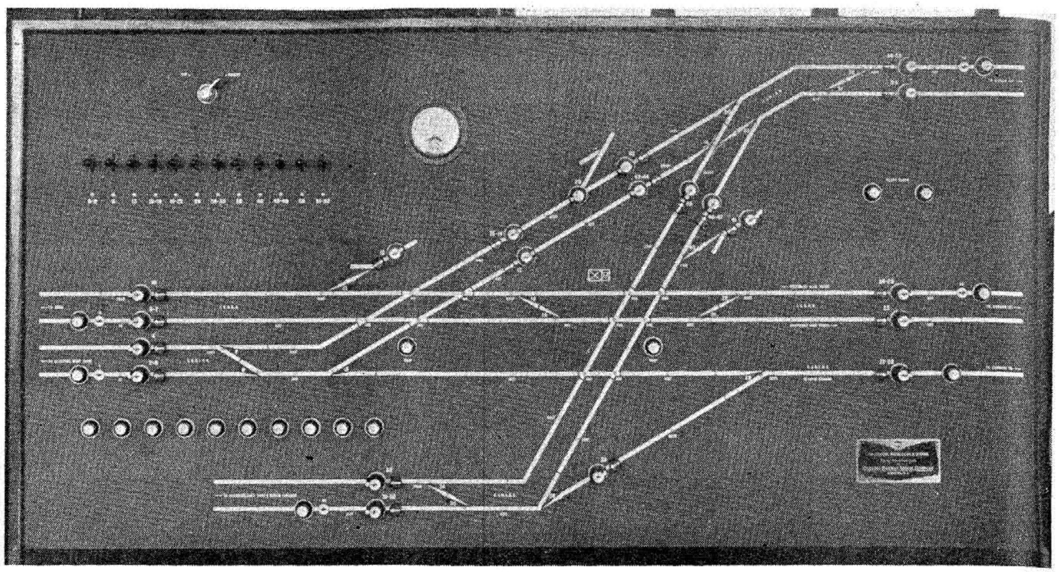


The panel of the new control machine is 24 in. high, and 48 in. wide, has 20 entrance and 20 exit buttons to control 29 signals, 5 switches, 6 crossovers and 1 switch lock. This interlocking was placed in service at 9 a.m. on April 30, 1941

Modern Entrance-Exit Replaces

Plug-in, quick-detachable relays, flame-proof wiring, new type sheet-metal instrument cases and special protection for cables, are features of modern construction on a large interlocking plant

At 55th Street near Cicero avenue in the southwest environs of Chicago, the Indiana Harbor Belt, which is a part of the New York Central System, has installed a modern all-electric inter-locking with Entrance-Exit, "N-X", control to replace a mechanical plant at a track layout involving several junctions and crossings with the Belt Railway of Chicago, which is owned and operated by the Chicago & Western Indiana. The tracks involved are used exclusively for freight service, and the trains consist primarily of transfer cuts being moved between various yards in and near Chicago. The traffic is heavy, and one or more trains are coming or going practically all the time during a 24-hour period. An average total of approximately 92 train movements are handled through this interlocking daily.

Why The New Plant Was Required

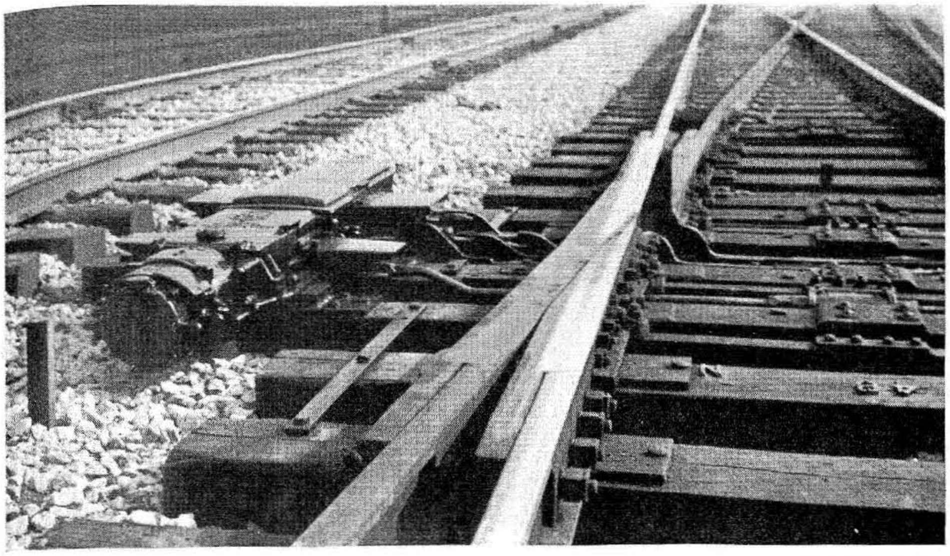
The installation of the new electric interlocking was necessitated by major track changes which were required to remove a double-track line of the C. & W. I., so that the area of the field of the Chicago Municipal Airport could be enlarged. As shown in the lower left of the accompanying illustration, an east-and-west double-track line of the I. H. B. runs parallel and just north of a double-track line of the C. & W. I. At a point, A, just west of the airport field, this line of the I. H. B. curves to the north, with a tangent to a point, B, north of 55th Street, and then curves eastward, with a tangent extending beyond a crossing with a north-and-south double-track line of the C. & W. I.

At the point A, mentioned previously, a double-track line of the C. & W. I. extends eastward through the middle of what ultimately will be the enlarged air field, and then this line curves north to a junction with the north-and-south line of the C. & W. I., at a point C, several hundred feet south of the crossing with the I. H. B. east-and-west line. In order to permit removal of the C. & W. I. double-track east-and-west line from the airport field as proposed, a new double-track line was built from point A, parallel with the I. H. B. track, northward to point B and then eastward as shown in dash lines. This new project involved a crossing with the I. H. B. tracks at the interlocking as well as a new double-track extension in the northwest quadrant of the crossing at the interlocking. Also a single-track connection was extended eastward across the C. & W. I. tracks to connect with the C. & W. I. single-track Elsdon branch extending eastward from the interlocking.

