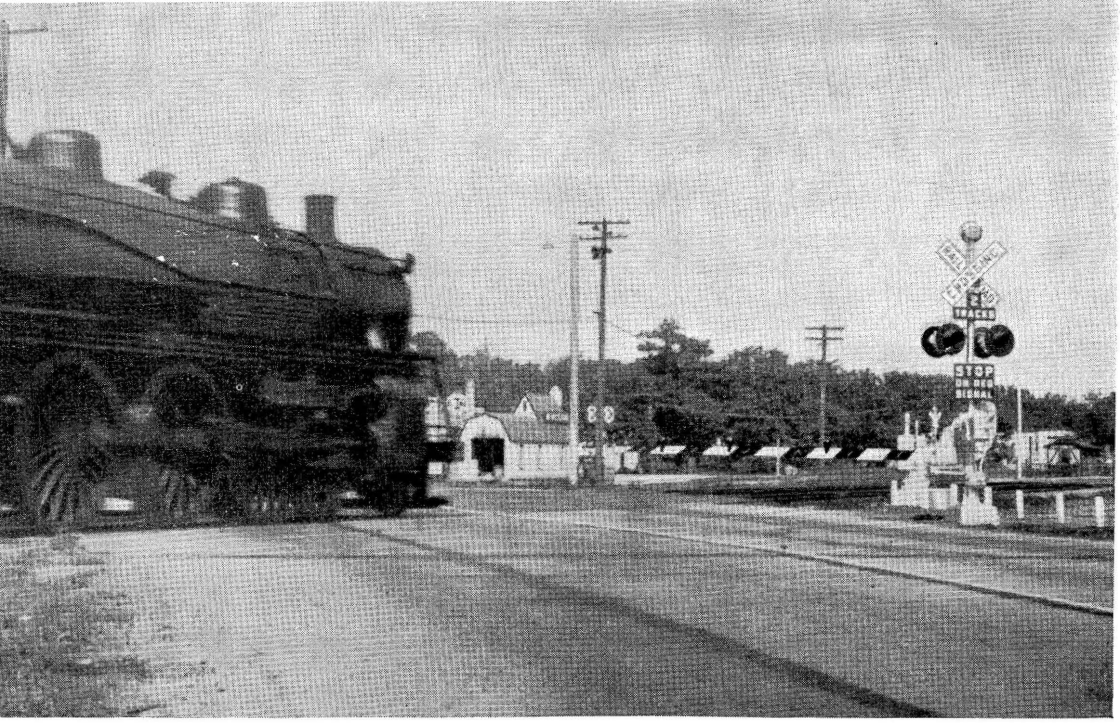



Gates down with train passing over Caldwell Ave. crossing

# Three Gate Crossings in a Row

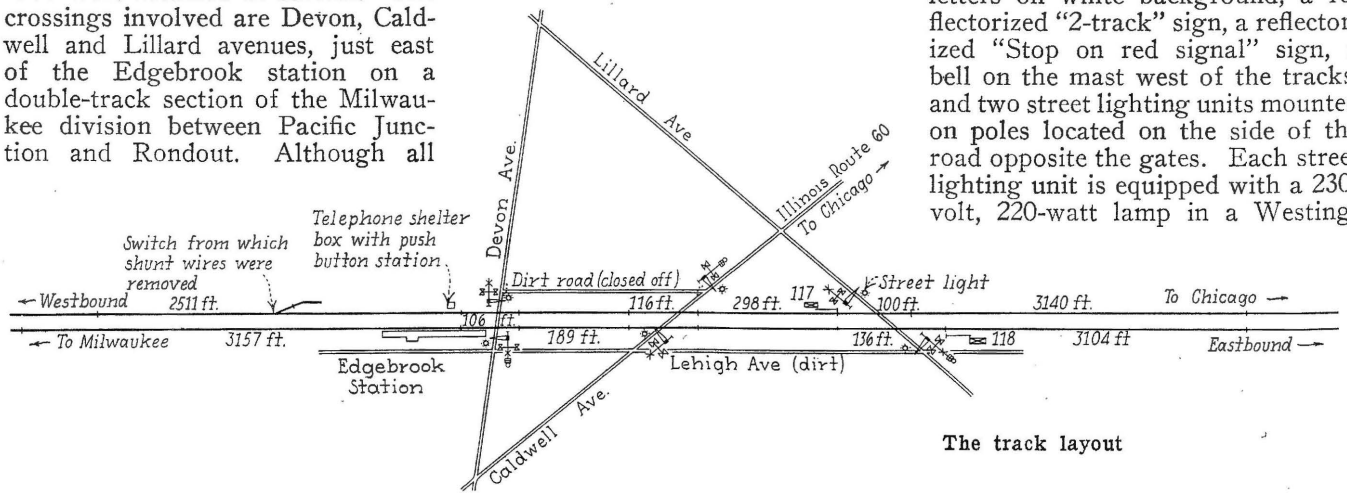
**Milwaukee installs gates operated by semaphore mechanisms at three adjacent crossings as supplementary protection to flashing lights, bells, and street lighting.**

