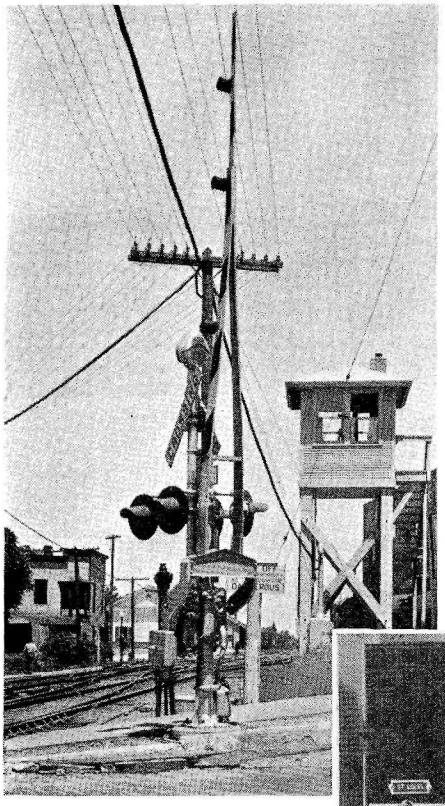
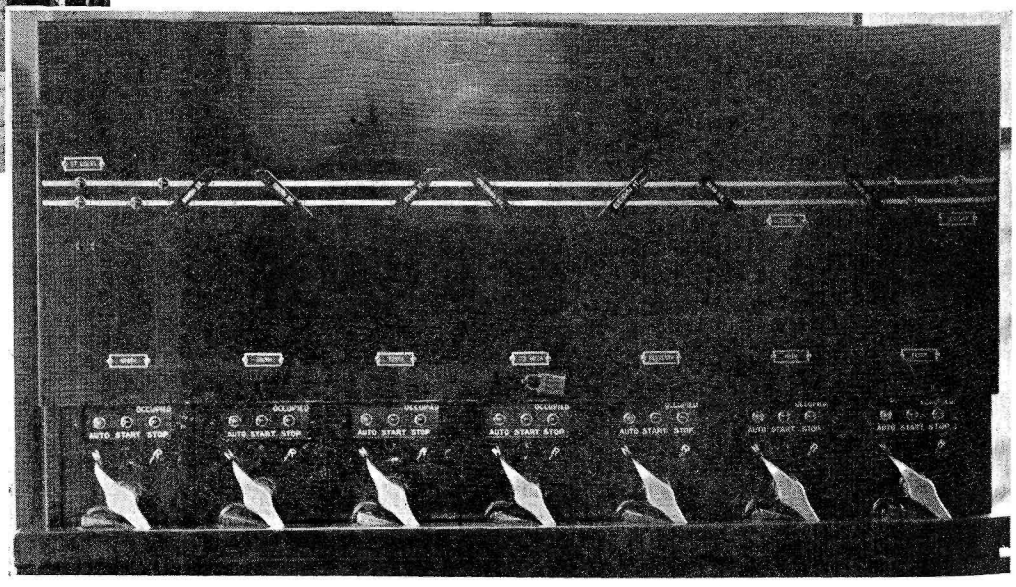
Wabash Installs Gate and Signal Protection For All Crossings in Lafayette

THE installation of short-arm gates with flashing-light signals at five crossings, flashing-light signals only at two crossings, short-arm gates added to an existing flashing-light signal installation at another crossing, and the closing of one crossing, mark the completion of the first unit of a three-year program undertaken by the Wabash railway to provide effective protection, in service full 24 hours every day, at the 18 street crossings at grade in the City of Lafayette, Ind. The main line of the Wabash between St. Louis, Mo., and Detroit, Mich., passes at grade through the densely built up residential sections of the south and eastern portions of the city. South street is business route No. 52, the major portion of through traffic on this route is over a new city by-pass which crosses the tracks on an overhead structure north of the city. Fourth street, where short-arm gates were added to an existing installation of cantilever mounted flashing-light signals, is route No. 43. Comparatively heavy local vehicular and pedestrian traffic is handled on several of the streets, especially on Main and Ninth streets.





