At the left in this picture is one of the new pedestrian signals, directed along sidewalk

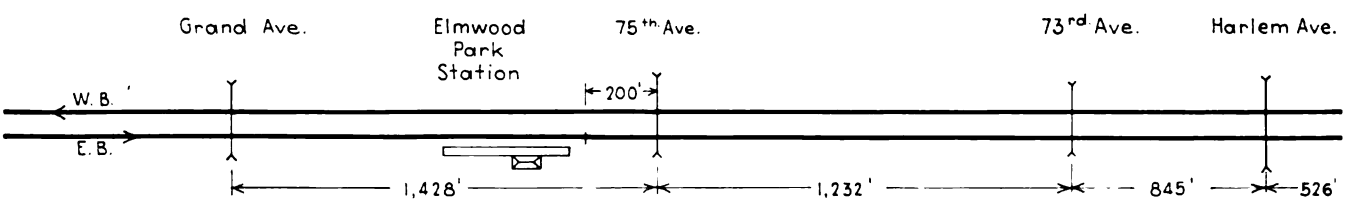
Gates at Eight Street Crossings on the Milwaukee Road

Improved protection, with automatic control, including speed selections and automatic cut outs, to reduce delays to city street traffic

THE four-track main line of the Milwaukee Road crosses eight main streets in Chicago and Elmwood Park in suburban area about 10 miles west of the Chicago Union Station, on the Milwaukee's route between Chicago and Omaha. Gates were previously in service at three crossings: Oak Park Ave., Harlem Ave., and Grand Ave. These gates were controlled automatically by track circuits, and also men were on duty part time for manual supervision of the control of the gates. At five other crossings, automatically-controlled protection was in service as follows: flashing-light signals at Seventy-Third Ave., Neva Ave., and Sayre Ave; wig-wags at 75th Ave., and rotating-disk stop signals, with flashing-lights, at Nordica Ave.

Due to extensive home building in this area, the street traffic over the crossings has increased considerably in the last few years. To provide a uniform type of adequate protection, with automatic control, in service throughout every 24 hours, the railroad has installed gates to replace the other forms of protection at the five crossings. Gates, with flashing-light signals, are now in service at all eight crossings in this area.

Through this territory the Milwaukee Road has four main tracks. The two tracks on the north, No. 1 and No. 2, are used primarily by passenger trains and by some "through" freight trains. Tracks No. 3 and No. 4, are used by other freight trains and by transfer moves between yards and industries. The traffic includes 4 through passenger trains and 28 suburban passenger trains, as well as 35 or more freight trains and transfer moves, thus totaling about 67 to 85 movements daily in this vicinity. The through passenger trains pass through this territory at speeds ranging from 60 to 70 m.p.h. Some of the suburban passenger trains stop only at Mont Clare, (a suburban station between Sayre Ave. and Nordica Ave.) while other suburban trains stop also at Mars and Elmwood Park Stations. As shown in the plan, all three of these suburban stations are located within the control sections of the crossing gates. Some of these trains



These gates are typical of those installed at five crossings in the 1951 project

have as few as two cars, while others sometimes have as many as 11 or 12.

Flashing Lights and Gates

The new protection consists of standard Signal Section, A.A.R. flashing-light signals, short-arm gates, and bells, as shown in the pictures herewith. As extra protection for pedestrians, additional flashing-light signals and pedestrian type bells were installed adjacent to the sidewalks at locations C and D as shown in the drawing herewith. The flashing-light units in these signals are directed along the sidewalks. These pedestrian signals are on short masts so that the center of the lenses is about 7 ft. above ground level.

Problems of Control

Under the previous arrangement, with gates at three crossings and flashing-light signals or wig-wags at the other four crossings, automatic track circuit controls were in effect with supervisory manual control at three crossings with gates. These track circuit control sections were established on the basis of a minimum of 20 seconds warning time, prior to arrival of the fastest trains.

