direction run through the passing track. The points on these spring switches, built to our own specifications, are 30 ft. long, having a reinforcing bar of steel 1½ in. by 1¾ in. riveted in the web of the point. The switches are of the oil-buffer type using two springs, one mounted on the head-rod and one on the No. 4 rod, the latter

being used to stiffen up the point and to prevent rolling. The oil buffer allows the points to return to their normal position 20 sec. after the train has trailed through.

A signal used for facing-point protection, located 150 ft. in the approach to each switch, controls the block section of each track between siding limits. Between switches at the leaving end of each passing siding, the regular home signal governs to the next block in advance. The point-protection signals for the



Two views of a spring-switch layout. In the lower view, note the reinforcing bar in the web of the point

straight track are normally green, and those for turn-outs are normally yellow.

The straight-track signal has three indications: Green indicates that the points are up tight; red, that the points are not tight; yellow over red, that the points are tight, but that the rack ahead is occupied. This being a permissive signal, trains are allowed to move in without stopping, thus allowing two or more sections to close up within the limits of the siding length without delaying an opposing train. The turnout point-protection signal has the following three indications: Yellow indicates that the points are tight, but designates that the train will use the turnout; red, that the points are not tight; and yellow over red, a permissive indication, for closing up as stated above.

Centralized Control

The yards and dispatcher's office are located at the edge of Michigan City, two miles east of the downtown passenger station. One of the high-speed passing sidings, HS, is located three miles east of the dispatcher's office. A C.T.C. system, under the control of the dispatcher, was installed to direct train movements by signal indication between Michigan City and this high-speed passing siding. The eastward signal at the shop and the westward leaving signal at the siding are normally at Stop and can be cleared only by the dispatcher.

For a distance of two miles through Michigan City the tracks are in city streets. Consequently, unforeseen delays frequently occur in this territory. If an eastbound train is delayed in this section, it cannot make its meeting time at HS siding and, therefore, has to wait at the shop until the westbound train arrives at that point. This delays the eastbound train at least eight minutes.

This condition was corrected by the installation of the C.T.C. installation mentioned above. If an eastbound train is a few minutes late, the dispatcher holds the westbound train at HS siding, and advances the eastbound train to that point. The advantage in this operation is that it permits the eastbound train to arrive at its terminal on time. The few minutes delay to the eastbound train is not so important, as it has 60 miles to go, most of which is on double track; thus, it has an opportunity to make up the lost time.

The switch at the east end of the yard track enters the main line in this block section 2,000 ft. east of the eastbound home signal. It was necessary to bring the control of this switch into the dispatcher's machine, as it was desired to head freight trains—moving east to South Bend—out of this switch. This was accomplished by the use of a push-button indicator. The trainman pushes the button, causing a bell in the dispatcher's office to ring. If there is no train in the block section, the dispatcher moves the lever to the right and then to the center. This lights a lamp in the indicator, notifying the trainman that he can open the switch, and that the dispatcher has already blocked out trains from either end. When the switch has been opened, a dwarf signal back of the fouling point clears and this line-up cannot be changed by the dispatcher until the train has moved through the block or until the switch has been restored to its normal position.

Train-Order Signals and Crossing Protection

The train-order signals on this road are of the two-position color-light type, controlled by the operator and operated in conjunction with the nearest automatic signal. The panel board in the operator's office has a green and a red light, which are in series with the train-order signal, and give the operator information as to the position of the signal and as to whether the signal lights are burning. Ten-volt 18-watt precision-base lamps are used in these train-order signals, as well as in all other signals.

At the time the railroad was taken over by the new company there were only two crossings with highway-crossing protection. Air gates were in service at these two crossings, which were in Gary. Since then we have protected 35 crossings: Two with automatic gates, 28 with automatic flashers, and 5 with manually controlled electric gates.

At the crossing of our line with the Michigan Central in Michigan City, it was formerly necessary for trains to stop before proceeding, but now there is an electric interlocking plant at this point. At State Line and Burnham, where mechanical plants were in service, detector bars were formerly used, but were eliminated in favor of approach and detector locking. The Burnham plant is now being further improved by installing d-c. low-voltage switch machines.

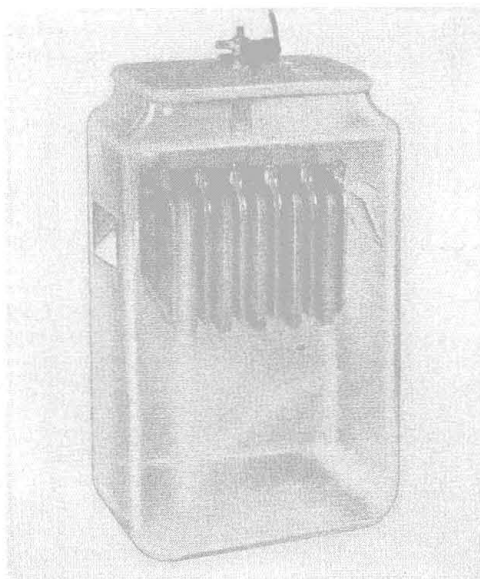
Train Operation Expedited

All these improvements have greatly speeded up train movements and increased the capacity of the track. For example, on the single track between Gary and Michigan City, freight service has been benefited greatly. With passenger trains operating on hourly service, it has always been necessary for a freight train leaving Michigan City to follow one of the regular westbound passenger trains, which are scheduled to leave 44 min. after each hour. Heretofore, such freight trains have been able to go to Powers siding, 5 miles

(Continued on page 55)

Another development, known as the Edison Voltage Regulator, makes this new 1,000-a.h. cell particularly suitable for the operation of color-light signals. In construction and appearance this regulator is similar to an incandescent lamp with a standard screw base, and with a filament made of tough, durable alloy. Under average conditions where approach lighting control is used, it is estimated that the regulator should have a life of approximately seven years.

