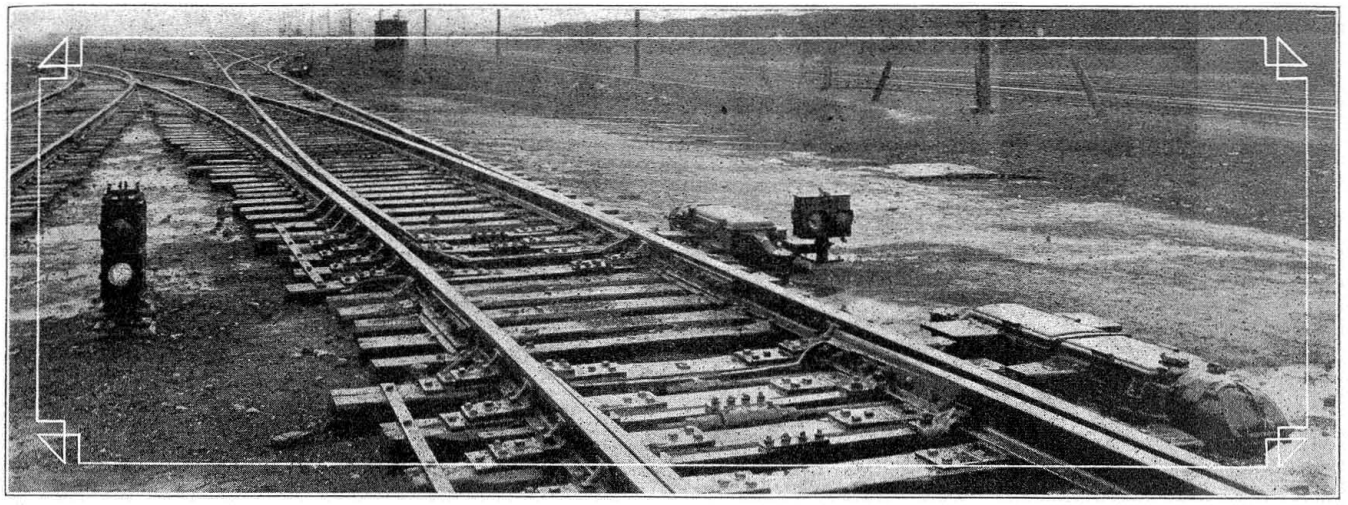
Railway Signaling

Volume 21 January, 1928 Number 1



At extreme right is one of the Model-5A machines for interlocking—Above it is one of the Model-6 high-speed machines for yard switching, the two layouts meet at these switches

Electric Interlocker and Switch Control Speeds Up Yard Operation

New York Central completes dual installation of G-R-S electric interlocking and yard switching facilities at Gibson, Ind.

ON December 22, the New York Central placed in service a combination electric interlocker and yard switch control plant at the east end of the westbound receiving yard of the Indiana Harbor Belt at Gibson, Ind. Approximately 500 engine and train movements are made daily through this plant. The unique feature of this installation is the combination within one tower of two distinct electrically-operated plants, one an interlocking layout and the other purely a yard switch control layout. A G-R-S Model-2 unit-lever type electric interlocking machine with 14 working levers, 3 of them for operation of G-R-S Model-5A switch machines and 11 for the operation of color-light home and dwarf signals, is located in the center of the operating room and directly in front of the illuminated track diagram. To the left of the interlocking machine is located the yard switch control machine. The latter is in every respect similar to the G-R-S control machines made for car retarder installations, the control levers for the retarder units being omitted. Sixteen G-R-S Model-6 high-speed switch machines are controlled from this board.

The tower is a two-story brick and concrete structure, the first floor containing the battery room, charging and relay room, yardmaster and bill clerks room, while the upper floor houses the two control machines and communication facilities for the towerman. The basement contains steel locker facilities for yard switchmen and other employees.