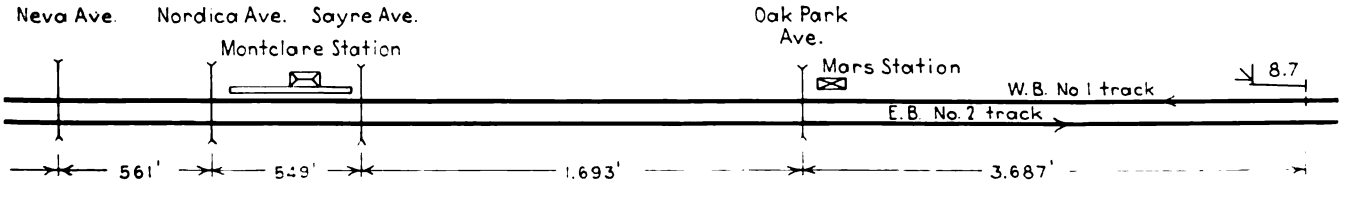
This conventional control, however, was not acceptable for the new protection with gates at all eight crossings, because the variation in train speeds and the stops by suburban trains at the three stations caused the gates to be down a lengthy time, causing delay to street traffic. In order to minimize delays to street traffic, a completely new system of track circuit controls was installed to include selective timing controls, cut outs and restarts. In the new project a short track circuit about 117 ft. long extends over each crossing on each track. When such a track circuit is occupied, the signals flash and gates stay down at that crossing regardless of special controls.

These gates and flashing-light signals are at Oak Park Avenue crossing

Selective Speed Controls

In the new installation, all of the track circuit approach control sections are long enough so that the crossing protection is set in operation a minimum of 20-30 seconds (depending on the distance between signals), before a train at the maximum speed of 70 m.p.h. would arrive at a crossing. For example, when a westbound train approaches on track No. 1 at high speed, (more than 47 m.p.h.) the crossing protection at Harlem Ave. (where the minimum protection is 24 seconds) is set in operation when the leading wheels pass the first cut section west of Oak Park Ave. 3,079 ft. from Harlem Ave. In contrast, if a westbound train such as a freight train approaches at medium speed (less than 47 m.p.h. and more than 23 m.p.h.), the protection at Harlem Ave. will not be set in operation until the front wheels of this train pass insulated rail joints at Sayre Ave., 1,559 ft. in approach to Harlem Ave.

In the speed selections discussed above, the speed of trains is determined by the time which elapses while the front wheels move from the entering end to the leaving end of a certain track circuit or a series of consecutive track circuits. Time is measured by motor-driven time-element relays. For example, a time-element relay starts when a westbound train on track No. 1 passes Narragansett Ave. This relay is set to operate in 48 seconds. Therefore, if the speed of the train averages more than 47 m.p.h. the time has not elapsed before the front wheels arrive at the first cut section west of Oak Park Ave. As a result, the crossing protection at Harlem Ave. is started in operation. On the other hand, if more than 48 seconds expires before the front wheels of the train pass from Narragansett Ave.



