

## Crossing Protection in Gary, Ind.<sup>†</sup>

**Project on the Pennsylvania includes the installation of new safety devices at 14 highway grade crossings, replacing older protection**

IN Gary, Ind., 25 mi. east of Chicago, the Pennsylvania has completed a highway crossing protection project, which is in compliance with a city ordinance, requiring certain railroads operating within the limits of that city

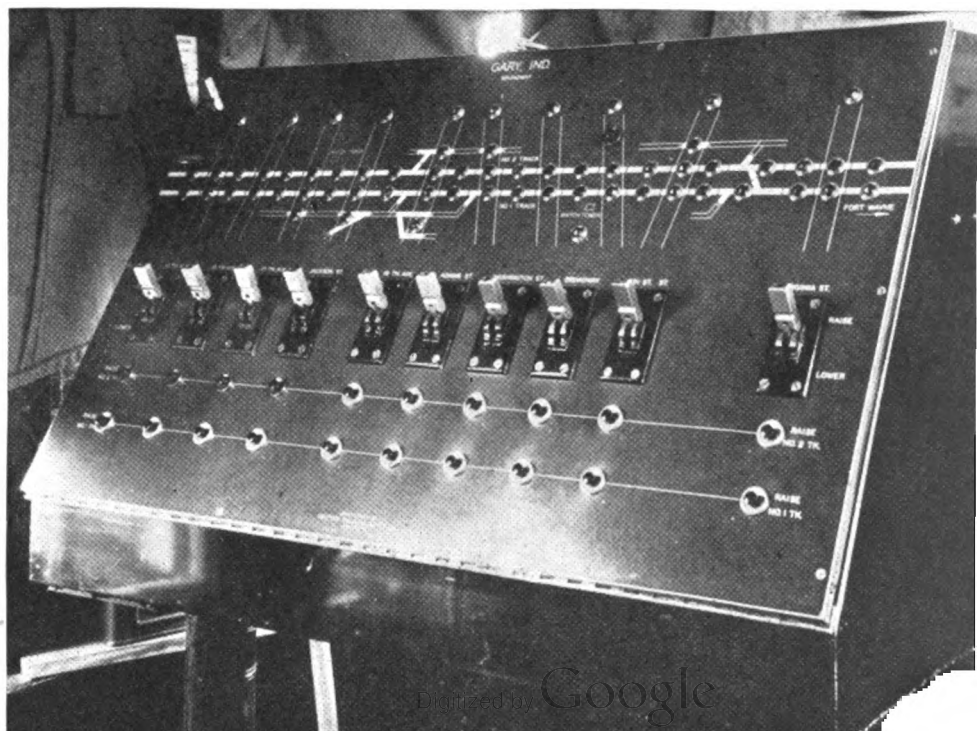
Above—Eastbound train, showing gates and flashers at Grant street. Right—The control panel at Broadway for the manual supervision of the gates and flashers

to install certain safety devices at street crossings along their respective rights of way. Most of this work involved replacement of older forms of protection, such as manually-operated pneumatic and mechanical gates,

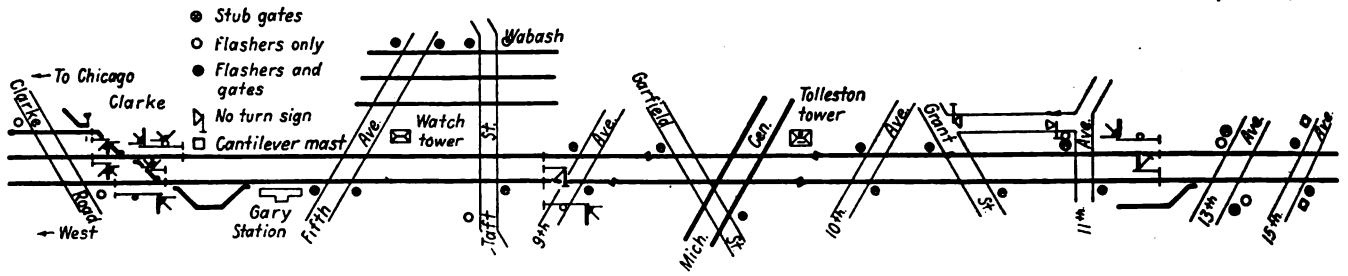
watchmen, and other protection, as well as to provide protection at crossings formerly unprotected. The ordinance required new protection at 14 crossings on the Pennsylvania, including the installation of electric short-arm gates and flashers with manual supervision at 13 crossings, replacing 10 manual gates and 4 automatic flashers, and automatic flasher signals only

at one crossing, replacing an automatic bell.