Interlocking Plant Has No Derails

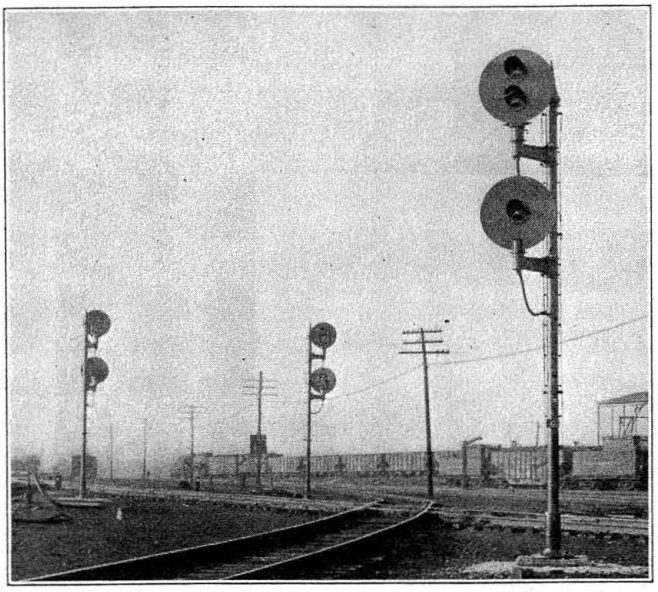
Owing to the fact that all train and engine movements through this track layout are at slow speed, it was possible to simplify the interlocking installation considerably. No derails are employed and distant signals are omitted. The interlocking layout comprises two single-track crossings, all tracks belonging to the New York Central, together with three power-operated switches. The three switches govern the approach to the receiving yard lead tracks for all trains entering from the south or north.

The east crossing is protected with four G-R-S two-position color-light slow-speed home signals located approximately 35 ft. from the diamond. The top unit is a two-indication color-light signal with yellow or red signal aspects, red being at the bottom. A separate marker signal unit is located directly below the top signal unit and continuously provides a red aspect to signify an absolute interlocking signal. These home signals, and in fact all of the signals in the Gibson yard layout, are continuously lighted by alternating current, 8-volt 18-watt lamps being used in both the high and dwarf signals. The dwarf signals provide two indications, yellow and purple to govern reverse traffic operation.

A noteworthy feature of the Gibson installation is the exclusive use of parkway cable for all signals, switches, and track circuits. At the high and dwarf signals the parkway cable is carried directly into the signal unit before it is terminated in a suitable pothead. The parkway cable, in the case of the high signals, enters the signal foundation through a pipe elbow and continues up inside the pole.

Parkway Outlets at Rail Connections and Switch Machines

At rail connections, the parkway cable is brought to the surface through a two-inch pipe riser embedded in concrete, the pipe being slotted at the top and fitted with an ordinary pipe cap. The parkway is



G-R-S two-indication color-light home signals are located about 35 ft. from crossing

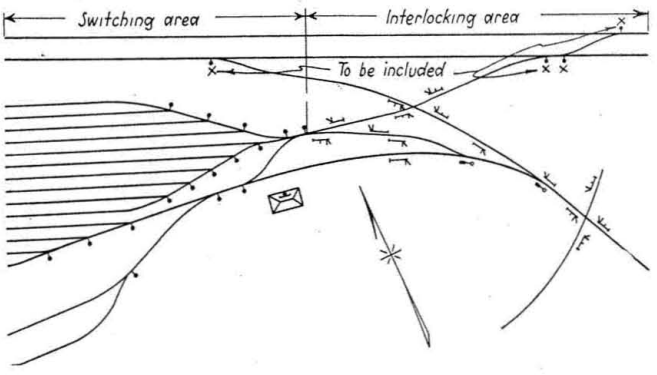
carried through the pipe and for a distance of about two feet beyond the outlet. A short length of rubber air hose is slipped over the armored cable at the point where it is attached to the web of the rail in order to keep it from making contact with the rail. The soldered and sealed connection with the copperweld bond wire used for rail connection is housed within the short length of rubber hose.

