Cantilever mounting for extra flashers at West Main Street, Kalamazoo, Mich.

Flashing Lights At 20 Crossings In Kalamazoo

How the Michigan Central has dealt with the important problem of protecting the motor and rail traffic involved in a group of city street crossings, over which trains move at medium speed, is related in this description of the layout, controls and operation of signaling at Kalamazoo, Mich.

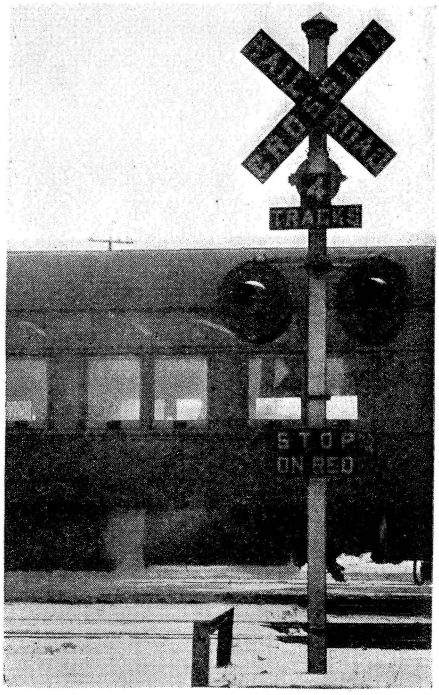
A CO-ORDINATED system of highway-railroad crossing protection, including composite flashing-light signals and specially adapted controls, has been effecting economies and rendering efficient service since its completion by the Michigan Central at Kalamazoo, Mich., 18 months ago. This city of 50,000 population, is divided by the double-track main line of the M.C., the main business district being situated south of the tracks. As the line follows an almost continuous curve through the city, the streets cross at various angles, ranging from 15 to 90 degrees. All of the crossings, of which there are 20, lie within a distance of two miles, extending to the southwest and the southeast city limits.

Besides the number and density of the street crossings, another factor complicates the problem of providing proper signal protection from the standpoint of the railroad; that is, five tracks of other railroads intersect the Michigan Central tracks within a 1,000-ft. distance, near to the main business thoroughfare and the passenger station. These crossings consist of a branch line of the New York Central extending southward to Elkhart, Ind., two tracks of the Pennsylvania line extending northward to Grand Rapids, Mich., and Mackinaw City, a branch of the Grand Trunk Western extending northward from Pavilion, Mich., and the north and south line of the Chicago, Kalamazoo to Saginaw (operated by the M.C.).

Levermen at two mechanical interlockings direct the train movements over these crossings; a third interlocking is located in the east yards about ½-mile distant, to control M.C. main-line crossover and yard movements. Besides the local switching, traffic over the M.C. in this territory comprises approximately 30 trains in each direction daily, of which 16 are passenger trains, most of the others being through freight trains running at speeds up to 35 m.p.h. These various circumstances are cited to indicate the extent of the layout, as well as to suggest the comparative difficulty of providing a satisfactory scheme of crossing-protection signaling that would be uniform, yet sufficiently flexible to make possible the virtual elimination of false or premature warnings. The only practical solution to the problem required the application of a composite manual and automatic control scheme at all but 6 of the 20 crossings referred to above.

Flag and Manual Gate Protection Displaced by Signals

Prior to 1934, the protection at eight of the crossings involved in this installation was that afforded by crossing watchmen on three shifts, who used stop signs and lanterns or, in some instances, manually-operated gates. Other crossings were equipped with electric signals of obsolete type, center-of-street flashers, or only the standard crossbuck signs, the latter with or without bells. All of these arrangements have either been supplanted or supplemented by standardized flashing-light signals with bells, conforming in most respects with the Signal Section, A.A.R., recommendations and in all respects with the requirements of the Michigan State Highway Commission. In every case the existing center-of-street flashers were moved to the side of the street and an additional signal added on the opposite side of the track. Those signals not equipped with back lights were, for



Typical flashing-light highway crossing signal near the Church Street tower

the most part, so equipped and side lights were provided where conditions warranted.