The territory involved in this project, shown in the accompanying diagram, is that part of the Pennsylvania's double-track main line between Chicago and the east. From 70 to 80 passenger and freight trains operate through Gary daily, plus numerous switching movements serving local in-



<sup>†</sup>This is the second of two articles dealing with the crossing protection program in Gary, Ind. The first appeared on page 474 of the August issue of *Railway Signaling*, with discussions of the installations on the Wabash and Michigan Central, including special features and construction practices.



Track layout of the Pennsylvania through Gary,

dustries. About 60 per cent of the switching is done at 19th avenue, 30 per cent east of Broadway and about 10 per cent elsewhere in the city.

**What Was Installed**

The first crossing involved in this project is Clarke road, 1.24 mi. west of the Gary passenger depot. Automatic back-to-back flashers only were installed on each side of this crossing, replacing a single electric bell and crossbuck signs. At Fifth avenue the Pennsylvania parallels the Wabash nearby. Manual pneumatic gates and flashers with crossbuck signs were formerly in service on each side of the joint crossing, being controlled from a watchman's tower at the crossing. The gates and flashers were replaced with modern automatic protective devices.

Fifth avenue is the extremely busy state highway, U.S. 20, with two lanes of traffic in each direction. Account

of eastward Pennsylvania trains stopping at Gary Station and Wabash yard operations in the vicinity of this crossing, arrangements were provided for manually raising or lowering the gates by a watchman located at this crossing. Because of the angle at which the highway intersects the railroads, the distance between the entering and leaving gates is approximately 300 ft. Two gates were installed at each side of the crossing, and the controls coordinated with the Wabash. Special provisions were made to permit the heavy traffic to clear the tracks before the leaving gate is lowered. This is especially necessary in cases where traffic had been stopped and then permitted to move just before another train enters the starting circuit.

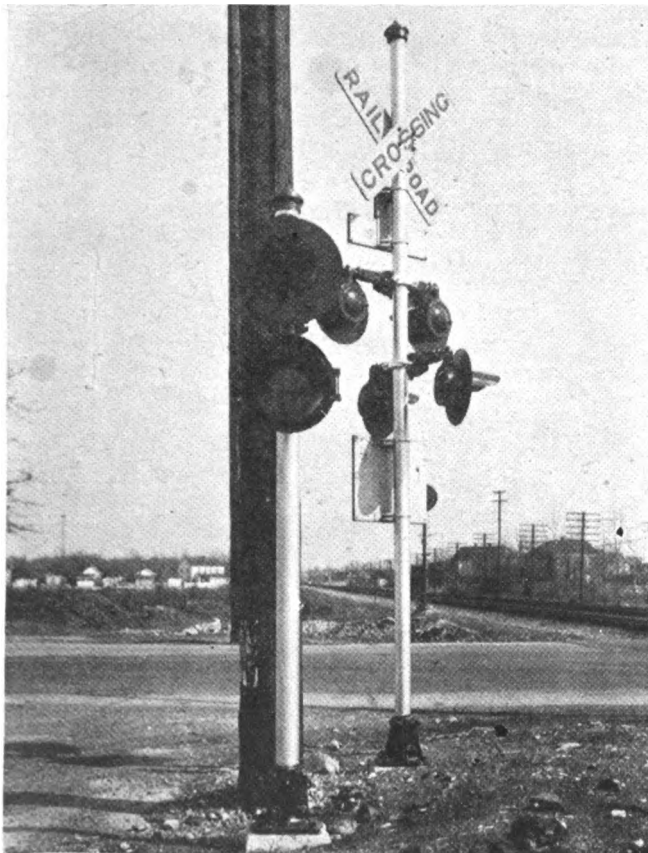
The leaving gate is manually controlled only. The flashers on this gate mast do not indicate toward normal highway traffic moving over the tracks but do indicate toward traffic which

might attempt to cross the tracks in the traffic lanes at the left-hand side of the highway. The entering gate masts are provided with back-to-back lights. They are normally operated automatically with provisions for raising the gates manually. Because of the excessive distance between railroads, longer than normal starting sections were installed. The only control the watchman has over gates is that he is able to keep them raised when a Pennsylvania train is standing at the Gary depot, thus preventing unnecessary obstruction of highway traffic over the crossing.