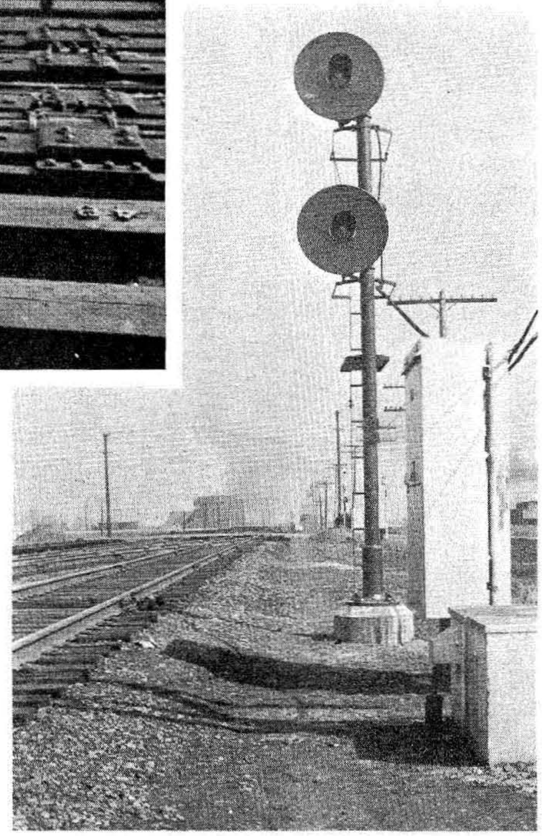
Many of the new switches, crossovers and movable-point frogs, as well as the new interlocking home signals, were, of necessity, located too far from the crossing to permit practicable operation of a mechanical interlocking. For these reasons, a new power plant was required. In order to reduce the costs, as well as to eliminate hazards of derails, a decision was made to remove the derails formerly in service on the main tracks.

Decision To Use An NX Plant

Having concluded that a power interlocking was necessary, the next decision was not to use a conventional type control machine with individual levers, mechanical locking between levers, and electric lever locks, but to adopt the all-relay scheme of interlocking in which the interlocking is accomplished by inter-connections of circuits, rather than by mechanical locking. The next decision was to use a most modern form of all-relay con-



Left-Switch machine for the operation of movable-point frog. Below—Typical search-light home signal



Interlocking Mechanical Plant

On Indiana Harbor Belt

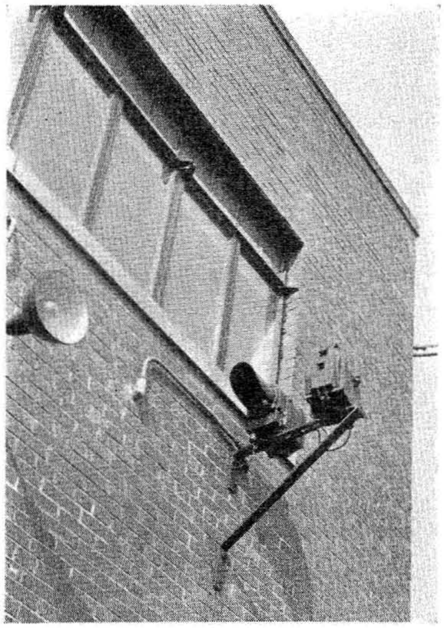
trol, i.e., the Entrance-Exit system, in which no individual levers as such are required, but rather a route is established as a whole by operating two knobs or buttons on the face of a control panel.

First a knob, at the place on the diagram representing the signal at the entrance of the route, is turned, then a button at the point representing the exit from the plant limits is pushed. The switches are then positioned properly for the route, and, afterwards, the signal clears. With a conventional type machine, using individual levers, the operation of a switch lever cannot be completed as one motion because time must be allowed for the proper switch machine to operate and for the indication of such operation to be transmitted to the lever to release the lever lock. With an NX system, however, all of the power switch machines involved in establishing a route are operated practically simultaneously, within a period of a very few seconds, after which the signal for the route clears at once. Therefore, the facility with which a route or routes can be established with this Entrance-Exit control system is a decided advantage at this new interlocking because the traffic is heavy. An important point is that the decision to use this modern Entrance-Exit all-relay control machine and system did not increase the total costs above those which had been calculated previously on the basis of using a conventional type individual lever interlocking machine with mechanical locking and electric lever locks.

Features of Control Machine

The face of the panel of the control machine is 24 in. high and 48 in. wide. This panel includes 20 entrance knobs and 20 exit buttons, to control 29 operative "arms" on interlocking home signals, 5 single switches, 6 crossovers, one set of movable-point frogs, and one electric switch lock on a hand-operated switch located in home signal limits. The switch machine for No. 40 turnout to an industry track has a pipe connection extending to a Hayes derail at the fouling point on this turnout. The basic principles of the NX system of circuits, for the control of an interlocking, were explained in an article on page 220 of *Railway Signaling* for April, 1939, and will, therefore, not be repeated here. The discussion herewith is devoted primarily to an explanation of the new features of the NX control as applied to the new I. H. B. interlocking.

When the high "arm" of a high signal is to be cleared, the operator turns the entrance knob 90 deg. clockwise, but if the "call-on" aspect is to be displayed, the same knob is turned 90 deg. counter-clockwise. The entrance knobs are hollow. A lens, with a black arrow pointing in the direction which the signal controls, is mounted in the face of each knob, but this lens is fixed, in that it does not turn with the knob. When an entrance knob is turned 90 deg. to initiate the setting up of a route, the lamp in the knob is lighted red. After the exit button is pushed, small lock lights in the lines representing the switches are lighted to indicate the route, as is indicated also by small movable sections of the diagram which represent the switches,



Train order signals on the tower

After the switches are positioned and the signal is cleared, the lamp in the face of the entrance knob, displays yellow light.

As a train occupies each track section of the home signal limits, this fact is indicated by other small lamps in the lines representing the track, which are lighted white. When a train accepts and passes an interlocking signal, the lamp in the face of the entrance knob shows red, and the operator then turns the knob to its normal position. He leaves the knob as it was, however, if he wants to allow the signal to clear again for a following train on the same route lineup, after the preceding train has cleared the interlocking limits.

On the diagram, on the lines representing each of the main-line normal-direction approach sections, there is a button. When a train enters such an approach section, an annunciator buzzer starts operation and a white light illuminates the face of the corresponding button. If the operator desires to stop the operation of the buzzer he pushes the button, but the lamp indication stays illuminated until the train leaves the approach.