Above—View at Main street looking east showing control tower Right—Manual control machine with the control levers locked in automatic position

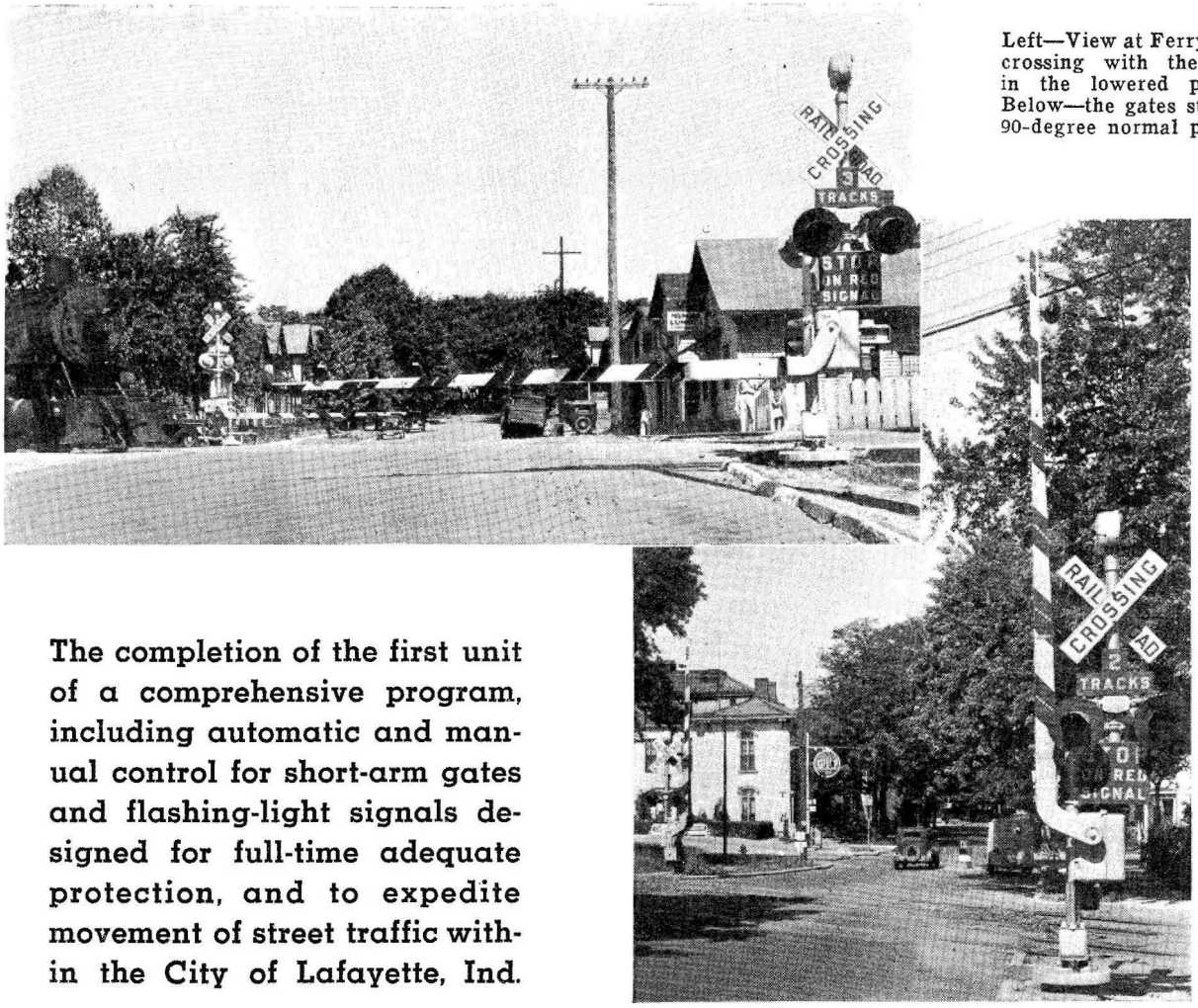
Three-Year Program

The portion of the program started in 1939 and completed early in 1940, includes short-arm gates with flashing-light signals at Ferry, Main, Columbia South and Ninth streets, short-arm gates at Fourth street, and flashing-light signals only at Tenth and Eleventh streets. As a part of this first project, the Indiana street crossing was closed, and barriers were constructed of steel rails, the street approaching from the east being extended along the railroad right-of-way to connect with the Union street crossing.

East End of Program

The 1940 program, which is now complete and in service, includes the installation of short-arm gates with flashing-light signals at Union street, and flashing-light signals only at Salem, Seventeenth, and Eighteenth streets. The third year's program is to include flashing-light signals at New York, Seventh, Kossuth, Third, Lingle, and Romig streets.