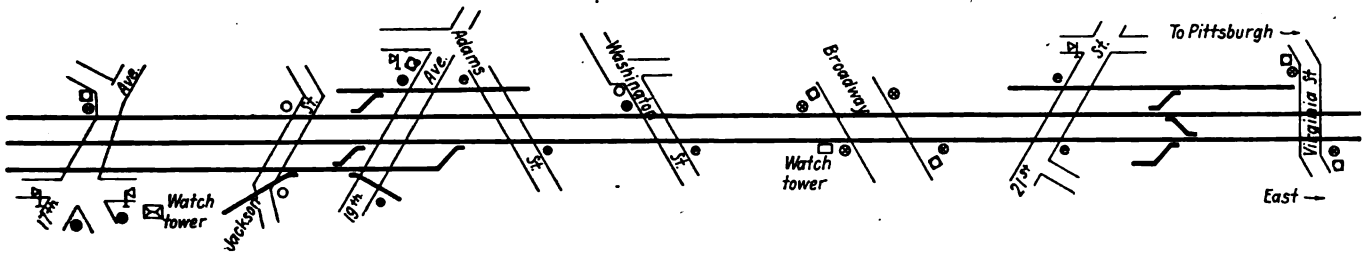
**At Taft Street**

Center-of-highway flashers were in service at Taft street, and these were retired. A single gate and flashers were installed at both sides of the joint crossing. Because of the limited view approaching the crossing, a single flasher assembly was installed at the left of the intersection as protection. Control is normally automatic with provisions for manual control by Wabash watchmen while Wabash trains are switching in the vicinity of the crossing.

The next five crossings east of Taft street are 9th avenue, Garfield street, 10th avenue, Grant street and 11th avenue. The protection at these crossings is automatic and under supervision of the Michigan Central interlocking towerman at Tolleston, located at Garfield street, where a double-track main line of the Michigan Central crosses the Pennsylvania. Flashers and crossbuck signs were formerly in service on each side of the 9th street crossing. These were replaced by gates and flashers. Pneumatic gates were in service at Garfield street, and these were replaced by a gate and flashers on each side of the joint crossing, the Pennsylvania handling the construction work on the north side of the crossing and the Michigan Central the work on the south side. Pneumatic gates were in service at 10th avenue, Grant street and 11th avenue, all of which were retired, and replaced with an electric gate and flashers on each side of the crossings. "No Left Turn" and "No



"No Right Turn" sign and flash signals at the crossing at 11th avenue in Gary, Ind.



showing the location of the new crossing protection

Right Turn" signs were installed on the north side of the Grant street and 11th avenue crossings, respectively.

Between 13th avenue and 19th avenue, inclusive, there are five crossings, which are under manual supervision for 8 hr. from 17th avenue, and 16 hr. from Broadway. Flashers were in service at 13th avenue, and an electric gate was added on each side of the crossing. No changes were necessary at 15th avenue and 17th avenue except the addition of manual supervision, as gates and flasher signals were already in service.

The next crossing east of 17th avenue is Jackson street where flashers already in service were retained. The 19th avenue crossing was formerly protected by pneumatic gates which were replaced by a gate and flashers on each side of the crossing, including a "No Right Turn" sign and a cantilever mast at the north side of the crossing.

Manually-operated pneumatic gates were also in service at Adams street, Washington street, Broadway and 21st street. No changes were necessary at Virginia street as gates and flashers were already in service. At Adams street, flashers and gates were installed on both sides of the crossing. Similar protection, with an additional set of flashers on the north side, was placed in service at Washington street. At Broadway, the widest street in the project, two gates, with sidewalk

arms, back-to-back cantilever mast flashers, plus a single set of flashers, mounted at lower level on the cantilever mast, were installed on each side of the crossing. Flashers and electric gates were installed at 21st street, including a "No Right Turn" sign on the north side of the crossing. Each of the above crossings is equipped with a Western Railroad Supply No. 222 electric bell.