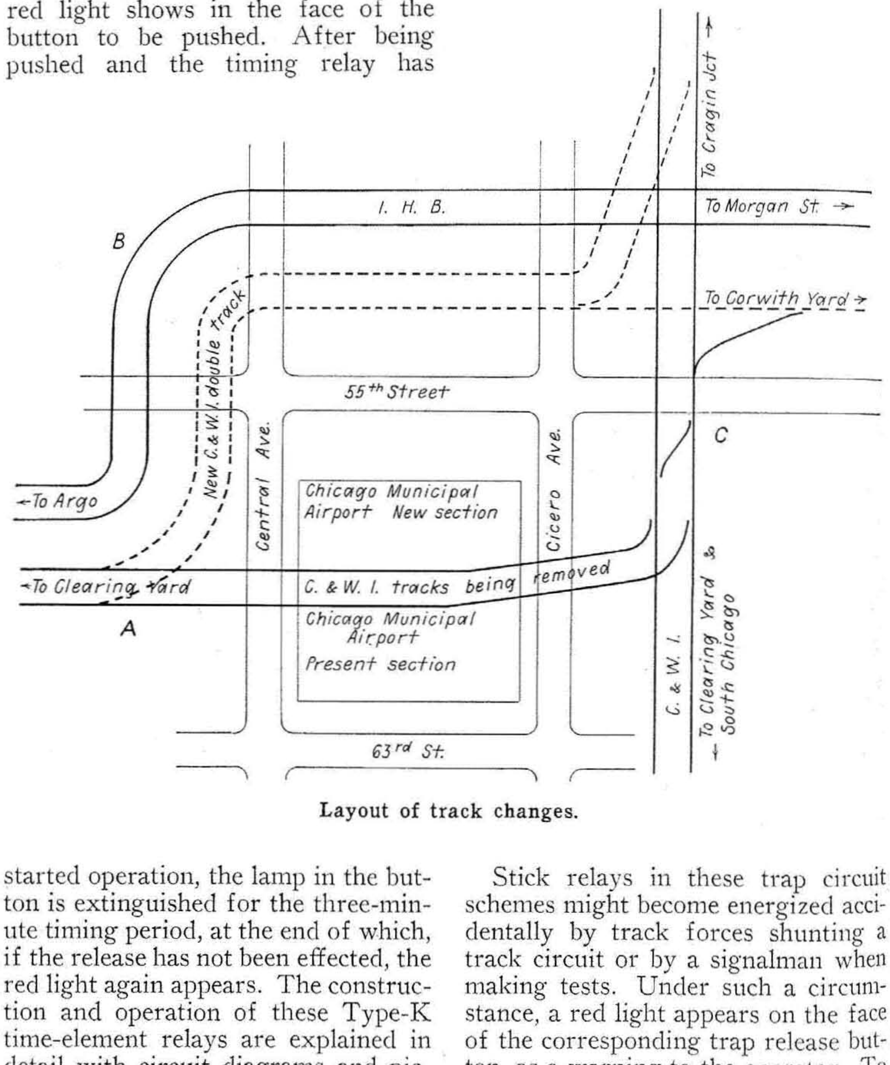
Located in the upper left portion of the panel is a row of small test keys, each of which can be used to control a track switch when testing or adjusting the switch points, operating rod or lock rods. Normally these test keys are left in the center position, and, therefore, do not affect the NX control system.

Time Releases and Trap Releases

If a proceed aspect on a high signal is to be taken away from a train which has already occupied its corresponding approach section, the entrance knob is returned to the normal position, and a time release must be operated to introduce a delay in which the train can stop short of the signal or enter the home signal limits to lock up the plant.

No hand-wound, clockwork time releases, of the conventional type, are used in this new interlocking, the release period being measured by motor-driven devices known as Type-K time element d-c. relays. Each such instrument, when needed, is started in operation by pushing one of the 10 buttons mounted in the row in the lower left portion of the panel. When operation of a release is necessary, a red light shows in the face of the button to be pushed. After being pushed and the timing relay has started operation, the lamp in the button is extinguished for the three-minute timing period, at the end of which, if the release has not been effected, the red light again appears. The construction and operation of these Type-K time-element relays are explained in detail with circuit diagrams and pictures, in Bulletin No. 56-7720 of the General Railway Signal Company, and a brief explanation was given in a New Device article on page 174 of *Railway Signaling* for March, 1939. Time locking is used in connection with the dwarf signals. When a leverman restores an entrance knob to the normal position the operation of a thermal time-element relay is initiated.

The installation of insulated rail joints to extend track circuits through the railroad crossings just south of the tower as well as the crossings west of the tower was not feasible from the standpoint of first costs or maintenance expenses. The length of the non-track circuited sections through these crossings is in each instance more than the 35-ft. limit, in other words, a car could be left standing on a dead section without being detected. For these reasons, "trap" circuits are used in these areas, such that a train, having accepted and passed a signal, must pass beyond the trap areas before a switch can be operated or a signal cleared for the same route or for a conflicting or opposing route. The trap circuits also enter into the control of the sectional release route locking.



Layout of track changes.

Stick relays in these trap circuit schemes might become energized accidentally by track forces shunting a track circuit or by a signalman when making tests. Under such a circumstance, a red light appears on the face of the corresponding trap release button, as a warning to the operator. To effect a release, he pushes the button, which causes a Type-K motor-driven time-element relay to operate, as explained previously, and at the end of the timing period, the trap circuit is restored to normal.

Manual Block and Train Orders

No automatic block signals are in service on this line of the I. H. B., train movements being directed by manual block, and train orders are used for certain purposes. This new tower is a block station and a train-order office for the I. H. B. After manipulation of the entrance knob and exit button to clear a high home signal for normal-direction right-hand running, such as signals 24 and 6, the corresponding signal displays an Approach aspect, which in this case, likewise, is a permissive manual block aspect. If no leading train is occupying the manual block involved, the operator can cause a "high green" aspect to be displayed as a clear manual block aspect. In order to effect this result, the operator must also push the corresponding Clear Block button, these two buttons being mounted separately in the area to the right on the control machine panel.

