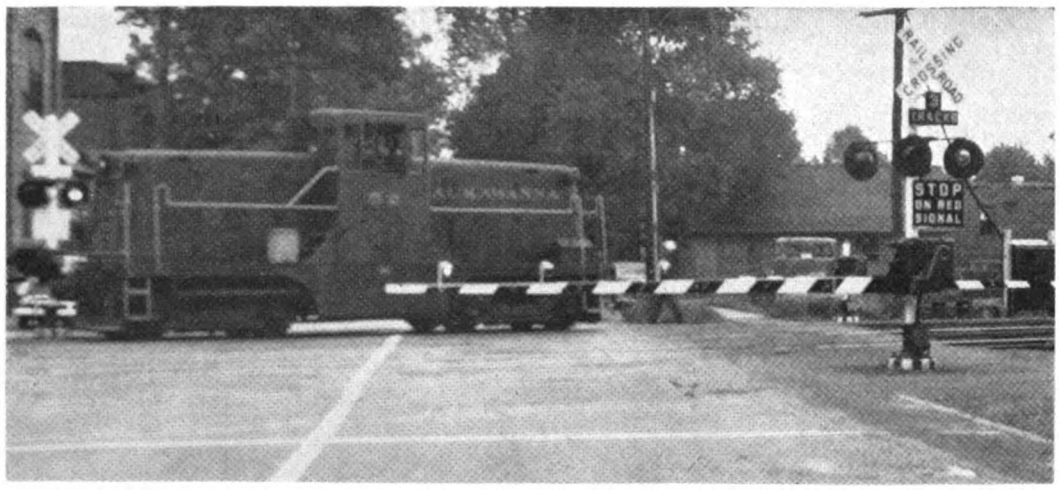


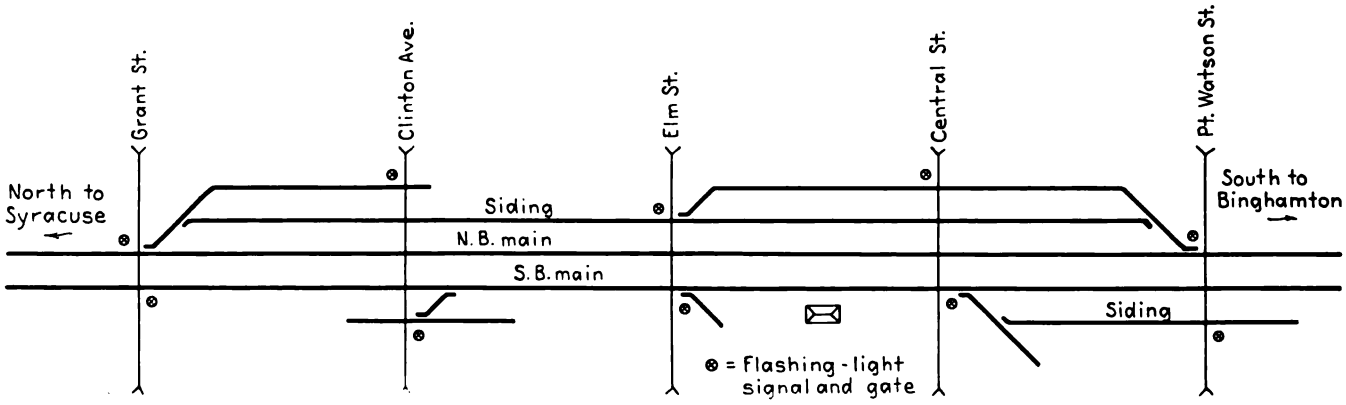
View at Elm street with street arm to left and sidewalk arm to the right