Most of the flashing signals are of the usual type, as illustrated, consisting of the reflectorized number-of-tracks sign, the Michigan standard "stop on red" sign, and the crossbuck "railroad crossing" signs, reflectorized, as required in Michigan. The flasher units are equipped with 10-volt 18-watt lamps. At least one bell is in service at each crossing. The signal masts are unusual in that, rather than pipe posts, they consist of 80-lb. T-rails, each fitted with two milled boards to make a square cross-section secured by square clamps. A square and pointed cast-iron pinnacle fits over the top of each mast. This construction has proved to be substantial as well as economical.

Extra Flashers Installed

At Burdick, Rose and West Main streets, three of the more important thoroughfares, extra signal protection was considered necessary. Accordingly, in addition to the usual reflex signs and flashers, two pairs of flashers were mounted on a bracket above the crossbuck signs. The masts for these signals are 15 ft. high and stand 3 ft. inside the curbing. The lower flashers are mounted 8 ft. above the surface of the street. This type of signal is in service on each side of the tracks at the three streets mentioned. Including the backlights, motorists are confronted with three separate sets of flashing lights operating in unison, in addition to the bells, when a train approaches these crossings. Thus, the possibility of a large truck, unfavorable background and/or foggy weather obscuring all of the visual indications simultaneously, appears highly remote.

Manual Control Provided

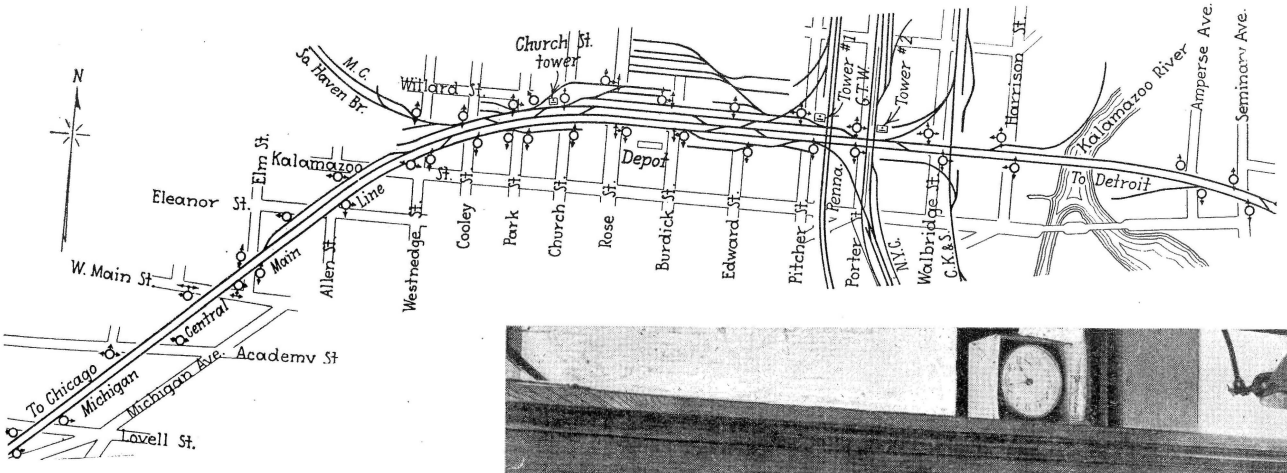
Controls for all of the signals at Kalamazoo are arranged for automatic operation by means of track circuits on both main lines, eight of the layouts including approach controls for reverse-traffic movements. In all cases, a stick-relay scheme is employed rather than an interlocking relay. The length of the various approach track circuits, depending upon the circumstances, ranges from 400 ft. to 3,800 ft.