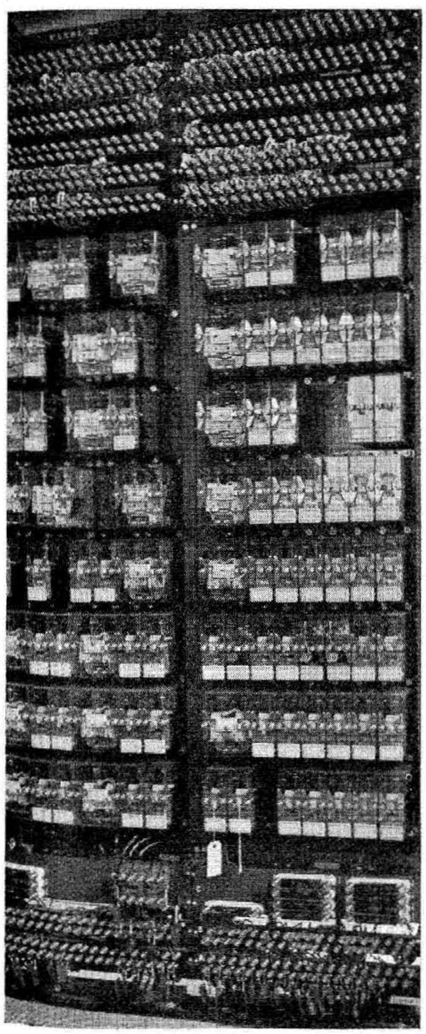
If the operator has train orders for delivery to an approaching train he operates a small toggle switch in a control box on his desk, which causes a normally-extinguished lamp unit on the face of the tower building to display a yellow light which is directed toward the approaching train. When the engineman of the train sees and acknowledges this train-order aspect by sounding the locomotive whistle, the operator controls the home signal to display the Approach aspect. Then the operator goes down on the ground to deliver the orders. A normally-extinguished yellow lamp, adjacent the toggle switch on the cotrol box is in series with the lamp in the train-order signal, so that, if this indication on the control box is not illuminated when the toggle is thrown, the operator knows that the aspect is not displayed in the train-order signal.

Searchlight Signals Used

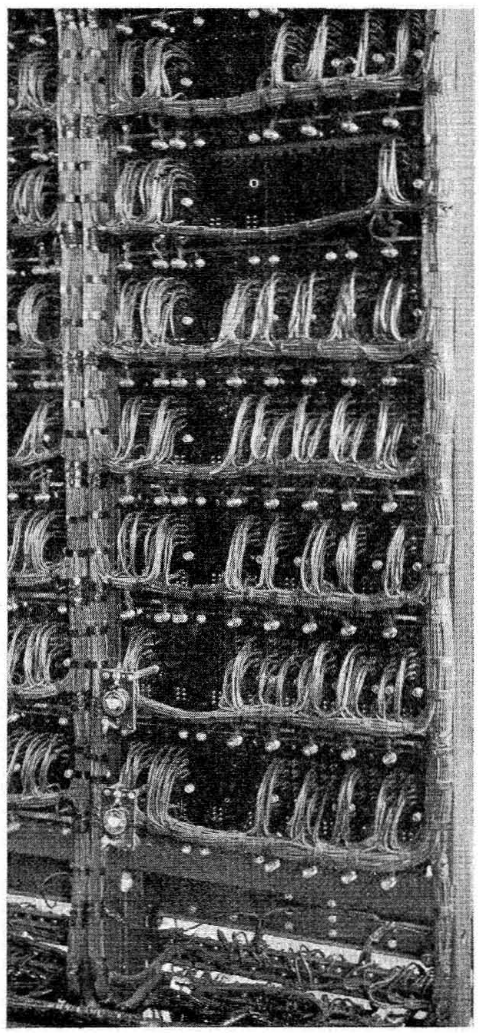
The new high signals, as well as the dwarfs, are the Type-SA searchlight, with low-voltage 250-ohm operating coils, and are equipped with single-filament 12-volt lamps. The high signals are side-of-mast mounted, and are all of the standard two-"arm" type, the top "arm" of which is located 17 ft. above the top of the signal foundation, and the second "arm" of which is located 12 ft. above the top of the foundation, or 5 ft. below the top "arm."

The high signal units are equipped with 8⅜-in. hot-spot lenses, projecting a beam of light of approximately 1½ to 2 deg. spread all around the beam axis, and a secondary downward beam through an angle of 40 deg. from the axial center-parallel curved prisms are molded on the inner surface of the central portion of the lens to divert a portion of the light in a downward direction. The small amount of light diverted from the main beam to produce the closeup indication does not affect the range to any appreciable extent, yet the secondary beam is good throughout the 40-deg. angle. The dwarf signals are all of the one-"arm" type, and are equipped with 8⅜-in. lenses with 8⅜-in., 20-deg. upward spread deflecting roundels. The deflecting roundel is mounted in front of the main lens by means of an adapter. Each signal, both high and dwarf, is identified by a small number plate to which are attached metallic raised letters and numbers, corresponding with those shown on the control machine. The signals are painted black.

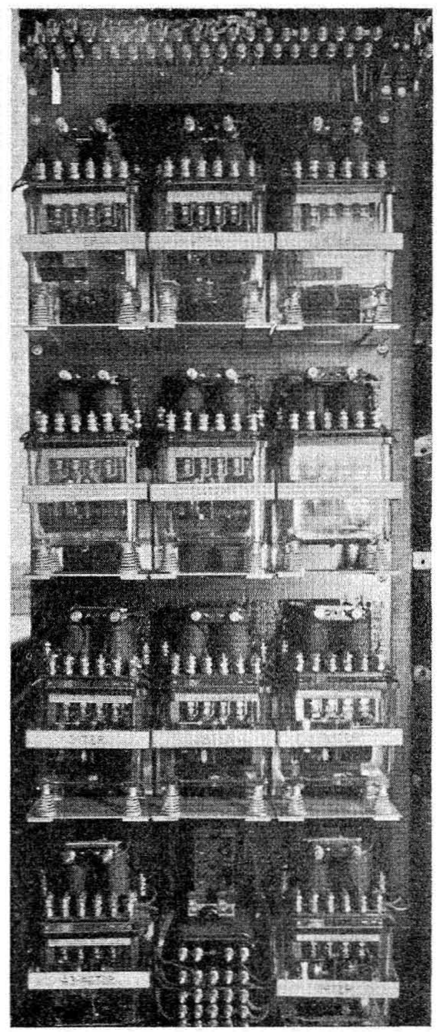
The high signals display either red, yellow, or green, over red, for the government of train movements on