The operating conditions involved, the equipment installed, and the control arrangement used on the first unit of the program are typical, and, therefore, the following explanation will



Left—View at Ferry street crossing with the gates in the lowered position Below—the gates stand at 90-degree normal position

The completion of the first unit of a comprehensive program, including automatic and manual control for short-arm gates and flashing-light signals designed for full-time adequate protection, and to expedite movement of street traffic within the City of Lafayette, Ind.

be confined primarily to this portion of the project.

Prior to this installation, a flagman was on duty during each of the three tricks of every 24-hour period at Columbia, Main, Ferry and Ninth streets, and also at Ninth street an automatically-controlled wig-wag was in service. A flagman was on duty 12 hours each day at South street. As a means of reducing the likelihood of accidents at the crossings, the speed of trains in this area was limited to 12 m.p.h. As the volume of vehicular street traffic increased within recent years, the manual flagman protection was inadequate, especially where part-time service was in effect, and where no protection other than standard crossbuck warning signs were provided at several of the crossings in this area.

Delays to Street Traffic

The requirement that the trains be operated at low speeds, resulted in the crossings being obstructed too long, thus causing delays to vehicular and pedestrian traffic on the streets. In order to improve safety and expedite street traffic, as well as to permit some slight saving in train time, the Wabash voluntarily proposed to install gates and signals at all the crossings throughout the city, and to arrange the controls for full 24-hour operation of the protection, and, furthermore, to provide an automatic-manual control effective at certain of the crossings under the control of towermen on duty 24 hours daily. When trains have stopped or are switching in the control areas, and no movement over a crossing is imminent, the towerman can raise the gates and cut out the signals so that street traffic need not be delayed unnecessarily.

Time Cut-Outs

At some crossings, automatic time cut-out controls are provided. For example, a westbound passenger train when making a station stop is stopped short of Ferry street crossing. After this approach track section has been occupied 80 sec., as measured by a thermal time-element relay, the flashing-light signals will be cut out and the gates will be raised automatically. When the train starts and enters a second track circuit approach to the crossing, the protection is again placed in operation, or the towerman can place the protection in operation when he sees the train starting.

Single and Double Track

While the main line through this territory is essentially single track, double-track operation through the city is afforded by a second track extending from Lafayette Junction, 1.6 miles west of Lafayette, to a switch just west of Ferry street near the passenger station. A considerable number of the eastbound through freight trains are routed over this second track, and, except in rare cases, they pull on through to the single track and eastward without stopping to block any of the crossings, and no switching moves in the crossing protection area are involved for these trains. When necessary to hold an eastward train on this second track for a meet, the train stops short of the eastward signal just west of Main street. In numerous instances, westward freight trains stop at Lafayette to set out or pick up cars, which necessitates switching moves over the crossings at Main and Ferry streets.

The daily railroad traffic includes

four passenger trains, five eastbound and three westbound scheduled freight trains, and an average of one eastbound and three westbound extra freight trains. In addition, a switch engine and crew work in Lafayette for eight to twelve hours daily, a considerable number of the switching moves being in the crossing-protection area.

Gates, Signals, and Bells

The flashing-light signals, together with the Stop-on-Red-Signal, number of tracks, and cross-buck signs, are in accordance with Signal Section, A. A. R., standards, the signals being mounted back to back. A crossing bell was provided on the mast of each gate. The protection at the crossings with gates are the Western Railroad Supply Company Model 10, using Type-3564 double-bearing gate mechanism. The flashing-light signals are the Union Switch & Signal Company's Type-HC-81 with 8⅜-in. lenses. The crossing bells are the Union Model 15-A rated at 10 volts, and are operated from battery.

The Fourth street installation is an unusual location as the flashing-light signals are on cantilever masts, according to A.A.R. Drawing 1686A with eight lights per signal, four on the main mast and four on the cantilever mast. The gates were mounted on separate short poles directly behind the cantilever mast. The bells are on the gate masts. The signals were installed under a previous Indiana program, and, on project unit 1, the gates were added.

At most of the locations, the distance from the street side of the curb to the edge of the sidewalk was such that gates operating to full 90 deg. were a necessity, so that a gate arm, when raised, would clear the street, and also that the counterbalance arms would clear the sidewalk. At a few locations, sufficient parkway area was available between the curb and the sidewalk so that it would have been possible to set a gate mast far enough from the curb to permit use of the 75-deg. clear position, and still afford a minimum of 14 ft. vertical clearance at the curb line. In order that all the gates throughout the city might be uniform, however, it was decided to set them all about the same distance from the curb and operate them all to the 90-deg. clear position.