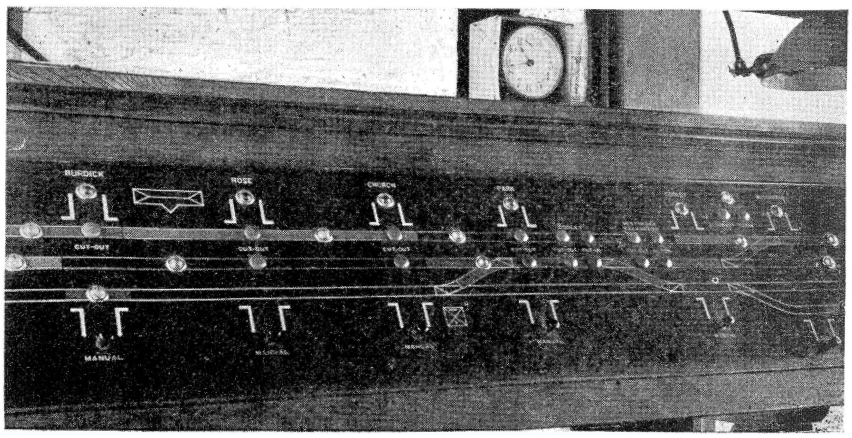
Because of the wide variation of train speeds in this locality, combination automatic and manual control is required for 14 locations, beginning with Kalamazoo street on the west and ending with Seminary avenue on the east. For example, in making the station stop, passenger trains would automatically set the signals in operation at several streets unnecessarily were it not for the manual controls. Switching movements would also detain motor traffic unreasonably. Furthermore, as the automatic controls are laid out for the maximum train speeds in each case, the manual controls afford a means of avoiding excessively long warning periods during slow freight-train movements.

The principal control station is situated in an elevated tower at Church street. A watchman supervises the crossing-protection signaling for seven streets from this point, there being three tricks for 24-hour service. The previous arrangement required a flagman at each of these crossings. The Church Street control panel, as illustrated, consists of a complete track model board, a full complement of track-occupancy indicating lamps similar to those commonly used at interlockings, and a system of push buttons for operation of the signals. Each crossing symbol on this board includes a miniature repeater lamp which operates in unison with the flashers on the corresponding street. A two-position stick button for each set of signals enables the watchman to make or break the controlling XR circuit to effect straight manual control at any time prior to the arrival of a train at the crossing, as for example, when a train is approaching a crossing from a side track.

Watchman Avoids False Operation

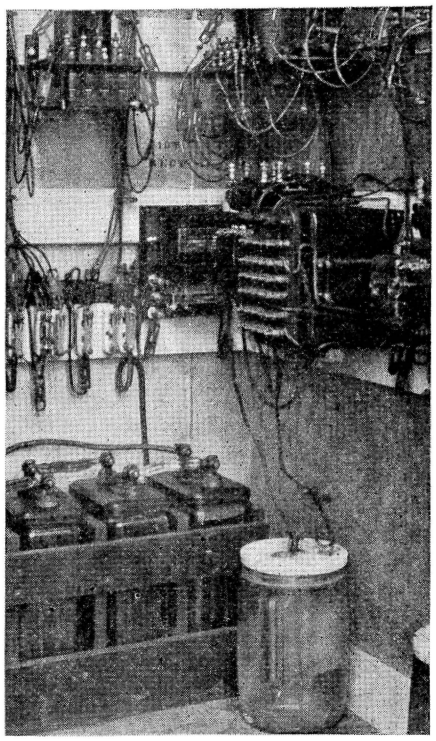
A non-stick push button for each approach control track section, designated "cut-out" button, enables the watchman to cut out the automatic control at any time. These buttons are used whenever a train or cars are standing on one of the control sections, as during a switching operation or station stop. Hav-





Track layout of the Kalamazoo crossing signal project, showing the signals and the direction of the indications. Right—the manual-control model operated from the Church Street tower

ing cut out the automatic control by using a cut-out button, the watchman must restart the signals by means of the "manual" button when the train is ready to proceed across the crossing. A cut-in button has



Storage battery provides stand-by lighting energy and operates the line circuits

been provided for each of three crossings where the view from the tower is not particularly favorable. These buttons enable the watchman to cut in automatic control of the corresponding signals once it has been cut out. Thus it is evident that the watchman at Church street has complete control of the signals at the seven most important crossings. By close observation of the track indicator lights, which are supplemented by single-stroke bells, he is able to supervise the signal operation to best advantage.

Operators and Watchman Co-operate

An important factor in the successful operation of the manual-control scheme is the system of loudspeaker telephone communication that is maintained among the three interlocking plants and the Church Street tower. Whenever a train approaches the yards, one of the levermen announces its appearance on the annunciator circuits. Later he informs the watchman and the other levermen of its progress by announcing "freight train coming on through" or "stopping to leave a cut of cars" or "moving fast," depending on the case in point. The various indicating and communication facilities, make possible the successful operation of the automatic-manual control scheme.