At the switch machines the parkway is brought to the surface through a three-inch pipe flared at the bottom to secure suitable bearing and provided with a right-angle elbow connected at the top. A short length of flexible metallic conduit is used between the elbow connection at the top of the pipe riser and the switch machine entrance box; the parkway cable being terminated within the switch machine.

Single-conductor No. 8 parkway cable with lead, steel armor and jute covering is used for relay leads and battery feeds. A multiple-conductor cable, similarly covered, is used for signal and control purposes at the interlocking end of the Gibson plant. All wires in multiple-conductor cable are No. 12, the number of wires in one cable being either 10, 7 or 5, to suit requirements. In the yard switching end, two 3-conductor parkway cables are carried to each Model-6 machine. One cable is for operation and has three No. 10 wires, the other is for the indication lights on the control board in the tower and has three No. 12 wires (one for normal indication and one for reverse indication). As will be explained later, each indicating circuit is entirely independent of every other indicating circuit, an individual return wire being included for each.

Single Rail Track Circuits Employed

The track circuiting of the Gibson installation was considerably simplified by adopting single rail track circuits. This was possible because of the extremely short length of the circuits and the excellent ballast and drainage conditions throughout the track-circuited area. One rail of each track is doubled bonded with copperweld No. 6 wire throughout the plant, this rail being connected to the negative side of the three-cell, six-volt Exide Type-EMG battery in the interlocking tower, for feeding all sections at the west end of the plant. Insulated joints are placed in the positive rail between adjacent track sections. Power distribution for track circuit purposes is further simplified by running a positive battery wire with connections to each of the switch machines in the yard switching layout where further connection is made to each positive rail through a 30-ohm resistance unit located in the switch machine. The only individual wire connection to each of the track circuits is for the track relay, and one wire only is run to the other end of the positive rail for this purpose. An adjustable resistance unit (0.1 ohm to 5 ohms) is inserted in each of the two relay leads to com-



Track plan showing extent of yard switch control area and interlocking area

pensate for variations in ballast conditions and to equalize the resistances of the track circuits for varying distances from the tower, where the track relays are located. At the west end switching layout, the track circuits extend from a point approximately 5 ft. ahead of the switch to one rail length beyond the switch point, a total length of about 50 ft. This length insures against the possibility of a car spanning the track circuit and not dropping the track relay.

At the east end of the interlocking plant it was believed that better track circuit operation would be secured by providing independent battery feeds for each circuit. Accordingly, one cell of Exide 120-amp. hr. storage battery was connected to each circuit. These cells were housed in small iron boxes, wood lined, mounted above ground, the boxes containing also the Balkite rectifier cell for keeping the cells charged by the a-c. floating system. Also, two track circuits in the immediate vicinity of the interlocking tower are fed with independent batteries, the cells being located in the main battery room of the tower. Aside from these exceptions, however, all of the track circuits in the plant are fed from a common three-cell six-volt track battery located in the tower.

The main operating battery comprises 55 cells of Exide Type-EMG chloride accumulator storage battery, each cell consisting of four Manchester-type positive plates and five box-type negative plates, the cell capacity being 120 amp. hr. The glass jars are mounted in glass sand trays placed on a wood bench at a height of about four feet above the floor. This bench has also a bottom shelf for cells about three inches above the floor, both shelves being carried around the four sides of the room. Acid resisting paint covers all woodwork as well as the walls and ceiling. Inasmuch as the storage battery is trickle charged it is expected that there will be no destructive corrosive effects in the battery room.

Tower operating room containing yard switch control machine (left), illuminated track diagram and electric interlocking machine (right)

An adjoining room on the first floor of the tower contains the charging panel and relay rack. The charging panel incorporates several novel features designed by the late Dwight Byers, formerly chief signal inspector, New York Central. The unique feature of this panel is the multi-tap transformer and rotary dial-type switch to control the charging rate of the 55-cell operating battery. A Tungar bulb of 7-amp capacity is mounted on the front of the panel and its charging rate may be varied from about .2 amp. to 2.5 amp. by manipulation of the rotary switch.