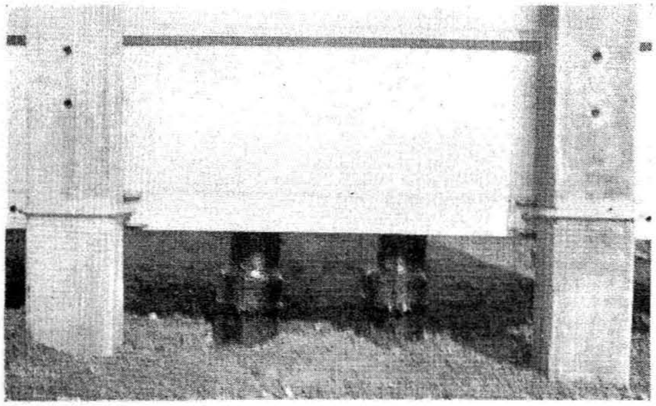
Racks of the plug-in type relays



Rear of the plug-in relay racks



Motor-driven time-element relays



Cables from the underground come up through cast-iron pipes at the ground surface

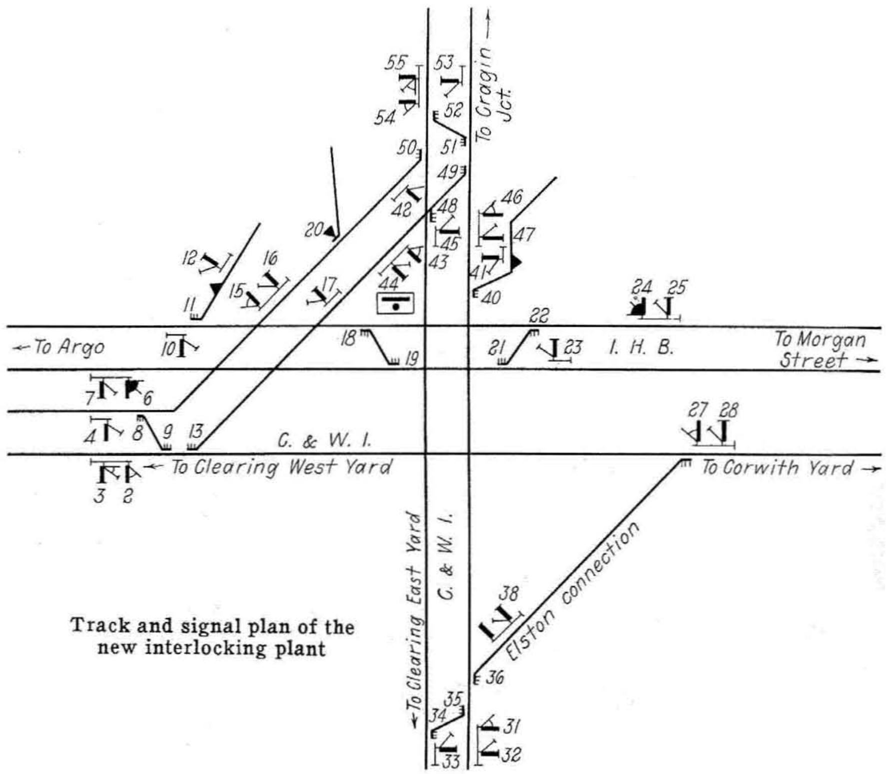
the main line or through moves, or red over red, yellow or green for slow speed, diverging route movements, or as call-on signals. The dwarf signals display either red, yellow, or green, depending upon the local conditions through which the respective signals govern train movements.

Each high signal mast stands on a Massey cylindrical precast concrete foundation. Each hole was dug to the proper depth and the bottom was leveled accurately. Using a wrecker derrick, a foundation was set, and the mast erected in an average of 20 min. per signal. Some of these signals have been in place for several months and none have settled out of alinement.

Power Switch Machines

The switch machines are of the Model 5C, equipped for operation on 110 volts d-c. The standard arrangements of lock rods and point detectors are used. Raco switch adjusters and self-adjusting controller sockets on the detector rod connections are used. Each switch machine is supported on two ties, mounted on ¾-in. saddle plates 7 in. wide and 31 in. long, made up with 2-in. butt straps welded in place so that the switch machine fits snugly between these blocks. Each plate is fastened to the tie by two ¾-in. by 6-in. lag screws at each end, and, in addition, a lag screw extends through each switch machine lugs and the saddle plates into the tie. Utilizing this arrangement of mounting, dapping of the ties is not required, and, therefore, standard sawed switch ties are used. The center line of each switch machine is 45 in. from the gage of the rail. Clearance is provided to permit rolling stock to pass despite the fact that the switch machines are mounted on the top of the ties. The mounting of the machines necessitates offsets in the rods, which is 2 9/16 in. in the throw rod, 4 15/16 in. in the lock rod and 3 1/16 in. in the detector rod.

When installing a switch machine, the saddle plates are laid loose on the ties and the machine is placed. Then the lock rods and operating rods are connected and adjusted, the saddle plates and machine being shifted slightly as required. After adjustments are made, the lag screws are installed through the saddle plates. This procedure obviates a lot of fitting, and, therefore, facilitates construction. The arrangement of tie plates and rail braces used at these switches represents N. Y. C. standard practice, as used at all main line switches, regardless of whether they are interlocked or operated by hand-throw stands. The rail braces and plates, as well as the switch ties are installed, maintained and replaced when necessary by the track forces.



Track and signal plan of the new interlocking plant

Wiring Distribution

Within home signal limits the circuits from the tower to outlying cases or junction boxes are all in underground cable. The control circuits are on No. 14 wires, which, for the most part, are in 15-conductor cables. The a-c. power circuit is on No. 4 wires, and the 110-volt d-c. circuit for switch machine operation is on No. 4 wires. Track circuit connections are on No. 10 single-conductor cable, using Raco bootleg outlets at the rail.