Manual Control Circuits

The circuits for the manually-controlled signals are similar to those controlled entirely automatically, in that a stick-relay scheme is employed. The push-button contacts are inserted in the proper places in series with the XR and SR circuits, with the necessary cut-arounds, to either break a stick circuit, re-establish it, or to effect "on" and "off" operation by means of the manual control button. Of course, the various annunciators and indicators on the Church Street control panel require a number of special repeater circuits and relays. For such purposes there are 38 relays in the first floor of the watchman's tower. These are, for the most part, General Railway Signal Company. Style-K neutral relays. A 10-volt storage battery operates the local controls at Church street and is also housed in the tower.

At Burdick street, near the passenger station, as well as at the larger locations elsewhere, a 4-ft. by 4-ft. by 6-ft. relay house was provided to shelter the instruments, transformers and battery. A 10-volt Exide DMGO-7 battery provides stand-by power for the six sets of flashers, which are normally supplied with energy from a commercial a-c. source. Track circuits throughout the Kalamazoo yard are fed by Edison primary battery. At several of the new locations, however, such as at Burdick and Westnedge streets, G.R.S. Type-BBY automatic rectifiers are employed each with one Edison primary cell as stand-by for the track-circuits. In general, the a-c. floating storage battery power system, with primary batteries for track circuits, is used throughout the Kalamazoo territory. Type-K-2 transformers are used to reduce the a-c. voltage from the 110-volt distribution circuits, which are fed from several meter locations.

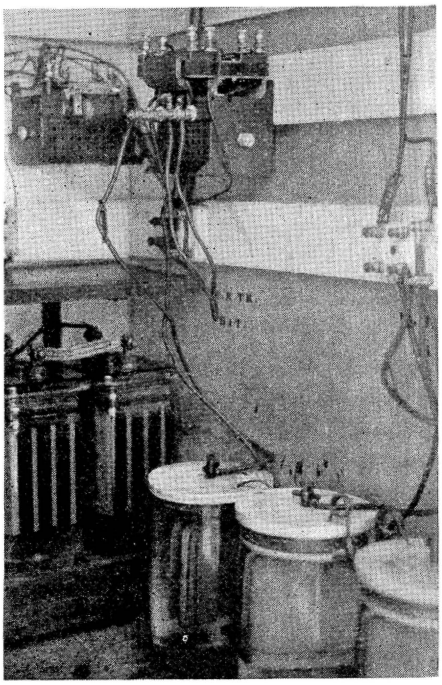
Special Plans Drawn

All underground wiring in the crossing signal project consists of trenchlay cable and a small amount of parkway. The track leads utilize T-rail bootlegs at the insulated joints, which has been standard construction on the Michigan Central.

Owing to the concentration of the crossing-signal and interlocking apparatus in the vicinity of Church street, Tower No. 1, and Tower No. 2, it was necessary to provide special circuit plans which would facilitate not only the actual construction but also simplify circuit maintenance and trouble-shooting later on. To this end an ingenious scheme was devised and carried out whereby the automatic block signaling and the interlocking circuits are segregated from the crossing protection circuits, on the circuit plans. A separate plan was provided for each crossing layout, showing the neighboring streets, track circuits, length of control sections, and local wiring, exclusive of the automatic or interlocking signal circuits. Of course a separate wiring plan was provided for the Church Street tower, as the controls are relatively complex at this point. By this means the wiring at any location is clearly defined by the special plans, and the inter-relation of all of the apparatus and circuits is shown on the general layout plans.

Since the uniform crossing protection at Kalamazoo was placed in service the number of accidents has been materially reduced. In addition to this desirable consequence, a saving has been realized in operating expense.

This project of highway crossing protection was planned and installed by the signal forces of the Michigan Central under the direction of J. C. Mock, signal and electrical engineer, and his staff. The principal items of material, including the new relays and rectifiers, were furnished by the General Railway Signal Company.



Automatic rectifiers and primary battery operate the track circuits