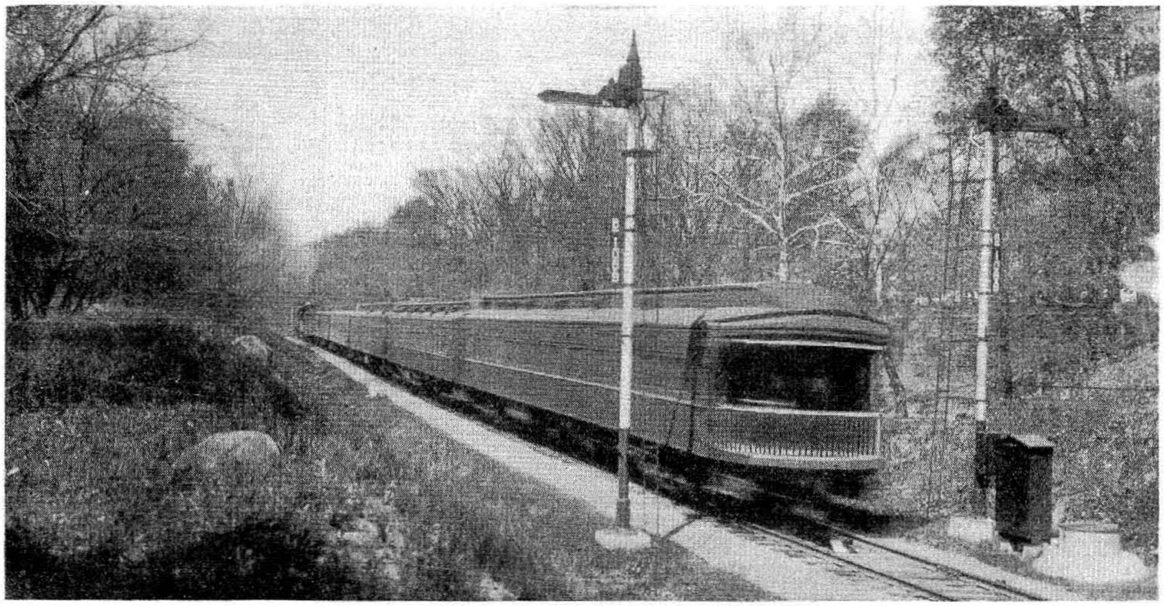

The route of the Hoosier is protected by automatic signals and train stop

Monon Revamps Signals to Co-Ordinate with Automatic Train Stop

Part I—Signal reconstruction program embraces 161-mile single-track line between Hammond, Ind., and Indianapolis*

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IN 1911 the Chicago, Indianapolis & Louisville (Monon Route) installed an automatic block signal system between Hammond, Ind., and Indianapolis, a distance of 161 miles of single track. The signals were the General Railway Signal Company's Model-2A operating in two positions with circuits arranged for overlap. The intermediate signals between sidings were staggered 3,000 ft. apart. There were also caution signals located 2,500 ft. in approach to meeting points at sidings. When the Interstate Commerce Commission issued its order No. 13413 in 1922, calling for the installation of automatic train control or train stop on certain railroads, it included the Monon. Upon the petition of the management of the railroad, the commission consented to a change in the prescribed territory, so that a fulfillment of both of its requirements under the order would be taken care of on that portion of the line between Hammond and Indianapolis, this being that section of the line carrying the heaviest passenger traffic.

Intermittent Inductive Train Stop

After due consideration it was decided to install an intermittent, inductive device as a plain automatic train stop, but with such a device on single track it was found that it would be necessary to make considerable alterations in the existing block signal system. It was believed that for the best operation of trains the overlap of the track elements in an intermittent device should not be any greater than the overlap of the block signals which controlled them; also that, wherever possible, there should be braking distance between one track element and the next. To secure this braking distance, it was obvious that certain block signals would have to be moved to new locations. To make one track element serve for both directions on single track, it was necessary to place the element in the center of the track between the rails and to have the track element controlled by a block signal for each direction. To secure this arrangement at a double location of signals, it was necessary to separate the intermediate signals a sufficient distance, and then to relocate the approach signals for the meeting points at the sidings opposite thereto. This arrangement of having one element in the center of the track serve for both directions made quite a saving in the cost, compared to what it would have been had there been a track element installed on the outside of the rail for each block signal.