Automatic-Manual Control for Gates at Five Crossings

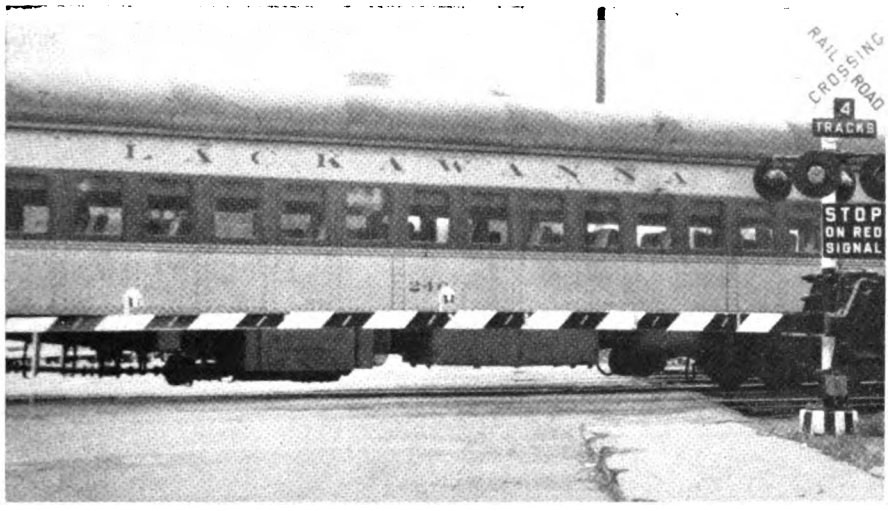
Lackawanna project at Cortland, N. Y., includes special control features and provides uniform protection 24 hours every day

AT Cortland, N. Y., the Delaware, Lackawanna & Western has installed flashing-light signals and short-arm gates at five street crossings, which were formerly protected by gates or watchmen. Cortland, a city of 18,105 population, is 43 miles north of Binghamton, N. Y., on the line of the Lackawanna from Binghamton to Syracuse, N. Y. Two passenger trains and several freight trains are operated each way daily, and numerous switching moves are made by the switch engine crew when serving industries. Through Cortland the main line is double track.

Several of the streets handle heavy local traffic, and, in addition, Port Watson street is a through highway. Within the last few years, the street traffic has increased, so that there was a need for increased protection at some of the crossings. Manually-operated gates, in service 24 hours daily, were at Port Watson street and at Clinton avenue. Watchmen were on duty 24 hours at Grant street crossing, and part time at Elm street and Central street crossings. In order to improve the protection, and have this new protection in service 24 hours every day, a decision was made to install flashing-light signals, with electric short-arm gates, at all five crossings. An automatic-manual control arrangement was included in the project. For a straight through train movement without a stop, the flashing-light signals and gates are controlled automatically by track circuits in the conventional manner. Manual control, superimposed on the automatic control, is used when trains stop at the station or when switch-



Track and signal plan of crossing protection at Cortland



Central avenue gate arm extends across sidewalk and to center of street

ing moves are being made.

One manual control machine, in an elevated cabin at Central avenue, controls the signals and gates at the Port Watson street and Central avenue crossings, and a second machine, in an elevated cabin at Clinton street, controls the signals and gates at the Elm street, Clinton avenue and Grant street crossings.