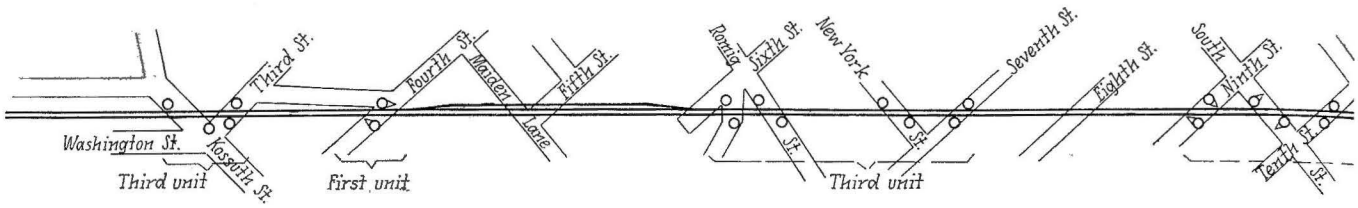
Sectional Foundations

The masts are set on Massey sectional precast concrete foundations, each consisting of three parts, a base, a hollow cylinder and a top plate, all bolted together, as explained in an article concerning new automatic block signaling on the Wabash on page 205 of the April issue.

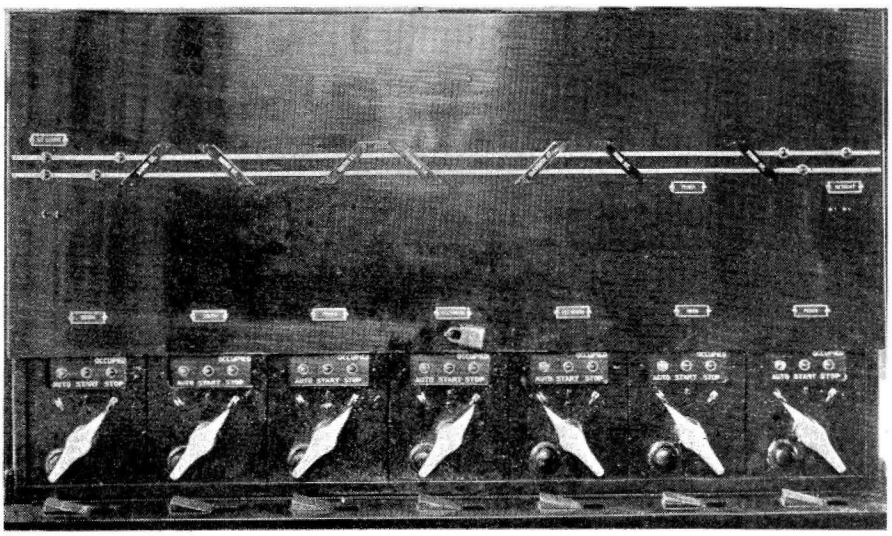
In order to prevent the gate arms, when clear, from interfering with the flashing-light signals and signs, a 15-in. offset bracket attached to the 5-in. gate mast, supports a 4-in. auxiliary mast on which the signals and signs are mounted, this feature being shown in one of the illustrations. This offset assembly has the advantage of allowing the flashing-light signal units and signs to be mounted at standard heights as applied to flashing-light signals.

The gates are of the short-arm type, i.e., only one gate is used on each side of the tracks, a gate mast being at the right of the street when approaching the tracks, and the gate arm is just long enough to reach to the center of the street, when lowered, the lengths ranging from 18 to 21 ft., depending on the widths of the pavements. Each gate arm is equipped with three light-weight lamps, the bodies of which are constructed of sheet aluminum, and 5⅜-in. red lenses are used. One lamp, located 28 in. from the tip, burns steadily while the protection is in operation. A second lamp is spaced 42 in. from the first, and a third 60 in. from the second, the second and third lamps being flashed alternately. The lamps in the flashing-light signals as well as on the gate arms are rated at 10 volts, 18 watts.