In carrying on the work of relocating the signals, the first practice was to use a derrick and work train to pick up the signal complete with its foundation and move it to the location where the new excavation had been made. Flat cars were used so that several signals could be moved with one train. Considerable difficulty and delay was encountered, however, in attempting to have the old foundations fit the new excavations, therefore, in order to hasten the reconstruction, a concrete gang was later set to work and new foundations were cast in place, the old foundations being abandoned when the signals were removed. The saving of time of the

*Part II explaining the train stop system will be published in a later issue.

work train and signal crews helped to compensate for the cost of the new foundations.

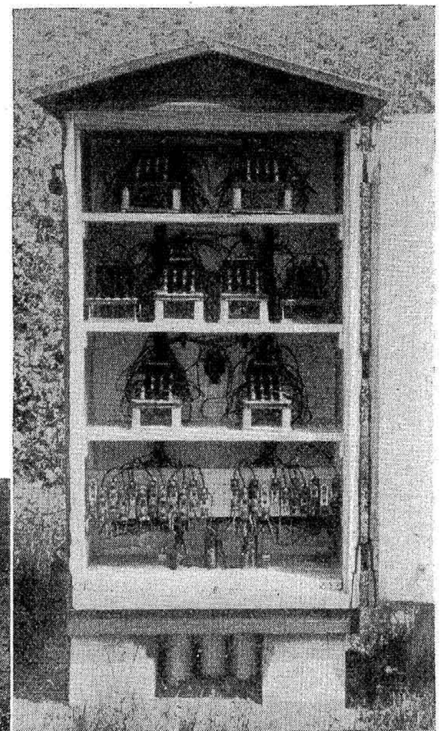
Electric Lamps on Signals

Owing to the ever increasing pressure to reduce maintenance cost, it was decided to take advantage, in the reconstruction work, of several improvements in signal practice. One of these was the use of electric lights in place of the existing oil lamps, which was accomplished by installing an Edison adapter in the existing lamp body and removing the oil fount. At interlocking plants, new cast-iron electric lamps were placed on the home signals.

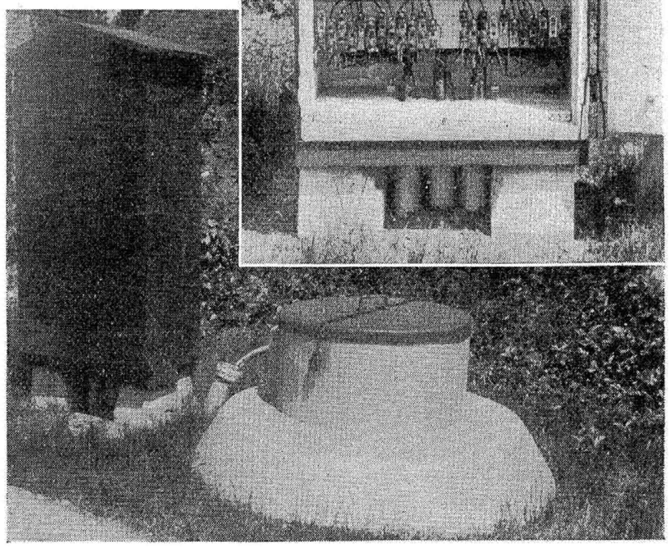
At several stations where 110-volt, a-c. commercial current was available, transmission wires of No. 10 copper with weatherproof insulation were installed and Balkite electrolytic rectifiers with transformers were placed at the signal locations to trickle-charge Exide Type KXHS7 storage batteries for both signal operation and track circuits. At a few points, the 110-volt, a-c. was boosted to 440 volts and carried on No. 10 copper weatherproof line wire for distances up to eight miles to serve several signal locations, but where the distance exceeded eight miles the existing Edison primary battery was left in service.

Parkway Cables Used

Another improvement carried out at this time was the use of Okonite parkway cable. All connections between the batteries and the rails, or between the relays and the rails, are made with single-conductor No. 9 cable having a 3/64-in. wall of rubber and a steel-tape armor. The connection to the rail is made by using a cast-iron bootleg in which a splice is made between the conductors of the parkway and a short length of No. 12 flexible wire. This splice in the bootleg is surrounded with petroleum asphaltum to keep out moisture. The flexible wire is soldered to a standard No. 8 bond wire which is fastened to the rail. The cast-iron bootlegs have a malleable iron top which affords excellent protection to the bootleg itself as well as to the wires and cable within. The connection between the battery well and the relay case is made with a cable of four conductors of No. 9 gage copper. Between the relay case and the signal mechanism, the circuits are run in parkway cable composed of 12 conductors of No. 14 gage solid copper and 3 conductors of No. 9 gage solid copper.