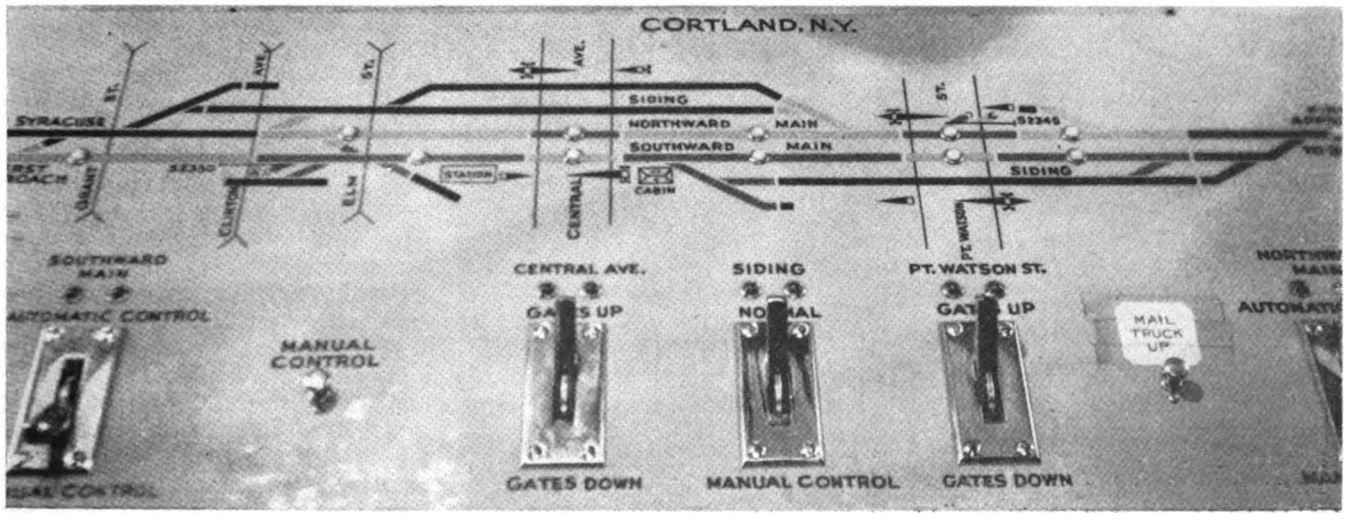
On account of the street crossings and industries, the train speed is limited to a maximum of 20 m.p.h. through Cortland, and the track circuit sections, to control the crossing signals and gates, are arranged on the basis of that maximum train speed. On each main track at each crossing, there is a short track circuit extending the width of the street. When such a track circuit is occupied the gates cannot be raised by manual control, except for a special instance, as will be discussed later.

The control panel of each machine has lamps on the track diagram to indicate track occupancy of each track circuit approach section and the short track circuits at the crossings. The location of each street and the flashing-light signals and gates are represented by symbols on the diagram. On the panel below the symbol for each street there is a toggle-type lever which normally stands in the "down" position. When the operation of crossing protection, at a crossing, is initiated, the bell rings, the flashing-light signals operate, and the lamps on the gate arms are lighted for a pre-warning period of 4 seconds; then the gate starts down, requiring about 10 to 12 seconds to reach its lowered position. The bell is then cut out.

Lever Cut-Out

Normally the signals and gates are controlled automatically by track circuits until, and if, additional manual control is needed. For example, when a southbound passenger train is approaching, the towerman at Central avenue, allows the track circuit control to cause the gates at Central avenue to lower in the usual manner. All passenger trains stop at the passenger station. The southbound trains stop with the locomotive to the south of Central avenue, but several hundred feet short of Port Watson street. Therefore, in order to avoid needless delay to street traffic on Port Watson street, the tower man, when a southbound passenger train is approaching, sets up manual controls to hold the gates clear at Port Watson street. Such manual controls must not prevent the gates from being lowered by automatic control if a train approaches on the northward main track. Therefore, to confine the manual control to the southward main track, the towerman must first throw, to the lower position, the lever marked "Southward Main" at the left end of his panel, as shown in the picture. Then he operates the lever for Port Watson street to the "up" position, which sets up controls so that the signals are not set in operation and the gates are not lowered at Port Watson street.

In addition to raising the lever, the towerman must also keep his foot on a footswitch, or he must keep a finger on a push button on the panel. This "dead man" feature was included in the controls, so that the towerman must remain at the control panel where he can easily watch train movements at all times when he has a manual control in effect to keep gates cleared at a crossing when approach track sections are occupied. Also, while a manual control is in effect, the towerman is warned to this effect by the two red lamps just above the lever for the



Panel of control machine at Central Avenue

crossing where the gates are on manual control.

In the example being discussed, after the southbound passenger train has completed its station stop, and is preparing to depart, the towerman then moves his lever for Port Watson street to the "down" position which allows the automatic track circuit control to be effective, which causes the signals to be set in operation and the gates lowered at Port Watson street.

When the rear of a train clears a crossing, the bell again starts to ring, and the gate arms start up. The flashing-light signals, gate arm lamps, and bell are continued in operation until the gate arms are within a few degrees of the clear position. This raising operation requires about 8 to 12 seconds.