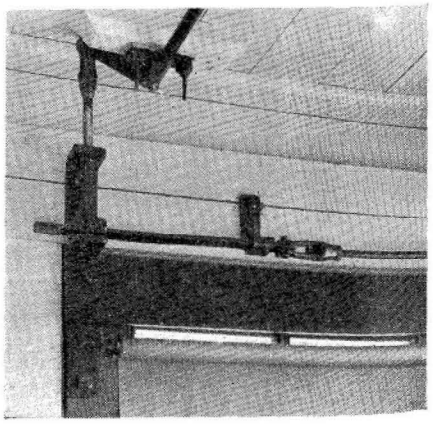
Normally the gates and signals are controlled automatically by track circuits, arranged to provide a minimum of 25 seconds warning time prior to the arrival at a crossing of a train traveling at 35 m.p.h. A short track



Track and signal plan through Lafayette, Ind.,



Left—The machine with the levers in positions for manual control Below—The lock on the cabin door is connected to control machine



circuit, on each track extending over each crossing, has direct control of the protection at that crossing, i.e., the signals operate and the gates stay down as long as such a track circuit is occupied, regardless of any cut-outs or manual control.

Where gates and signals are in service, the crossing bell on each mast, as well as the lamps in the signals and on the gate arms, operate five seconds as a pre-warning before the gate starts to lower. This delay time is accomplished by cascade control of two slow-acting relays. The lowering of the gate requires 10 seconds, after which the crossing bells cease to ring. After a train clears the crossing, the lamps in the signals and on the gate arms continue in operation until the gate is nearly cleared.

Automatic Manual Control

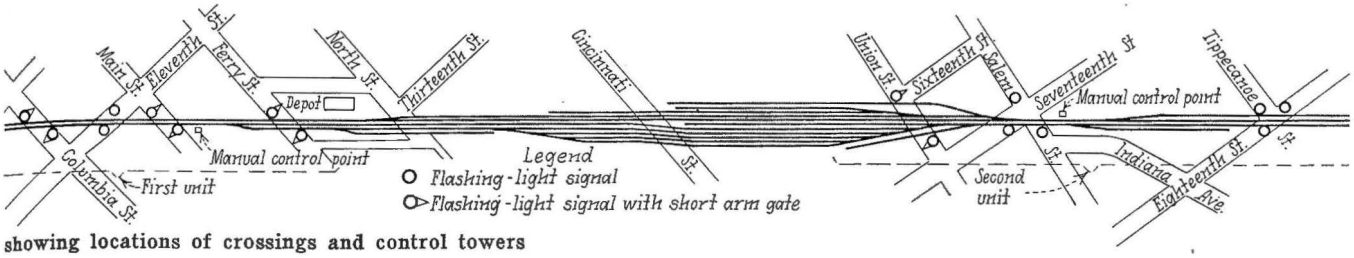
On account of the numerous switching movements, it was desirable to provide manual control as an auxiliary feature to the automatic control. A small elevated tower for the control machine and watchman is located on the south side of the track just east of Main street. Windows are provided on the track side and in the two ends so that the watchman can see the locations of trains. The control machine consists of a set of seven non-interlocked desk type B-20 controllers, which are assembled in a sheet-metal cabinet on an angle-iron base supported by pipes. An illuminated track diagram on the panel is equipped with lamps which indicate the occupancy of certain sections of each track between certain streets.

One lever is provided for the control of the signal and gates, where used, at Ferry, Main, Eleventh, Columbia, Tenth, South and Ninth streets, thus totaling seven levers. No switching moves are made on the eastward track in the section west of Eleventh street, and, therefore, the manual control is not effective with reference to the eastward movements on either track except for the gates and signals at Main and Ferry streets. However, the manual control is effective for the control of the signals and gates at the seven crossings in so far as westward train movements on either track are concerned.