CROSSING gates, operated by semaphore mechanisms, have recently been installed by the Chicago, Milwaukee, St. Paul & Pacific at three heavily travelled crossings in Edgebrook, Ill., on the outskirts of Chicago. Flashing lights, bells, and street lighting placed in operation in 1930 were retained in service. The crossings involved are Devon, Caldwell and Lillard avenues, just east of the Edgebrook station on a double-track section of the Milwaukee division between Pacific Junction and Rondout. Although all three crossings have very heavy automobile traffic, practically no pedestrian traffic is involved, the greatest amount being on Devon avenue which is adjacent to Edgebrook station. Railroad traffic is composed of both suburban and through passenger trains, totalling approximately 32 trains each way daily, and an occasional freight, practically all of the Milwaukee freight trains out of Chicago being handled over another line between Chicago and Pacific Junction.

Devon avenue crosses the railroad approximately at right angles while Caldwell and Lillard avenues cross the tracks at angles of approximately 30 and 45 degrees, respectively, Caldwell intersecting Devon a few hundred yards west of the track and Lillard intersecting both Caldwell and Devon avenues a few hundred yards east of the tracks.

### Protection Provided

With the addition of the gates, the protection at Devon avenue consists of two flashing-light signal masts, each equipped with flashing-light units facing in both directions along the highway, a crossing gate covering each approach lane, a non-reflectorized crossbuck sign with black letters on white background, a reflectorized "2-track" sign, a reflectorized "Stop on red signal" sign, a bell on the mast west of the tracks, and two street lighting units mounted on poles located on the side of the road opposite the gates. Each street lighting unit is equipped with a 230-volt, 220-watt lamp in a Westing-




The track layout

house reflector, controlled by a Tork time clock. The protection at Caldwell and Lillard is similar, except that the bell at Caldwell is on the mast east of the tracks.

All gate arms extend a little less than half-way across each highway, allowing room for cars to run around them in case of trouble. Each gate arm is equipped with 10-volt, 18-watt lamps, showing red in each direction along the highway. The lamp nearest the gate tip is steady burning, while the two directly in line with traffic flash in synchronism with the flashing-light signals.

Average train speeds over the crossings are around 65 to 75 m.p.h., some of the through trains, particularly those eastbound, exceeding these speeds and some of the suburban trains being considerably slower, due to the station stop at Edgebrook. The control circuits extend 3,200 ft. in each direction on each track, except for a 2,600-ft. eastbound approach control on the westward track. The flashing-light signals, bells, and flashing lamps on the gate arms operate, upon the entrance of a train upon the control circuits, for five seconds before the gates start down. The gates then lower, consuming 9 or 10 seconds, and are down a minimum of 6 to 10 seconds for fast trains and 20 to 25 seconds for suburban trains. At each crossing the gates start to rise when the rear of the train has cleared the crossing. However, the flashing-light units, flashing gate arm lamps, and bell continue to operate until the gate arms are entirely clear. The gates clear in approximately eight seconds.

## Operating Features

One of the interesting features of the installation is the inclusion of a push button in a telephone box on the westbound Edgebrook station platform for use by trainmen in restarting the operation of the protective devices at the three crossings when a westbound train makes an eastward return movement on the westward main. Another interesting feature is that the shunt wires were removed from a trailing turnout in the eastward approach on the westward track and a switch-repeating relay installed in order to eliminate false operation when trackmen were testing the switch.

The territory in which the crossings are located is signaled with Style B, three-position semaphores, giving straight two-block indications. Neutral primary battery track circuits are used with polarized line control for the signals. As will be noted in the diagram, a set of automatic signals is located at Lillard avenue. Separate track sections were provided across each crossing and between the crossings, with 4-ohm track relays, control of the protective devices at each crossing being effected by a line interlocking relay for each track. The 5-second delay between the operation of the flashing lights and the gates is obtained by breaking the gate motor controls over the contacts of two 2.5 second slow-acting relays controlled in cascade.