View of concrete house and control tower at Central Avenue

Up For Mail Truck

As a general rule, each southbound passenger train stops with the door of the mail car about in the middle or to the south half of the width of Central avenue. Large quantities of mail are unloaded and loaded at this station, and, therefore, a large-sized highway type motor truck is used as a mail truck. When the train stops, this truck is backed up to the door of the mail car, on the west side. In order to do this, the highway crossing gate must be raised. The towerman watches to see that other vehicles are out of the way, and that the truck is ready to back into place; then he pushes a special button marked "MAIL TRUCK UP", and also operates the manual control lever for that crossing. This sets up controls to cause the gate on the west side of the track to be raised, but the bell continues to ring, and the lamps on the gate arm, and the flashing-light signals, on the gate mast, continue in operation. When the truck pulls away from the car door, the towerman throws the lever to the "down" position, which causes the gate to be lowered in plenty of time before the train is ready to depart.

If a switch engine is to make a move on a siding or house track over a crossing, the towerman throws the "Siding" lever to the "down" position, and then throws the lever for the particular crossing to the "down" position. This sets the signals in operation and lowers the gates at that crossing. The reason for using the "Siding" lever is that this selection provides for manual control without interfering with automatic control by trains approaching on either main track. The motor cars used in this territory are, of course, insulated so they will not shunt track circuits. When such a motor car is approaching a crossing, the towerman operates the "Siding" lever, and the lever for the particular crossing as explained above, to set the signals in operation.

Locations of Signals

This project includes short-arm gates which, when lowered, extend only half way across the pavement, i.e., to obstruct only the right-hand lane of street traffic approaching the crossing. At Elm street, the gate mast foundation is in the parkway, between the curb and the sidewalk. At such locations, the street arm extends out over the street; and the sidewalk arm, operated by the same mechanism, extends over the sidewalk. At Central avenue, there is no parkway between the sidewalk and curb. At such locations, the gate mast foundation is on the "field" side of the sidewalk, so that the one arm extends across the sidewalk and half way across the street pavement. On the "left" side of the streets approaching the tracks, where there, of course, is no street arm, there is a sidewalk arm operated by a special mechanism for that purpose only.

Concrete Houses

On this project, the relays, batteries and other apparatus are located in sectional type pre-cast concrete houses, made by the Permacrete Company. The wiring connections are made with solderless terminals made by the Aircraft-Marine Company. An automatic circuit-breaker is used, instead of fuses, in the incoming 110-volt a.c. power circuit to each concrete house. If the 110-volt power fails, a power-off relay operates to connect the flashing lamp circuit to the battery. A small 11-volt ¼-amp. lamp is mounted behind a No. 461 Raco 2-in. bulls-eye white lense in the door of each house. When the maintainer sees that such a lamp is not lighted, he knows that power is off, a circuit breaker is opened, or some fuse is blown. If any other railroad employee sees that such a lamp is not lighted, he tells the maintainer at once.

In the concrete houses, the terminals, arresters, rectifiers, low-voltage transformers, circuit breakers and resistance units are mounted on a board made of ¾-in. plywood. The arresters are the Raco double safety type. The gates at each crossing are operated from a set of nine cells of Edison A6H storage battery. The lamps are normally fed from a transformer, but if the a.c. fails, the lamps are fed from the storage battery. The lamps on the flashing-light signals and on the gate arms are rated at 11 volts 11 watts.

The wire in the buried cables, from a concrete house, are No. 6 to all gate locations. The wire in the buried cable is solid to terminals in a box on the base casting for the signal. From these terminals, the wire is flexible up to the mechanism, signal lamps and gate lamps. The wire inside the concrete houses is No. 16 flexible. The insulated wire and cable on this project was furnished by the Kerite Company.

This crossing protection project was planned and installed by railroad signal forces, the flashing-light signals, and gates were furnished by the Western Railroad Supply Company and the relays, rectifiers, and low-voltage transformers by the Union Switch & Signal Company.