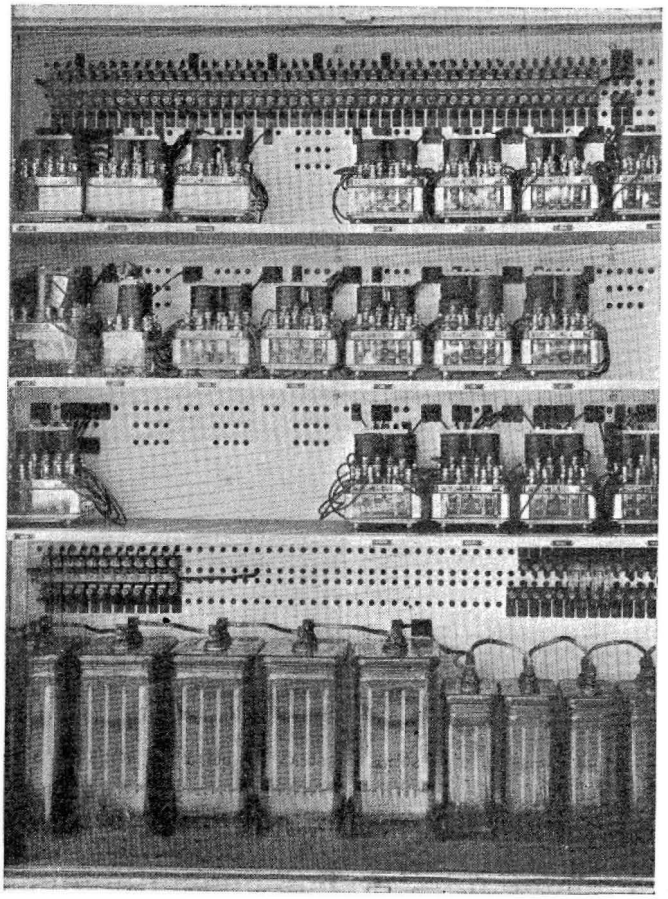
Positions of Levers

The levers normally stand with the point to the left over the letter N, which places the system on full automatic track circuit control, and this condition is indicated to the towerman by the illumination of a green lamp over the N position of each lever. If a train enters the track circuit control section for the protection at a crossing, and the signals are in operation, the red lamp above the center position of the lever for that crossing is flashed. If the train stops on the control section, or, when switching, makes a reverse move so that no movement is to be made over the crossing, the watchman moves the lever for that crossing to the center position. He takes another look to see that conditions have not changed, and then he pushes a button at the left of the lever, which releases a mechanical toggle, thereby permitting the lever to be moved on over from the center position to the R, reverse, position. This causes the gates to be raised and the operation of the signals to cease at the corresponding crossing. As a warning to the leverman that he has cut out the operation of protection at a crossing, a red lamp above the R position of the lever is lighted. The leverman then keeps a close watch of the train or switching operation involved, and if a move is made toward the crossing, the leverman returns the lever to the center position, thus causing the protection to be placed in operation again, as is indicated by the flashing of the red lamp above the center position of the lever. After the train departs from the area, the levers are returned to the normal position.

A special feature about this control circuit arrangement is that when a



showing locations of crossings and control towers



Interior of an instrument and battery case at typical crossing

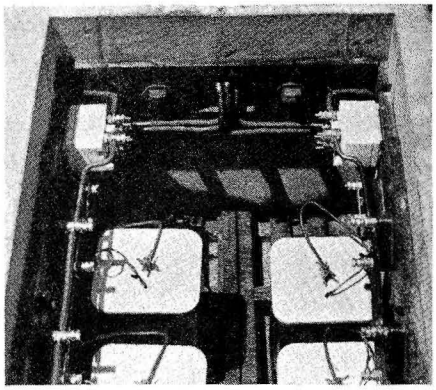
lever is in the center position, the gates and signals at the corresponding crossing are placed in operation regardless of whether the track circuits involved are released. By this feature, the towerman can lower the gates and operate the signals to provide protection when insulated track motor cars are being run through the territory.

Lock-Out of Manual Control

An ingenious locking arrangement is provided to insure that the towerman cannot depart from the tower without placing all levers in the normal position on automatic control. As shown in one view of the machine with four of the levers reversed, the space below the levers is open so that any lever is free to be moved back and forth as desired, which is true when the towerman is on duty with the cabin door closed and locked.