The underground cable is of the so-called "trench" type, no metal being used in the coverings over the insulated conductors. Each conductor has individual "AO" rubber compound insulation with no tape or braid. The insulated conductor or conductors as a group are packed with soft rubber filler and enclosed in a tough elastic, continuous rubber jacket, which in turn is protected by an outer coating of two layers of impregnated jute. This cable was laid directly in trenches in the ground, being surrounded by at least 6 in. of soil or sand, free from rocks, cinders or other foreign matter. Where cables extend under tracks, the top of the cable is at least 24 in. below the bottom of the ties. A layer of sand 2 in. thick is thrown over the cables and then a piece of creosoted gum lumber 1 in. by 8 in. is placed on top. This form of protection prevents damage by track forces, especially when power "moles" are used for cleaning the crushed rock ballast.

The cable runs other than under tracks are at least 24 in. under the surface of the ground, but no protective board is required. When installing the cables in a trench, they were laid individually with no crossing over of cables, so that, if additions or replacements are required later, each cable can be brought out separately, without interference with other cables. At some locations the cables extend under clay embankments, under streets, etc. At these locations, 3-in. pipe conduit was installed. The holes for this piping were "bored" through the dirt and clay by a special auger, designed and constructed on the job by the signal forces.

At certain intervals, especially at turns, the location of cables is indicated by cast-iron markers, which are disks at ground surface level, and supported by risers set in the ground. Arrows on these disks point in the direction in which cables extend from that location.

Past experience of the New York Central proves that cables deteriorate most rapidly at the ground line where dampness accumulates and evaporates with changes of weather. Therefore, to provide protection, the cables at each case are brought up through a metal conduit, which extends about 9 in. into the ground and about 9 in. above the ground. Where only a few cables are involved, ordinary cast-iron soil pipe is used, but, where there are several cables, the work of threading cables through a pipe is obviated by using a pipe which is made in halves lengthwise. When the cables are all in place, the two sections of a pipe are placed around the cables and clamped together.

Ordinary marlin is wound tightly around the cables from a point several inches below the top of the pipe, and then on up to the bottom of the case. This marlin wrapping is coated with No-Ox-Id grease, to prevent absorption of moisture, and will thus render a life of several years. After the marlin is in place, waterproof plastic sealing compound is packed between the cables and the pipe, and is tapered up around the cables to shed water.

Cable Pot-Heading

On the inside of the instrument cases, each incoming cable is individually pot-headed. Allowing sufficient length of cable to work readily, the pot-heading is done somewhat as follows: The outer jute covering is removed for the length required, then the elastic coating is rolled back over itself to expose the individual insulated conductors, each of which is then wrapped with two layers of friction tape and painted with insulating paint. Then the elastic overall covering is rolled back over the taped conductors; more tape and paint is applied so that none of the insulation material is exposed, and the end zone is sealed to prevent moisture from creeping into the cable. The cable is then laid into the slack box, and the ends of the conductors are attached to terminal posts. On this installation no cables extend up through the masts of signals, because a cable inside of a mast cannot be inspected. Near each signal is a sheet-metal junction box mounted on a concrete post. The circuits destined for a signal mechanism are brought in cable up to terminals in the box, and, from these terminals, insulated wires in an aerial cable extend to the signal mechanism.

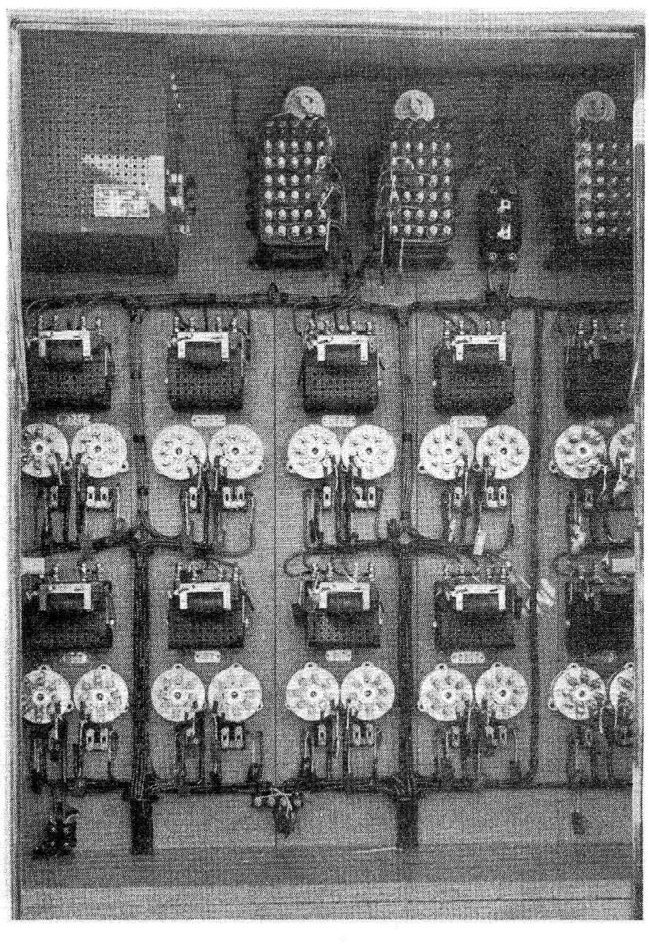
Beyond home signal limits, the a-c. power circuits as well as control circuits are, for the most part, in aerial cable, supported in cable rings from Copperweld stranded messenger on pole lines. All this aerial cable is coated with No-Ox-Id grease as a protective weatherproof coating, which, from experience gained previously, should render a life of at least five years without renewal. Where cables drop down to cases, the coating of grease discourages boys from swinging on the cables.