### Control Panels

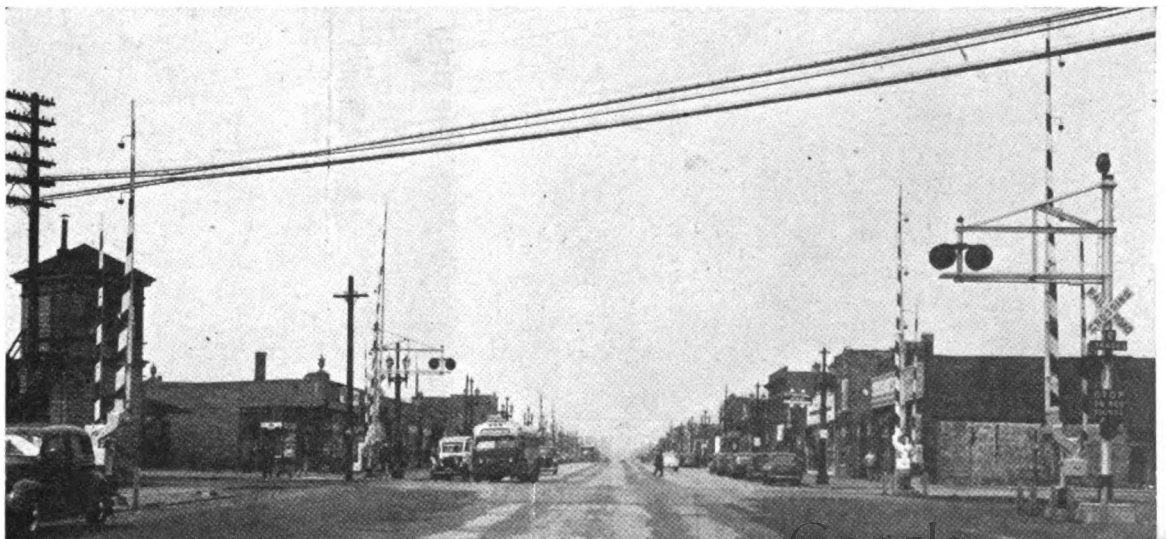
The gates and flashers auto-manually operated are controlled over Western Railroad Supply Company Sig-Na-Trol panels. At Adams street, Washington street, Broadway, 21st street and Virginia street, the gates and flashers are manually supervised from a panel in a watch tower on the southwest side of the Broadway crossing. In addition to these streets, for a period of 16 hr. daily, 13th avenue, 15th avenue, 17th avenue, Jackson street and 19th avenue are controlled from this panel. For the remaining 8 hr. daily the protection at the latter crossings is controlled from a similar panel in a new watch tower located on the southeast side of the 17th avenue crossing. The period of use of this panel is during the time of local freight switching, after which the controls are transferred to the Broadway panel. Another similar panel is located in the Tolleston tower at Garfield

street to control the flashers and gates under the towerman's jurisdiction. The operation of all the panels is similar.

At the top of the panel is a track diagram showing track circuited sections in solid white and non-track circuited sections with two light lines; each track circuit, when occupied, is indicated by a yellow light. All the short sections through the crossing are lighted simultaneously, being connected in multiple. If one of these sections through the crossing is occupied, all the lights over that crossing will be lighted, indicating that the gates cannot be manually raised, or the flashers stopped.

Directly above each crossing on the panels is a red light, which is normally dark. These flash when the corresponding flashers at the crossing are in operation. Below the track diagram at Broadway is a single red lamp which is normally out. When lighted, this lamp indicates an a.c. power failure. Directly below the track model is a row of lever switches, which are of the two-position up-and-down type. A lever switch is provided for each crossing and is located directly below the crossing on the control panel. The handle of the lever is normally up. To lower the gates at a crossing the watchman pushes the lever down, and to restore the gates to normal the lever is raised. The gates then follow, providing the approach sections and the

View of the crossing at Broadway, showing the watch tower at left and the use of cantilevers for flashers