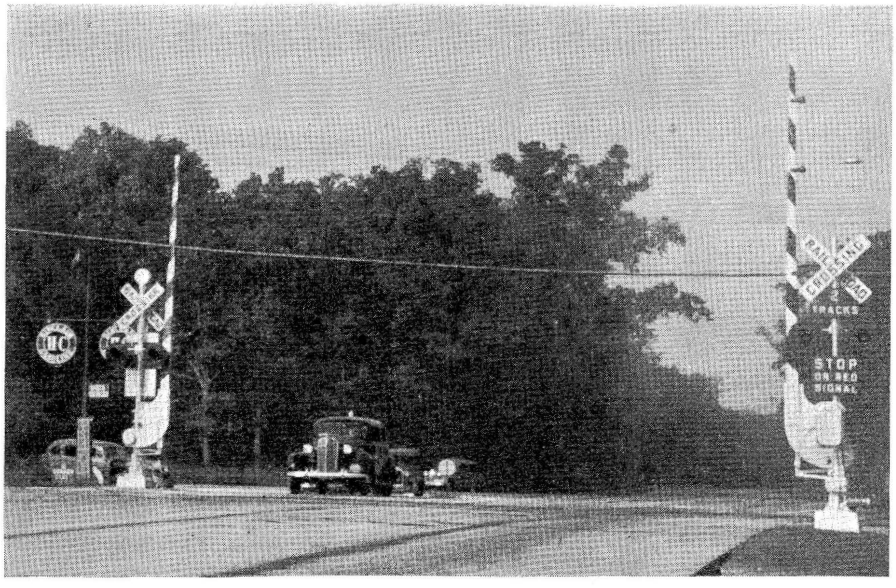
## Equipment

The gate arms were supplied by the Western Railroad Supply Company, the gates at Devon avenue being equipped with Union Switch & Signal Company Style T-2 semaphore mechanisms and the gates at Caldwell and Lillard avenues being equipped with General Railway Signal Company Model 2A mechanisms.

All mechanisms were modified so as to be adaptable for the operation of gate arms. The counter-weights on the gates were so positioned as to secure the torque required for different phases of operation of the gate arm. For example, when the gate is in the raised, or 90 deg., position, it is desired that the torque be maximum (approximately 60 ft. lb.), in order to break loose any sleet that might tend to prevent operation. As an arm lowers, the torque gradually reduces until, when it is horizontal across the highway, the torque is approximately 20 ft. lb. The advantage of having minimum torque at horizontal, is that the effort to

*(Continued on page 709)*

**Right—Instrument cases at Devon Ave. The exteriors are painted with aluminum paint.**




**Below—The gates at Devon Ave.**

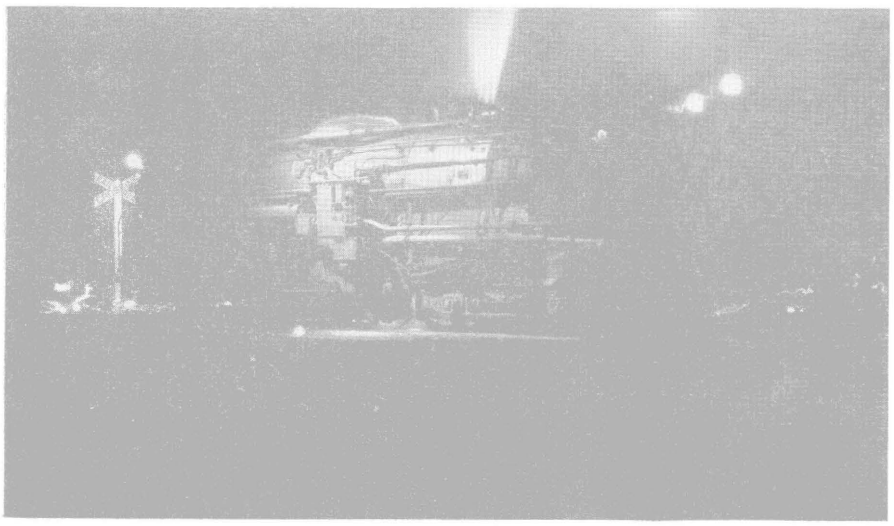
terminals where the traffic includes trains moving at high speed and others at low speed, as well as cases where cars stand on the crossing for short periods, the function of providing a warning of the approach of a train is properly performed by a signal such as the standard flashing-light type. The argument might be advanced that, regardless of whether a train is approaching the crossing, switching on the approach sections, or occupying the crossing, the signals would be operating and should, therefore, afford warning sufficient to cause a vehicle driver to stop, regardless of whether he could see the train on the crossing.