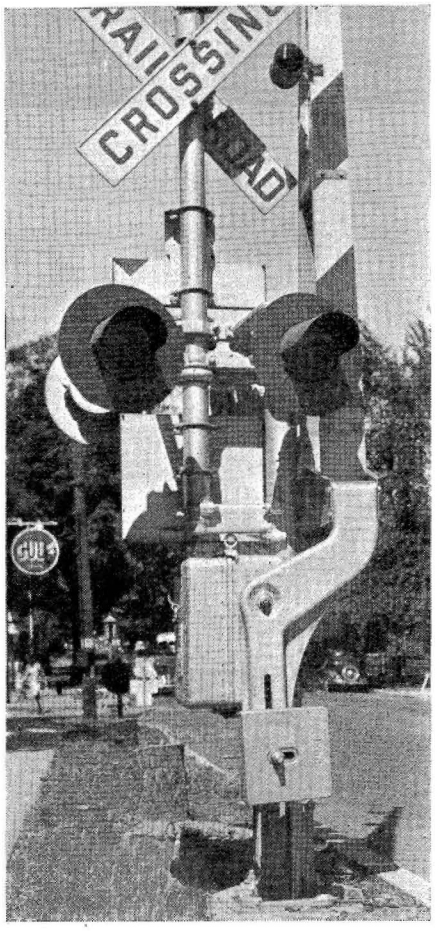
If the cabin door is to be opened to permit the towerman to leave and the next trick man to enter, all levers must be placed in the normal position. The angle iron bar, with holes and angular blocks, which extends along the front of the machine under the levers, is raised up so that a hole in this bar surrounds the lower end of each lever. The slanting blocks prevent the raising of the angle iron bar if any lever is not normal.

This angle iron bar is the front portion of a rectangular frame extending around the machine. At the mid point at each end of the machine, this frame is pivoted so that the frame as a whole can be swung up and down to the positions shown in the two views. A springed plunger with a knob located in the frame, at the right end near the front of the machine, serves to release or hold the frame in one position or the other.



A track circuit battery

Connected to the rear side of this swing frame is a rod extending up to a crank mounted on the ceiling, and a rod rotated by this crank extends across the ceiling to another crank near the doorway of the tower, this second crank being connected to a vertical plunger operating up and down in a locking assembly including the equivalent of two lock rods. The upper rod has one hole which is positioned to match the plunger, only when the cabin door is closed, this rod being operated by a pin connection to a bracket bolted to the door near the hinged side. The purpose of this lock rod is to prevent the raising of the channel iron bar on the machine unless the cabin door is closed. The equivalent of a second lock rod consists of a bracket bolted to the inside of the door at the top and left corner. The portion of this bracket extending horizontally into the room, has a vertical hole which takes the vertical plunger when the door is closed. As long as the angle iron bar on the front of the machine is in the lowered position to permit manual control, the plunger of the door lock is down through a hole in each of the two lock rods. The upper rod checks that the door is closed, in contrast to being open, and the second rod, which is the bracket, serves to lock the door closed.



The signals and signs are mounted on a 5-in. mast which is off-set 15 in. from main mast

By placing all levers normal, the channel iron bar can be raised, which withdraws the door lock plunger, and then the door can be opened, but the door must be closed before the machine can again be released to permit manual control.

In the 1940 program, which includes gates and flashing-light signals at Union street, and flashing-light signals only at Salem, Seventeenth and Eighteenth streets, an auto-manual control will be used similar to that previously explained, the control tower to be located on the north side of the track east of Seventeenth street.

Power Supply

At each crossing on this project a set of five cells of 120-a.h. Exide EMGS-7 storage battery is provided for operation of the lamps. At each crossing with gates, a second set of six cells of 60-a.h. Type DMGO-7-SR battery is provided for operation of the gate mechanisms, the current for operation of two mechanisms varies depending on the position of the arm, ranging up to 12 amp. maximum as the gate nears the raised position. Each track circuit is fed by three cells of 500-a.h. Columbia primary battery connected in multiple.

At each crossing, the relays, rectifiers and battery are housed in welded sheet-metal cases. The slow-acting relays are the DN-19 type, and the line control relays are Union Switch & Signal Co. 500-ohm DN-11 type, while the track relays are 4-ohm DN-11. Type DN-22 power-off relays and Type FN-16 flasher relays are used. The flashing-light signal lamps and gate lamps are fed normally from the a-c. supply.

The wiring distribution is underground, using No. 6 wire for the battery circuits to the gate mechanisms, No. 12 for the lamp circuits, and No. 9 for rail connections. The underground cable outer protection is of the mummy type including no metal, the cable being furnished by the Kerite Insulated Wire & Cable Co.

This crossing protection installation was planned and installed by the signal forces of the Wabash under the jurisdiction of G. A. Rodger, signal engineer. The installation was paid for by the Wabash railway, with the exception of the expense for the protection at South and Fourth street crossings, which was paid by the State of Indiana from Federal funds allotted for the improvement of highway safety on State routes. The estimates, plans, construction and completion of the protection at these two crossings were handled with State Highway Commission of Indiana for approval and their final acceptance.