Instruments In the Tower

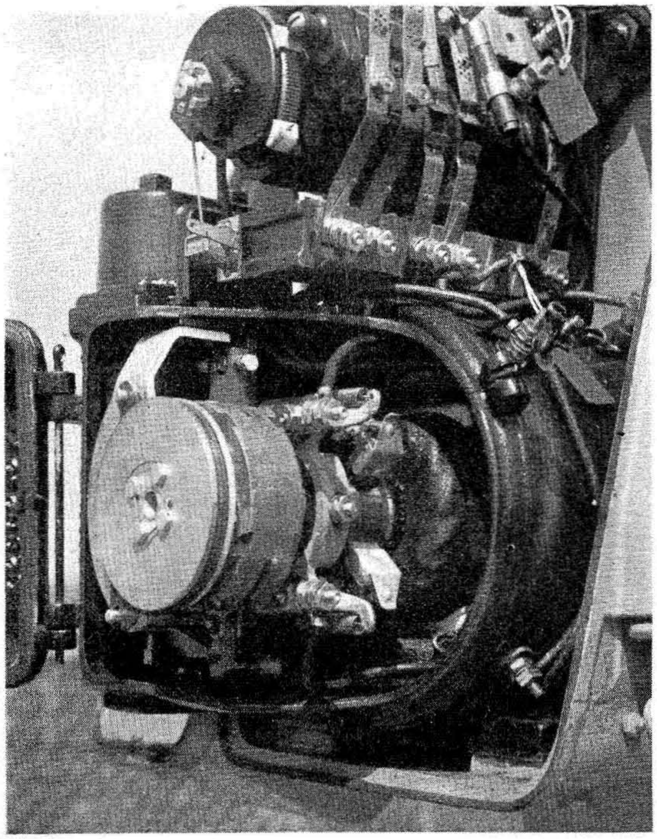
With the exception of the motor-driven time-element relays, all of the relays in the tower are of the plug-in, quick-detachable type. Plugs, protruding from the rear of each relay, fit into receptacle contacts, mounted in bakelite boards, each of which is 24 in. wide, thus affording sufficient space for eight Type-B1 relays or four Type-B2 relays in a horizontal row. Eight such rows constitute a rack. The panels of each rack together with two terminal boards, one at the top and the other at the bottom, are attached to two angle iron frames, which are mounted in rubber bases to absorb vibration which may be caused by passing trains.

Each rack is 2 ft. wide and 8 ft. high. Eight such racks, four in each of two rows, include a total of 387 relays, which together with the 12 motor-driven relays make a total of 399 relays in this instrument room. Eleven different types of relays are used. Spare relays are marked distinctly with an identification card in an enclosed metal frame. When any relay fails, the maintainer can pull it out and insert a spare relay within a period of less than 30 sec. This facility with which relays can be replaced is an advantage at this interlocking because otherwise one or more trains would be delayed seriously while changing out relays of the conventional type, requiring transfers of wire connections from the posts of one relay to the posts of the one being installed.

Another advantage of the new quick-detachable relays is that they



Interior of sheet-metal case including rectifiers and resistance units

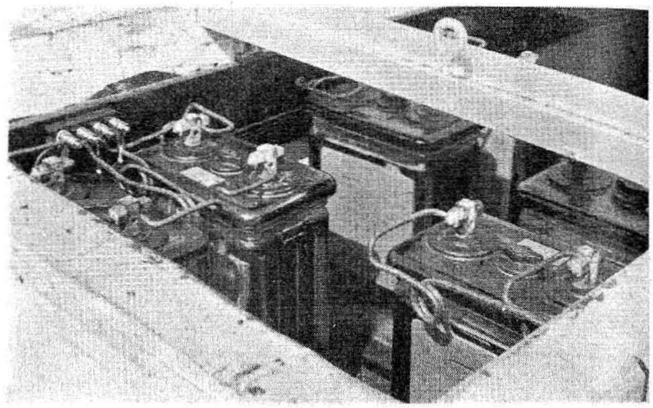


Crossing gate mechanism showing disk brake to control lowering operation

thus warding off rain water which might accumulate on both supports if allowed to run off the roof of the case and down the back side. The assembly of the top support consists of a 1½-in. by 1½-in. by 3/16-in. steel angle, welded to the case, and bolted to a ⅜-in. by 4-in. by 4-in. steel angle by a ½-in. by 1¼-in. U.S.S. machine bolt with a square nut. The angle, ⅜ in. by 4 in. by 4 in., is supported by a ¾-in. by 8-in. machine through bolt with a square head nut.

At the front of each of these cases, a section of panel equal to the upper half of the opening is hinged at the top. When swung upward it can be supported by two long hooks, one at either side, which fit into holes in the case. By releasing two latches inside the case, the panel for the lower half of the opening can be lifted out and set to one side. The upper door, in the raised position as explained, acts as a shelter to prevent rain or snow from entering the case. This plant was constructed during winter months. While wiring these cases during stormy weather, protection was provided by a piece of canvas 9 ft. wide and 20 ft. long, attached to posts set temporarily around each case.

All the apparatus sheltered in such cases is wall mounted, and the wires from the terminals at the bottom of the case are run in blue enamel insulated cable rings screwed into the face of the back board. This arrangement, as shown in the illustrations, not only affords good appearance, but also allows sufficient slack of wire lengths such that when inspecting or replacing a relay a man can get it out where he can work at it easily. Raco multiple-path arresters, mounted in each case, protect all incoming line and track circuits.



Storage batteries housed in concrete boxes at signals

occupy less space and include more contacts than conventional types of relays—for example, some of these relays have 16 contact fingers. Therefore, for a plant as a whole, the relays can be housed in much less space, which is an important item with reference to building costs.

Each rack as a whole, 2 ft. wide and 8 ft. high, assembled with the upright angle irons, was wired during manufacture, the wire used being flame-resistant type. The wires are soldered to prongs which extend through the bakelite panels to the receptacle contacts on the face of the board. Wires of the cables which come into the tower underground are attached to the posts of the terminal boards at the bottom of each rack, but the wires for connections between racks or between racks and the interlocking machine are attached to posts on the boards at the top of the respective racks. The wires from the relay racks to the control machine or elsewhere are in fireproof sheet-metal ducts. A concrete duct below floor level, and covered with non-skid steel plates, extends from the relay racks to outlets in the walls of the foundation of the tower; cables leading to the exterior of the building being run in these ducts. All wiring inside the tower is, therefore, considered to be as nearly fireproof as practicable construction will permit.

At the signals and other locations on the plant, relays, rectifiers, etc., are housed in sheet-metal cases, with celotex linings. These cases are supported from precast concrete posts, and the mountings are designed especially to minimize deterioration of the metal of the cases, which might be caused by accumulations of moisture.