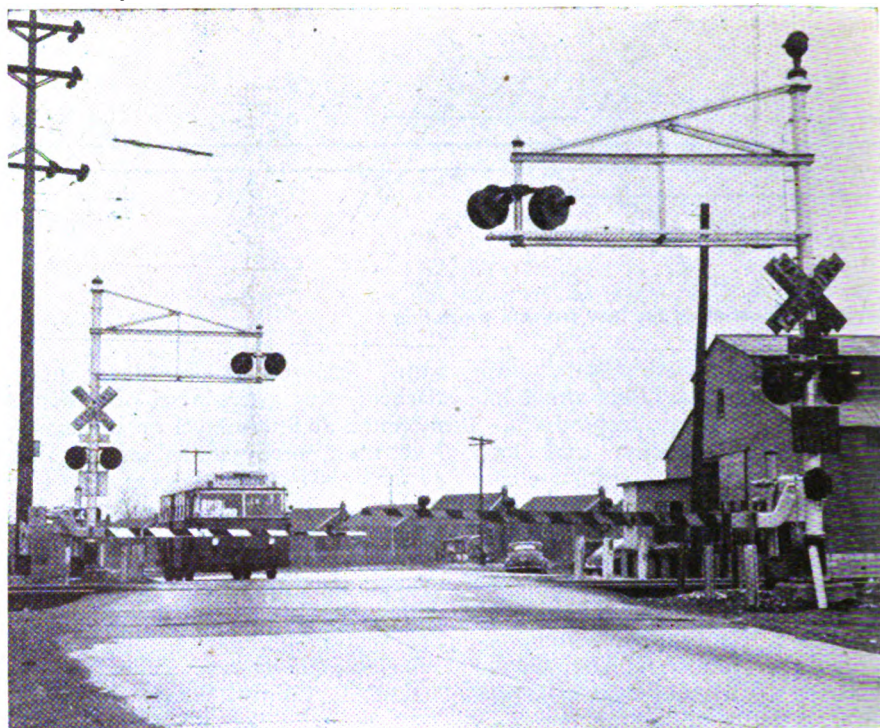


The crossing at Virginia street with the gates lowered. Note the use of cantilevers for mounting of the flasher signal units

short track sections over the crossing are not occupied.

In addition to these levers on the panels, two push-buttons are provided below each lever, one for each track, for raising the gates when approach sections are occupied and the gates are down. If a train approaches from either track and stops to switch or for other reasons, without passing over the crossing, the watchman presses the button for the track concerned, and the gates are raised, thus eliminating obstruction of highway traffic. When the train is ready to proceed over the crossing the watchman lowers the lever above the button, as described previously, which lowers the gates. When the train has cleared the short track section over the crossing and the lever has been restored to normal, the gates again are raised.

In the upper left-hand corner of the Broadway control panel is a lever similar to those for the gates, which transfers the manual controls of the 17th avenue watch tower to Broadway. This lever is up when the panel at 17th avenue is in service. When the watchman at 17th avenue goes off



duty he telephones Broadway to lower this switch. Doing so de-energizes a relay at 17th avenue and transfers all controls to the left-hand section of the panel at Broadway. Any inadvertent operation of the control panel at 17th avenue while Broadway has control will not effect operation of the protection.

The crossing at Broadway is wide and occasionally a slow-moving vehi-

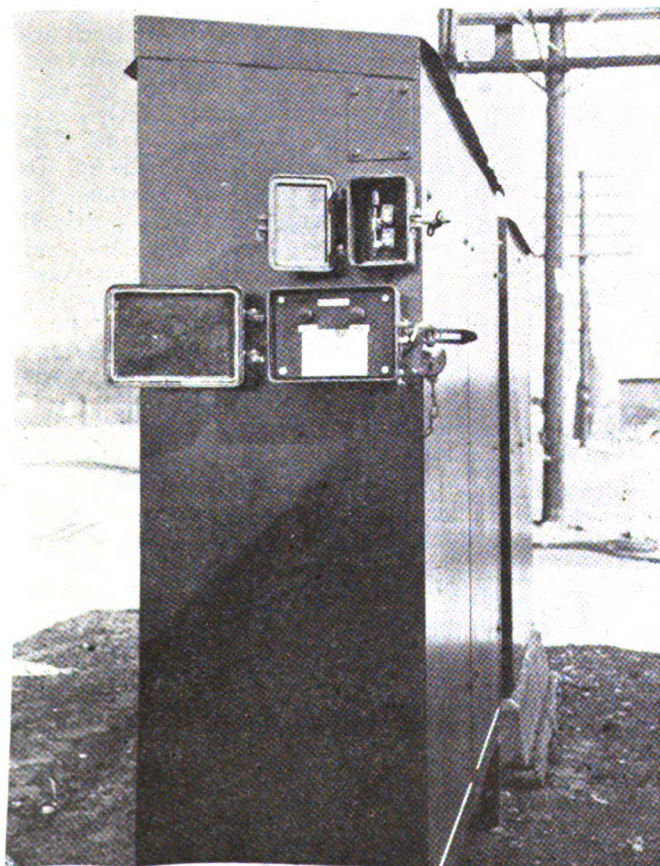
cle traveling from south to north does not have sufficient time to pass under the leaving gate before it starts down. A button is located on the track diagram of the Broadway panel for such traffic emergencies. Pressing this button results in retarding the lowering of the leaving gate on the north side of the crossing, and allowing a vehicle to get clear of the crossing.

#### Control Features at Tolleston

The control panel in Tolleston tower at Garfield street, where a double-track main line of the Michigan Central crosses the Pennsylvania, controls five crossings, namely, 9th avenue, Garfield street, 10th avenue, Grant street and 11th avenue.