For charging the 5-cell control battery, a regulation type Tungar rectifier is mounted at the rear of the panel. The ammeter for the second rectifier is mounted on the face of the panel, together with the voltmeter and ammeter for the first mentioned rectifier that charges the main 55-cell battery. An overload circuit breaker protects the charging equipment as well as the storage battery.

A total of 39 Model-9E, 4-point relays are mounted on the relay rack. Of these 24 are of 430-ohms resistance and are employed for control and route locking purposes. The remaining 15 relays are of 9.2-ohms resistance and are for track circuit operation. The relays controlling the operation of the interlocked switch machines are provided with two 110-volt contacts to handle the operating current.

The relay rack also is used to mount the solenoid relays employed in connection with the yard track switch control machine. Each solenoid relay has two windings, mounted one above the other, the relay itself being mounted in a vertical position. When the control lever is reversed battery is connected to the upper or high resistance winding and then to the control wire outside the plant. This picks up the solenoid control relay and completes a circuit through the low-resistance or bottom coil on the relay, through which a multiple connection of battery to the control wire is made. The resistance of the lower winding allows enough current to flow to operate the switch machine. This solenoid relay, because of its stick feature, insures a complete movement of the switch machine when once started, irrespective of the position of the track relay. However, the track relay must be up before a switch movement can be initiated.

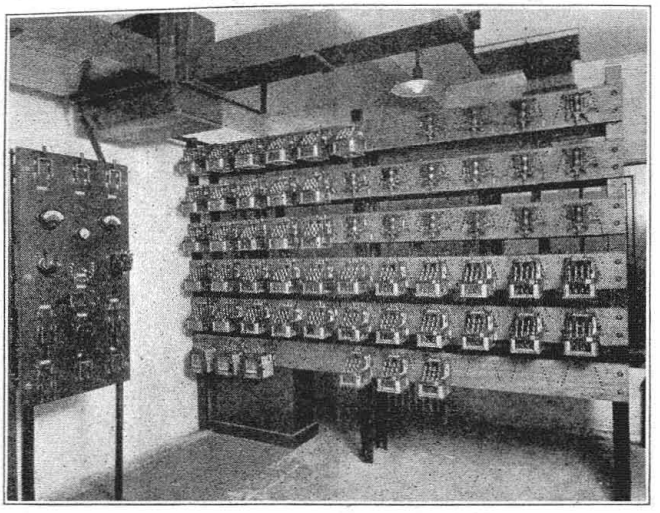
All parkway cable enters the tower through a concrete manhole located in front of the relay room. From there the cables are carried in a wooden runway provided in the wall of the tower and also through a trough provided in the concrete floor of the relay room. The trough in the floor has removable cast iron covers. Wooden conduit supported from straps bolted to the ceiling houses all cable and wire carried from the vertical runway in the wall to the machines upstairs and to the relay rack.

G-R-S Model-6 Yard Switches Used

A total of 16 Model-6 yard switches are controlled by the car retarder control board in the operating room of the tower. Low-voltage toggle switches are used on the control board, each switch being provided with two switch indicating lights and a track circuit indicating lamp. The switch indicating lamps are controlled in multiple with the switch target lamps. Three wires are carried to the switch indicating lamps for this purpose. The targets are controlled by means of a switch circuit controller incorporated in the Model-6 switch machine and are

fed by a 110/12-volt transformer. The targets provide either a lunar white or yellow indication. Each switch is protected with a short track circuit, the condition of the track circuit being indicated on the control board by a red lamp near the control switch.

The operating officers of the Indiana Harbor Belt which operates this property anticipate that the new installation will eliminate a great deal of congestion at the throat of the westbound receiving yard by speeding up train and engine movements. In fact, the general superintendent contemplates connecting up four additional switches for power operation and control from the present tower. This proposed extension of the interlocking plant will eliminate three switch tenders at an approximate saving of $500 a month. When this extension is completed, and when more operating figures are available, it is expected that a definite saving will be shown.