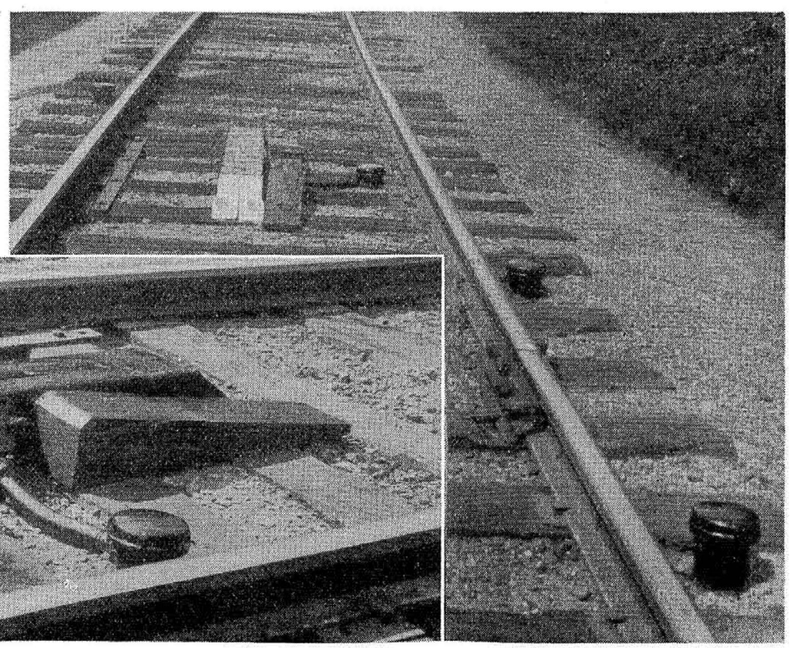


Interior of relay case. Note small reactor between two relays on first shelf

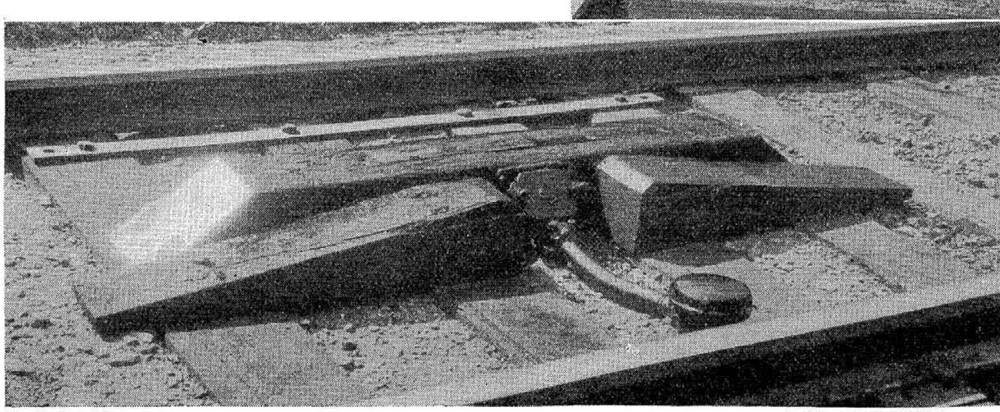


Parkway cable is protected at ground line by means of vitrified pipe

All the parkway cable, except the single-conductor, has a lead sheath to protect the rubber insulation and then a layer of steel tape. To prevent undue rusting of the steel tape, where the cable enters the ground at such places as the battery well, the signal foundation, and the relay case, a four-inch vitrified sewer pipe is



Right—Location of parkway outlets at an inductor



Below—Close-up of G-R-S train stop inductor. Note method of protecting outlet box and flexible conduit installed, this pipe extending 10 or 12 in. above the surface. After the cable was put in place through this sewer pipe a quantity of hot petroleum asphaltum was poured around the cable until the pipe was filled. At the relay cases the sewer pipes are set so that their tops extend through the bottom and into the inside of the case. These latter pipes are filled with Lastik weatherproof cement furnished by the Lastik Products Corporation. This material has the advantage of a satisfactory seal for the cable, without being soft enough to run in hot weather, nor hard enough to crack in cold weather. Furthermore, it can be dug out with a blunt edged tool without the use of heat. This is desirable whenever it becomes necessary to add or replace a cable.