With the original location of the home signals on the Pennsylvania, the only street crossing protection within interlocking limits would have been that at Garfield street. Any train stopped at a home signal would have resulted in unnecessary operation of the protection, thus blocking highway traffic. Consequently, the eastward home signals originally located between 9th avenue and Garfield street were moved west of 9th avenue. The control circuits for the crossing protection are arranged so that a train on an approach section will not start the operation of the crossing protection unless the home signal for the route has been cleared. This arrangement was provided to eliminate unnecessary operation of the crossing protection in the event that a train is stopped at a home signal before reaching the crossing.

The westward home signals on the



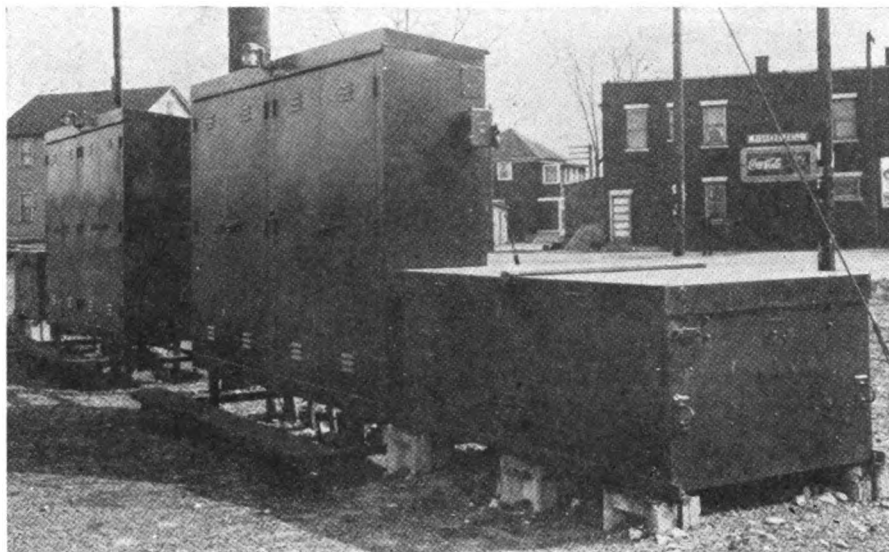
Trainmen's manual controls and maintainer's testing switch mounted on the end of an instrument case at one of the crossings

Pennsylvania at Tolleston interlocking were formerly located between Garfield street and 10th avenue. These were moved east of 11th avenue to incorporate the crossing protection at 10th avenue, Grant street and 11th avenue within interlocking limits for the same reason that the eastward home signals were moved. Operation of the manual control panel in Tolleston interlocking tower is otherwise identical with those at 17th avenue and Broadway.

### Trainmen's Manual Controls

At certain locations, including 13th avenue, 15th avenue, 17th avenue, 19th avenue, Adams and Washington streets, and 21st street, manual track-side controls are provided for emergency use by trainmen. Separate controls are provided for each track. One control being provided at each side of the right of way. The controls are mounted in cast-iron boxes locked with switch locks. Each control consists of two push-buttons, one for raising the gates when the track is occupied and one for lowering the gates. After the track is clear, normal operation of the protection is automatically restored. Gates cannot be raised if a street track section is occupied.

The operation of the automatic gates and flashers is based on a speed of 70 m.p.h. Five seconds after the flashers start to operate, the gates start down, which permits any vehicles on a crossing ample time to get in the clear. After the gates have started down they require about 12 sec. to complete the motion to the horizontal position. With control circuits provided for 70 m.p.h., the gates are in the horizontal position 15 to 20 sec. before a train reaches the crossing, thus assuring adequate safety to highway traffic.



Instrument cases and battery boxes for protection at Grant street and 11th avenue

The gate mechanisms are the Western Railroad Supply Company's Model 10 with Type 3564 mechanisms. The motors are designed for operation on 12 to 18 volts d.c. and require about 8 amp. when in operation on 12 volts with a 24-ft. gate arm. The gate arms vary in length from 19 ft. to 30 ft., with one 40-ft. gate at Broadway, depending upon the width of the highway lanes. Each gate arm is painted black and white, and is equipped with three electric lights with red Fresnel lenses. The end light burns continuously when the gate is in operation. The other two flash in coordination with the flasher signals. These gate lights are equipped with 21 cp., 12-16-volt single-filament lamps.