Byers charging panel at left and relay board at right—Solenoid relays for Model-6 yard switch machines are mounted in upper right corner

All the engineering work in connection with the plant at Gibson was carried out under the general supervision of F. B. Wiegand, signal engineer, New York Central, Lines West, Cleveland, Ohio. C. E. Rowe, signal supervisor, Illinois division of the New York Central, was in direct charge of the construction work, assisted by F. J. Fleming, construction foreman.

Preparation of Circuit Plans

By J. M. Carley

Signal Estimator, Baltimore & Ohio, Boston, Mass.

WHILE there has been progress in standardization of signal plans in the past few years, and many railroads have adopted "written circuits" instead of the older forms of circuit plans there are many who stick to the idea that nothing is quite as satisfactory as a track plan made to vertical scale (but not horizontally) showing the various units and the actual connection of the wires to the rails, signals, switch circuit controllers, etc. This type of plan is drawn for a certain job and can be corrected and filed as a record of what was approved for installation and what was actually installed, this by making a Van Dyke* of the plan after approval and another Van Dyke after the tracing has been corrected in accordance with the marked print sent in by the engineer in charge of the work showing the work "as installed."

So-called "typical" circuit plans are frequently made with blanks left which may be filled in on the tracing (or with crayon or water colors on the blue print) to show the particular location to which that plan applies, such as: "DOUBLE SIGNAL LOCATION *at Sta. 215 + 800*" *or* "CUT SECTION *at Sta. 230 + 825*," the italics signifying the portion to be filled in by either of the methods mentioned above. The major use of the typical plan, or as it is sometimes called, the "standard" plan, is to establish a set of plans which will be a sort of an enyclopedia to those requiring such information. These show the approval of the responsible officers, or heads of departments, of combinations of units and accessories in a manner that will promote safety as well as provide the most economical arrangement; they are generally drawn to embrace various kinds of apparatus without specifically referring to the type, for instance, the controller contacts for a signal will be shown as "closed 0 deg. to 5 deg." or the resistance of a relay and number of contacts. The large circuit plan is therefore a combination of the typical plans, put together by a draftsman who possesses a good portion of common sense and ability to visualize the complete plan. Actually the circuit designer becomes so familiar with the typicals that he needs only to refresh his memory occasionally.

Another type of plan has become quite popular which I will designate as the "book" type for want of a better name. These plans are prepared in convenient sized sheets, about 15 in. by 24 in., each class of circuits being set up together. At an interlocking plant all electric route-locking circuits would be on one sheet, signal control circuits on another sheet, etc. This scheme has the great advantage of incorporating the sketches of the circuits which are necessarily made by the designer, the checker, the field wireman and finally the inspector, into a plan, possibly avoiding errors in copying from another plan. It is an excellent plan to do wiring by and to check circuits with. It does not show, however, the assembly of units and wires that for certain purposes may be required. Also a sheet may be inadvertently omitted in sending out plans and the omission not noticed until the lack of the sheet will be bothersome if not expensive.

As to the actual drawing of the plans, the satisfactory method seems to be to use 10 by 10 cross-section paper, which is available in 50-yard rolls in different widths (20 in. is a convenient size), with the ruling in red, as it is easier to see through tracing cloth than green lines. The track plan is carried along at the top of the plan and the pole line, at the bottom. The ruling is particularly convenient as one space can be used for the width of the track, two spaces square for a relay symbol, etc. If there is much probability of important errors in the designer's work, a cursory check of the pencil detail work may be profitable. Usually the errors and changes are so minor that the tracing can be changed after the checker and circuit engineer have made their check. Clear separation of locations without a great waste of paper is important. Frequently it will be necessary to break the track plan at an interlocking plant and often also to break the pole line, otherwise the width would have to be increased. It is desirable to show only the cross-arms where wires on the line are broken or added. The size of plans will, of course, vary considerably, but it seems advisable to keep the width to a certain predetermined figure, increasing by multiples of say 7½ in., the length depending on the general location.

* A brown print from which white prints can be made on blueprint paper.