At the same time that the signals were relocated so as to have them in pairs, the circuits were changed. The A. P. B. scheme of signal circuits was used, thus the signals now operate in three positions and the signal overlaps are discontinued. At some of the shorter passing tracks, where there is not sufficient braking distance between signals, the overlap was supplemented by having two signals display the approach indication. At each signal location, all of the relays are housed in a wooden relay case measuring 15 in. by 35 in. by 5 ft. 6 in. high. This case is mounted on a creosoted oak block which is supported by two A. R. A. concrete pipe carrier foundations.

[Part II, explaining the train stop equipment, will be published in a later issue.]

Report on C. & N. W. Side Collision at Chicago

INABILITY to control the air brakes on a back-up train at the Chicago & North Western terminal, Chicago, on January 26, 1929, is given as the cause of a side-collision with an outbound suburban passenger train, in the recent report of the Bureau of Safety. The back-up man was not able to bring his train to a stop at an interlocking signal indicating "stop," owing to a stoppage of the air flow through the train brake pipe, caused by "the formation of an ice plug, which became lodged in the air hose at the head end of the next to the leading car." This rendered ineffective the attempt to apply the brakes by means of the "tail" hose valve. One passenger was killed and 51 were injured.

Lake street interlocking tower is located on the north side of the tracks and between the west end of the train shed and the point of accident. Signal bridge "A," which spans the lead tracks, is located about 95 ft. west of the point of accident. Interlocking signal 13, the signal involved, is of the three-position, semaphore type; it is located on the bridge and governs eastbound movements on lead track 2. A stop indication is displayed by this signal when the route is lined for a movement westbound from the station on lead track 2 and thence through the crossover up movement eastward or inbound. From the California avenue coach yard to the passenger terminal at Madison street, a distance of about 3 miles, the movement is controlled by means of a tail-hose in charge of a back-up man. No train orders are issued covering these back-up movements.

After empty coach trains are made up in the California avenue coach yard they are inspected and the car inspectors test the air brakes by means of the yard plant. When a train is ready to start the movement to the passenger terminal, the back-up man makes the coupling between the road engine and the train and after the air is pumped up the engineman makes a service air-brake application. The back-up man then walks the length of the train, inspecting the piston travel on the cars; on arrival at the rear end of the train, provided the air brakes have set properly on all of the cars and the piston travel is normal, the back-up man gives the engineman an air whistle signal to release brakes, then attaches his tail hose to the leading car and opens the valve on the tail hose to ascertain that the air flow is all right and that the brakes apply when operated from the leading end. The train then departs from the yard and the back-up man makes a running test of the air brakes to determine whether they are working properly. During the course of the back-up movement, enginemen leave the brake valve in the running position, placing the air brakes entirely under the control of the back-up man.

The leading car was uncoupled from the equipment of train No. 155 after the accident; the back-up man was instructed to have the balance of the equipment pulled ahead and then backed into the station on another track. He signaled the engineman to pull ahead a short distance so that he could go between the cars and couple his tail hose to the rear of the train line and at that time he discovered ice in the hose on the rear of the car. He tried to blow it out by opening the angle cock quickly but had no success; he then signaled the engineman to pull ahead and after reaching signal bridge "D" the train was again stopped and at about this time he saw Assistant Division Superintendent Koch and called the latter's attention to the matter. Mr. Koch stated that on examining the hose on the rear of the car he found that ice had formed in the hose and he expressed the opinion that it resulted in the opening being from 65 to 75 per cent closed. After they succeeded in blowing it out, it was found that the piece of ice was very dark, indicating the presence of oil; it varied 1⅛ to 2 in. in length and was from ¾ to 1 in. in diameter and irregular in shape. There was an impression of a rim on one edge of it, where apparently it had lodged against the air hose gasket. After its removal the air brakes were tested and the train was then backed into the terminal and brought to a stop without incident by means of the tail hose valve.

The report concludes that, "This accident was caused by the failure of the back-up man to stop the train before passing interlocking signal 13, due to a stoppage of the flow of air through the brake pipe in the equipment of train No. 155 as a result of the formation of an ice plug which became lodged in the air hose at the head end of the next to the leading car, thereby preventing the air brakes from taking effect when an attempt was made to apply them by means of the tail hose valve.

"Careful inspection of the tail hose used in the back-up movement failed to disclose anything that would have caused or contributed to the accident, and the cause for the formation of the ice could not be determined. According to the records this was the first accident to occur on this railroad from such a cause since January, 1915, a period of 14 years, during which time between 2,200,000 and 2,500,000 back-up movements were controlled by means of tail hose. Coach 3251 had been in service on 16 trips between Chicago and northern Wisconsin from January 1, 1929, up to the time of the accident."