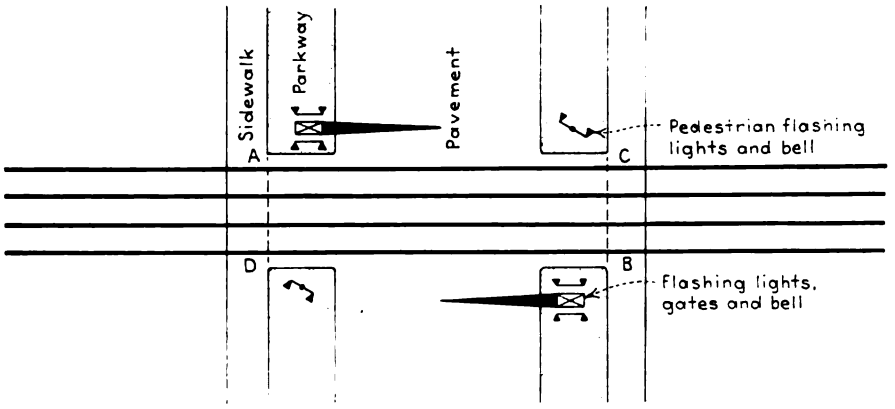


Fig. 2—Plan showing pedestrian signals

to Oak Park Ave., the average speed is less than 47 m.p.h. As a result the protection at Harlem Ave. is not set in operation when the front wheels pass the first cut section west of Oak Park Ave. As a third example, if a westbound suburban passenger train approaches at reduced speed, prepared to make a stop at Mont Clare station, the protection at Harlem Ave. will not be set in operation, until after the train stops at Mont Clare, and then, after starting again, enters the track section 1,000 ft. in approach to Harlem Ave. In the circumstances discussed above, the speed of the train must average less than 47 m.p.h. in the 3,097 ft. approaching Oak Park Ave., and must average less than 23 m.p.h. between Oak Park Ave. and Sayre Ave. After the train leaves the station and the front wheels pass the insulated joints 150 ft. west of Nordica Ave., and 830 ft. from Harlem Ave., the protection at Harlem is set in operation. No time selection or cut out applies for this 830 ft.

Special Local Control

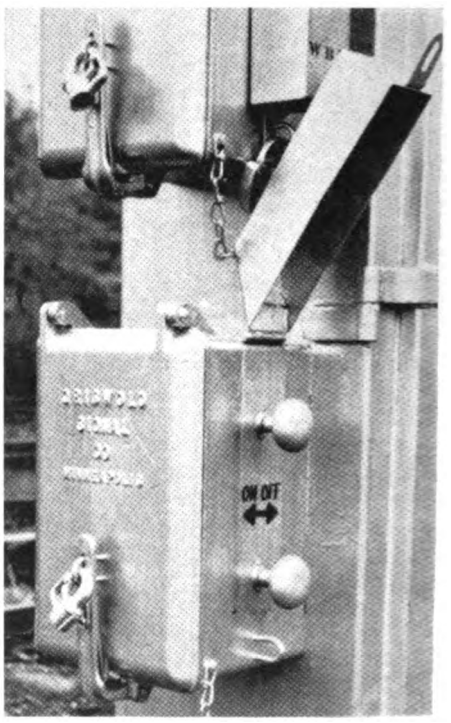
When making switching moves it is some times necessary to use local control at crossings in order to cut out the flashing-light signals and clear the gates to permit street traffic to move. As shown in one of the pictures, a set of controllers is housed in a small box on the side of a relay case at a crossing. Each controller is operated by a handle that turns like a door knob. This action is against spring pressure. Therefore, in order to clear the gates and hold them clear, the knob must be turned and held by hand. The controller knobs are normally enclosed by a sheet metal cover which is locked with a standard switch padlock. The controller case is locked with a signal department padlock. At each crossing there is one controller for each of the four tracks.

Interlocking Relays

In this installation, interlocking relays are used in the customary manner to cut out the flashing-light signals and raise the gates when a train passes a crossing and is occupying the receding track circuit control section. In some instances a local freight going east on track No. 4, will stop to leave part of the train between Neva Ave. and Nordica Ave., then the engine and other cars run forward past Nordica Ave. to set out or pick up cars on a spur for a coal yard, then return to pick up the train. This local track layout is shown in the plan below.

When making the move as described above, the cars left west of the crossing will actuate the time element cut out for that section, and pick up the west side of the interlocking relay, allowing the flashing lights to cut out and the gate to clear. The engine, on a return move over the crossing to pick up its train, gets normal operation. On this return move the front wheels of the locomotive often do not clear the circuit over the crossing, holding the west side of the interlocking relay on the "hook" which would result in operation on a receding move.

To eliminate this faulty operation, a special relay was installed to pick up when the time-element stick relay west of the crossing is up; the east side of the interlocking relay is down; and the track relay over the crossing is down. A contact on this special relay, when picked up, bridges the crossing track circuit break in the control circuit of the west side of the interlocking relay, and allows it to pick up. The east side of the interlocking picks up normally when the engine moves off the east track circuit. This drops



Local manual controller

the special relay, allowing the west side of the interlocking relay to drop, assuring normal operation on a receding move.

The crossing protection was planned and installed by signal department forces of the Milwaukee Road, under the jurisdiction of L. B. Porter, superintendent telegraph and signals.