Especially during the hours of darkness, the aspect of a flashing-light signal can be plainly distinguished for several thousand feet, providing no objects interfere with the line of vision of the approaching drivers. If drivers carelessly disregard this signal protection, it does not seem logical that anything more can be expected. However, at some locations signal aspects are difficult to distinguish. For example, at one crossing equipped with flashing-light signals on the Illinois Midland, stores and taverns along a highway near the crossing use so many neon signs that it is difficult for the driver of a fast-moving automobile readily to pick out the flashing-light crossing indications. As a result, automobiles have been run into the sides of trains at this crossing, and, therefore, illuminating equipment is to be installed to supplement the signal protection. Likewise, at a crossing on the Misouri-Kansas-Texas near Coffeyville, Kan., where through trains as well as switching movements are involved, a complete new installation, including flashing-light signals as well as illumination, has been in service since May of this year.

### Subject Deserves Study

In consideration of the information given here, and also because of the fact that engineers of several state commissions are studying illumination as a type of crossing protection, it would seem that signal engineers might well give the subject adequate study in order that they may be prepared not only to give their managements advice as to the policy to be followed with reference to this type of protection, but also be informed as to the types of equipment and construction methods to be followed. The installation on the M-K-T, mentioned above, was installed by the signal department forces of the railroad, the installation being paid for by the state from federal funds.

Regardless of whether signals are used in connection with illumination installations, the use of track circuit control seems most practicable as a means of reducing the charges for electrical energy consumed by the lamps, as well as increasing the life of the lamps. The power required for the lamps can, in most instances, be taken from the a-c. power distribution lines of the signal department used to feed the a-c. floating or a-c. primary signal power systems. Furthermore, as this illumination is a form of protection, it should logically be handled by signal department forces.



Night view at an illuminated crossing on the Chicago & Illinois Midland

## Milwaukee Gates

*(Continued from page 707)*

raise the arm is likewise minimum. The flashing-light units are Western Railroad Supply Company, Style A.A.R. with 10-volt, 18-watt lamps. Soft-toned, 12-volt, d-c. bells were provided.

Power is obtained from the railroad's power line at 220 volts, 60 cycle, power being fed from a commercial tap at Forest Glen, Ill., 1.3 miles east of Edgebrook. Power is transformed by a Union W-10 transformer at each crossing, with 6 cells of Exide 80 a.h. DMGO-9 battery floating on an RX-21 rectifier.

### Instrument Cases

All line relays are of the Union DN-11 type, with the exception of the DX-13 interlocking relays, NF-2 flasher relays, and ANL-30 power-off relays. The relays are shelf-mounted, with shock-absorbing spring supports. All line wires are No. 10 weatherproof. Either sheet steel or cast iron instrument cases are located at each crossing. Parkway cable is used between signals and is run under each concrete slab crossing in two 3-in. iron pipes. At Devon and Caldwell avenues, the lead-in from the pole line to the instrument cases are in two 10-conductor No. 14 parkway cable. The lead-in at Lillard avenue consists of No. 14 weatherproof wires made up in cable form. The signals, mechanism, instrument cases, etc., are painted with aluminum paint.

The neutral track relays between the crossing are fed by 3 Edison 500 a.h. primary cells in multiple. On the approaches the primary cells are floated on RT-5 rectifiers. Track leads are No. 9 parkway terminated directly at the rail with Saco rail terminals. Elastite trunking pot heads are used in bringing the parkway up to a rail terminal. Battery housings at the crossing consist of 16-cell capacity concrete battery tubs made by the Milwaukee at the Tomah shops. Brach lightning arresters, A.A.R. porcelain terminals, black fibre tags, and No. 12 and No. 16 flexible wire jumpers and relay leads were used.

This installation was designed in the office of L. B. Porter, superintendent of telegraph and signals of the Milwaukee, at Milwaukee, Wis., and was installed by a crew of six men from the signal department forces under the direction of J. Ellefson, signal inspector. The installation was placed in service on September 16.