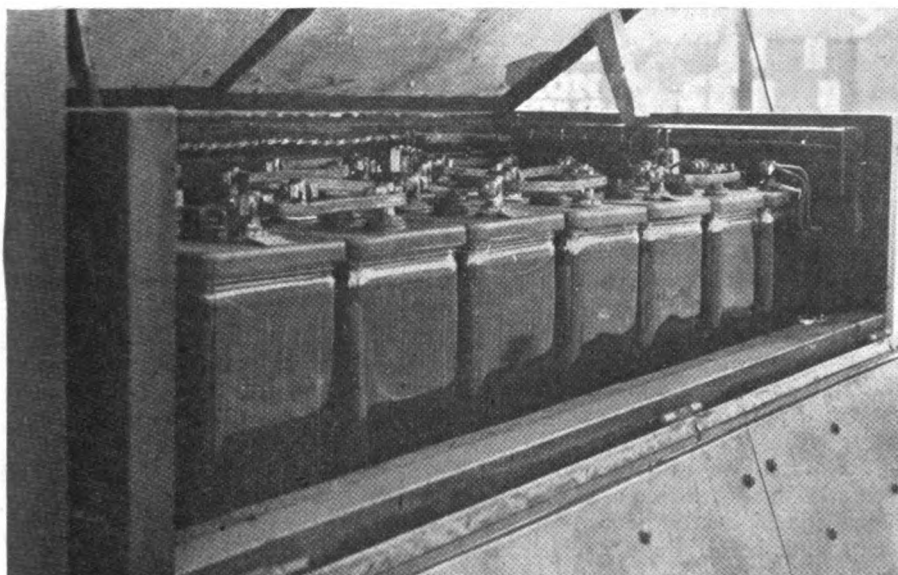
Flasher units on the gate masts are Western Railroad Supply Company Type 950-201. All others are the Union Type HC-81. All are equipped with 8 $\frac{3}{8}$ -in. red roundels and 21 cp.,

12-16-volt single-filament lamps. Each gate mast flasher consists of two sets of flashers mounted back-to-back on the mast. In addition to the flashers and gates there are also "Railroad Crossing," "Stop on Red Signal" and number-of-tracks signs at each side of the crossing. Where the view would otherwise be obstructed, the flashers are mounted on cantilever masts to provide better vision for highway vehicle drivers. At some of the larger and more important crossings, flashers are provided at two points on the cantilever masts. In some instances where streets parallel the railroad closely and intersect with a street crossing the railroad, a flashing-yellow light unit and electric "No Right Turn" or "No Left Turn" sign is provided to increase protection.

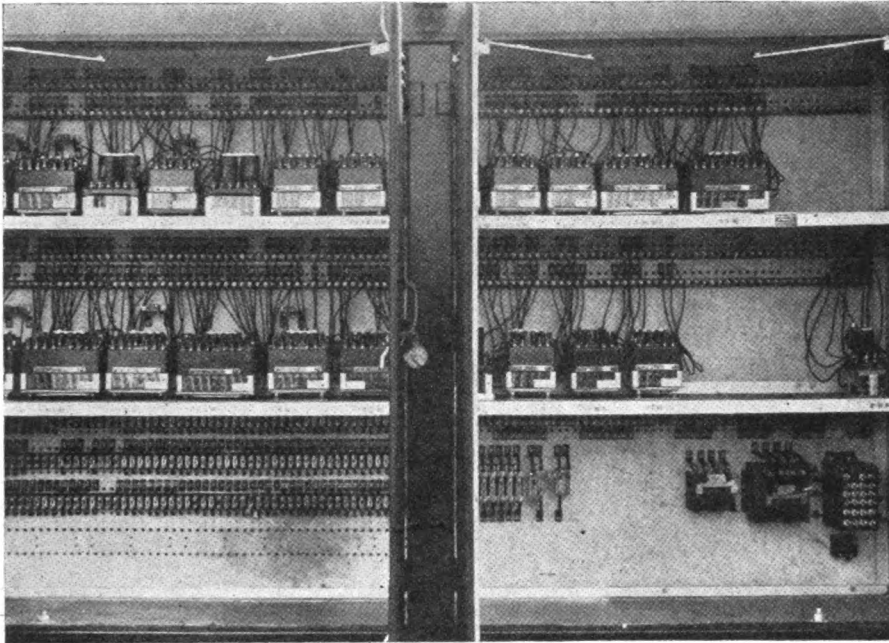
### Track Circuits

All track circuits are the 4-ohm d.c. neutral type. Short track circuits are used over all the crossings, so when occupied, the gates and flashers cannot be cleared under any circumstances. Some of the short track circuits are of the series type in order to reduce cost. In such instances, only one insulated joint is installed, the relay being installed in series with the track circuit around the joint. This arrangement also saves an additional track battery and rectifier.