In operation, the filament is in series with the lamp. The filament acts simply as a hot-wire resistor—the higher the voltage the hotter it gets, and its resistance increases in proportion. Within limits, any voltage exceeding the required maximum—such as that voltage which might otherwise prevail following a period of open circuit or light discharge—will be “dissipated” by this filament, and consequently the voltage impressed on the lamp is always remarkably uniform.



The new Type-HA1002 Edison primary cell

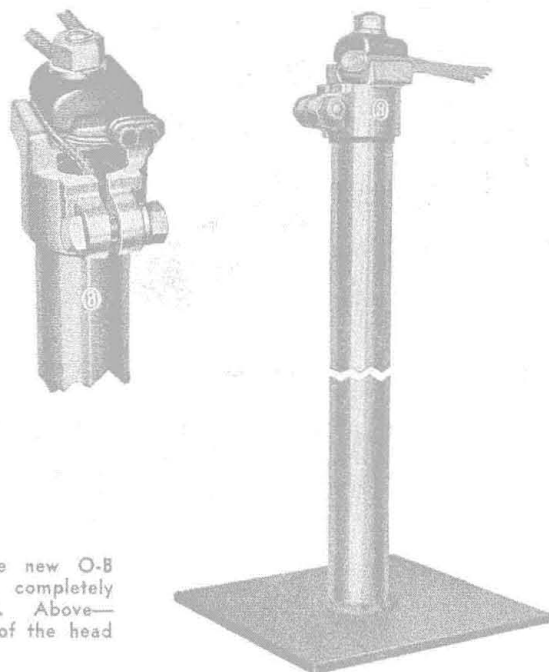
Positive voltage regulation of this type protects the filament of the signal lamp against overload, thereby prolonging its life and materially reducing the danger of lamp failures. In addition, it has the effect of conserving battery energy, of providing a high degree of uniformity of signal indication and eliminating fading.

O-B New Parkway Pothead

The Ohio Brass Company has introduced a new pothead for parkway cable. Like other similar devices, this is a permanent outlet for the cable and a permanent seal for its insulation at the point where the cable emerges for connection to track-leads. With this new pothead, inspection of connections is said to be easy and immediate. There are no covers to remove and the device need not be disassembled. The fiber which is used for the purpose of insulating the head casting from the grounded pipe, is in compression, and, since this fiber is assembled between metal and thus protected, it is claimed that it cannot weather, shrink, or otherwise get out of shape, and that its life will be long and satisfactory.

The device is easy to assemble. Connections may be either soldered or just clamped to the head casting, which fits either welded bonds, pin-type bonds, single or double channel pins or single and duplex pin bonds. The con-

ducting clamp is made of bronze. Bronze bolts, for use under extreme corrosive conditions, are supplied on order; otherwise, the bolts furnished are galvanized steel.



Right—The new O-B pothead completely assembled. Above—Close-up of the head

The base-plate of this pothead is made of $\frac{1}{4}$ -in. steel plate, which is 8 in. square and which, when buried, provides sufficient bearing surface to keep the pothead firmly in position. The height of the riser pipe is 18 in., and its diameter is $1\frac{1}{4}$ -in. A $\frac{1}{2}$ -in. bolt with a hex nut is used at the top, to clamp the bootleg connections, and a $\frac{3}{8}$ -in. bolt is used to clamp the head on the riser pipe.

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Signaling Progress on the South Shore

(Continued from page 41)

distant, to clear the next eastbound train. If on time, the freight train could then proceed to Wilson, which is a high-speed siding similar to the Powers siding, only longer. At this point they would clear another eastbound train, as well as a westbound train, the eastbound train being due at the west end of the siding at 9 min. past the hour, and the westbound train being due at the east end of the siding at 14 min. past the hour.

Clearing two trains at Wilson invariably meant that the freight train would have to back over onto the eastbound main line and would delay one of the trains for a short period of time. However, with the new siding at Powers, it is now possible for a freight train to leave the shops at Michigan City, proceed to Powers to clear the eastbound passenger train at 24 min. after the hour, and then proceed to Wagner, which is the next siding west of Wilson. In some cases, when conditions are favorable, a freight train can clear an eastbound passenger train at Powers, and proceed to Gary to clear the next eastbound train, which leaves that point at 58 min. after the hour. Thus, freight trains which previously consumed from 3 hr. to 4 hr. between Michigan City and Gary, now make the trip in from 1 hr. 15 min. to 2 hr. A passenger train formerly required 2 hr. 50 min. to go from South Bend to Chicago, but now, due to these changes, it is possible for this same train to make the run in 1 hr. 50 min. Trains on time in the past year averaged 97 per cent, as compared with a previous percentage of around 50.