Between 21st street and Virginia street there is a hand-throw crossover



The storage battery at each crossing is sheltered in insulated battery boxes



Inside view of one of the welded sheet steel instrument cases in which the relays and other apparatus are sheltered at each crossing

between the eastbound and westbound main tracks, and several turnouts. Circuits are provided to automatically cut out operation of gates at Virginia street while trains are shifting in the vicinity of these switches.

The relays, transformers, rectifiers and other equipment at each flasher and gate location are sheltered in a 9-ft. 8-in. welded sheet-steel instrument case. Where this size case is too small, a 4-ft. 11-in. case is used also. These cases are mounted on steel frame foundations about 1 ft. above the ground, with a creosoted foot board at the front and rear of the case. All cases are painted black.

### Power Supply

Power for operation of the gates and for standby operation of the flashers at most of the crossings is furnished by six cells of Gould 240-a.h. lead-acid storage battery, rated at 12 volts, on floating charge from an RX-42 copper-oxide rectifier. At certain crossings, such as Fifth avenue, Grant street, 11th avenue and Broadway, where longer gate arms are used and line loss in motor leads is greater, seven cells of the same type battery are used. The gates are normally fed by the storage battery, while the flashers and lamps on the gate arms are normally a.c.-fed through a power-off relay, which in the event of a power failure, transfers them to the storage battery. A white power-on light is installed on the outside of the instrument case at each crossing protection location. This light is illuminated when a train is on the approach section, and indicates that the a.c. power is on. The light is mounted where it can be readily seen by train crews on passing trains. Any member of a crew

observing that the light is off, which indicates an a.c. power failure, is instructed to report the fact to the nearest block station.

Each track circuit is fed by one cell of Edison B4H nickel-iron-alkaline storage battery, with the exception of the short series circuits over the crossings which are fed by one cell of Gould 180-a.h. lead-acid battery. Track battery in both cases is on floating charge. The batteries are located in insulated battery boxes.

A 440-volt a.c. power distribution circuit is in service in the territory, being fed by the Northern Indiana Public Service Company at Gary depot and at the Broadway crossing. The line is sectionalized at 13th avenue to enable working on the line in emergencies. This circuit is on two No. 6 weatherproof copper wires, mounted on Hemingray top-groove glass insulators, and is transposed about four times per mile. At each crossing location General Electric 440-110-volt air-cooled crossarm-mounted transformers are used, being rated from  $\frac{1}{2}$  to 3 kv.a., depending upon power requirements. These transformers are connected to the power circuit through Line Material Company drop-out type fused cut-outs, also mounted on the crossarm.

### 110-Volt Transformers

The 110-volt transformers in the instrument cases are the Union Type W-10 with four secondaries, including two track taps of 5 volts each, a 20-volt rectifier tap, and a 10-16-volt lighting tap. A W-20 transformer is used at 17th avenue and at Broadway to provide higher output due to the greater number of lights, which require about 20 amp. besides the gates.

All circuits other than the power-distribution circuit are in Okonite and Kerite aerial cable consisting of from 19 to 37 No. 14 conductors. Similar cable is used for line drops to the instrument cases, the same being supported on  $\frac{1}{2}$ -in. galvanized messenger strand. Okonite and Kerite underground cable, varying from 5 to 12 No. 9 conductors, is used between instrument cases and flashers and gates. Between cases and gates the battery and leads are usually doubled, to reduce loss. Track connections are made with Kerite No. 6 and No. 9 single-conductor parkway cable. Case wiring is No. 9 and No. 14 solid copper. Flexible wiring is used between the flasher units and the junction box at the top of the mast where the underground cables terminate. Where base-of-mast junction boxes are used, solid conductors extend to the units. Cables entering the new watch towers containing the control panels are terminated on the first floor, from which point flexible No. 16 insulated copper wire is run to the panel.

### Protection of Track Circuits

All track circuits are protected from lightning by Union pin-point arresters across all track relays. Western Railroad Supply 275-TC rare gas arresters, with a 60-120-volt breakdown are used across the lighting busses at the flasher locations. The rails in this territory are bonded with rail-head type bonds. Track connections are made with double stranded-type bonds with a single  $\frac{3}{8}$ -in. plug. Raco test switches are provided at every crossing for test purposes.

The gate and flasher combinations are mounted on poured concrete foundations. The railroad dug the holes and set the forms, while the concrete was premixed and poured in place, thus saving considerable time in construction. Other foundations, except relay and battery box foundations, are precast concrete.

The main materials for this work were furnished by the Western Railroad Supply Company and the Union Switch & Signal Company. The installation was planned and made by the regular signal department forces of the Pennsylvania.