The bottom support, which takes the weight of the case and contents, is a "dry-spot," in that it is placed in a location such that it is sheltered from rain. The assembly of the bottom support consists of a ⅜-in. by 4-in. by 4-in. steel angle, inset and bolted to the bottom of the case by a ½-in. by 2-in. carriage bolt with a square nut. This right angle is bolted to a 3-in. by 1 19/43-in. No. 6 gage steel channel, by a ¾-in. by 8-in. U.S.S. machine bolt with a square nut, which also passes through the post. The top support is of a minimum contact area, and, therefore, accumulates little or no moisture. The case is designed with an outward triangular projection of the steel shell, extending the full width of the case parallel to the top, just above the angle that is welded to the case for the top support,

Power Supply

Power at 220-volts a-c., 60-cycle, is delivered by a public utility to a power transformer mounted outdoors at the west end of the tower. The distribution to the tower, as well as over the entire plant area, are supplied from two secondaries of this transformer, the 110-volt secondary being rated at 5 kv.a. and the 440-volt secondary at 2.5 kv.a.

The main battery for operation of the 110-volt d-c. power switch machines consists of 56 cells of 280-a.h. Gould, lead-type battery, which is on floating charge from a G. R. S. Co. Type-BP, Size-848, rectifier, the d-c. output of which is rated at 3 amp., 145 volts. A duplicate rectifier is provided as a standby. The low-voltage control circuits are fed by a set of 6 cells of 680-a.h. lead storage battery, which is on floating charge from a Type-BP, Size-848 rectifier, the d-c. output of which is rated at 18 amp., 22 volts. A duplicate standby rectifier is provided. The voltage and current discharge of the battery for operating switch machines are indicated by Weston instruments which are mounted on a power panel on the east wall of the second floor of the tower. In addition, the voltage of the switch operating battery is indicated by a meter which is mounted in the panel of the interlocking control machine. In order not to carry other than low voltages into the machine, this meter is arranged to operate on low voltage, which is accomplished by controlling this meter through a shunt on one of the meters on the power panel. Thus, although the meter on the control machine indicates up to 150 volts, it actually is operated by not to exceed 20 volts.

Mounted on the rear of the power panel is a Type-K d-c. relay which is so connected that in case of a ground anywhere on the 110-volt d-c. switch operating power distribution circuit, this relay operates to control an alarm and indication lamp. This ground-detector circuit was explained in an article on page 24 of *Railway Signaling* for January, 1936.

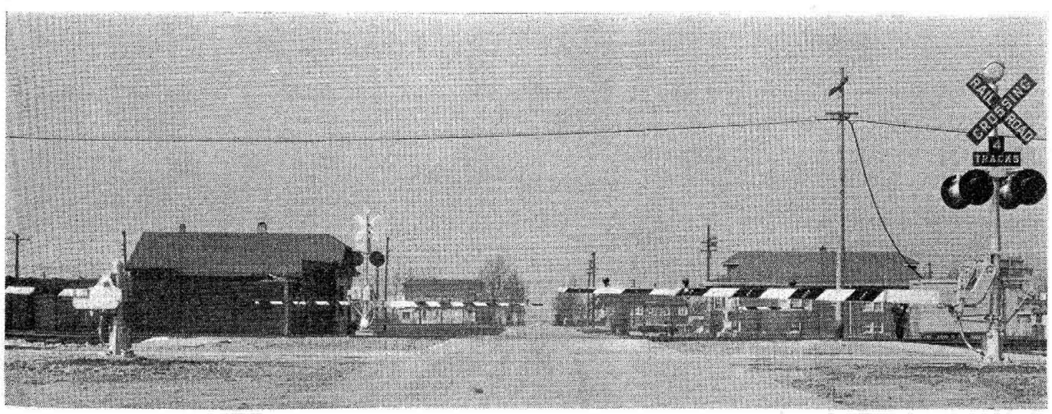
The a-c. power is distributed over the plant area on single-phase circuits, on No. 4 conductors. The distribution voltage is 440 volts on the I. H. B. and 110 volts on the C. & W. I. At each instrument case on the plant area, the incoming power circuit is taken through an enclosed Raco fused disconnect switch, which can be used to open the power circuit for the case as a whole. In addition, the power circuit to the primary of each low-voltage transformer can be opened by operating a porcelain enclosed snap switch. The transformer terminals are equipped with insulated nuts, thus preventing shocks as well as accidental shorts. The low-voltage transformers for feeding rectifiers, etc., are of the Type K-2, with various ranges of secondary voltages. No secondary is used to feed more than one rectifier, thus avoiding confliction of circuits in case of grounds.

The storage batteries outside the tower are all of Exide manufacture. At each interlocking signal location there is a signal operating battery consisting of six storage cells rated at 120 a.h. At each of the street crossings where bells, gates and flashing-light signals are in service, this equipment as well as the gate lamps all operate normally from a storage battery of 8 cells rated at 200 a.h., except for the crossings where gate arms shorter than 26 ft. are in service, at which locations 7 cells of the same capacity are used.

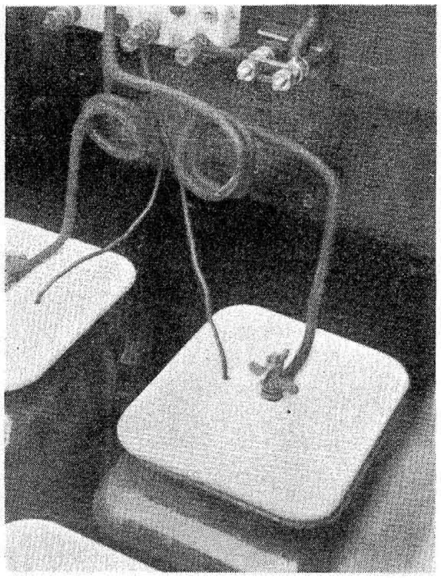
In addition to the track circuits used ordinarily, a separate track circuit is used on the fouling section of each turnout. With certain exceptions, which will be explained later, each track circuit is fed by a 120-a.h. storage cell, which is on floating charge through a G. R. S. Co. rectifier. At the remote ends of the approach annunciator track circuits, no a-c. power was available, and, therefore, each of these track circuits is fed by a set of two 1,000 a.h. Edison primary cells.

Street Crossing Protection

In the territory between point A on the diagram and the interlocking, in which territory the new double-track line of the C. & W. I. was constructed parallel with that of the I. H. B., the increased number of trains to be operated justified the installation of the most modern and complete forms of protection at the crossing of streets



Highway crossing gates in lowered and raised positions. Note sidewalk gate at left with the tracks. The new protection includes electrically-operated bells, gates, and A.A.R. standard flashing-light signals. In each instance, the



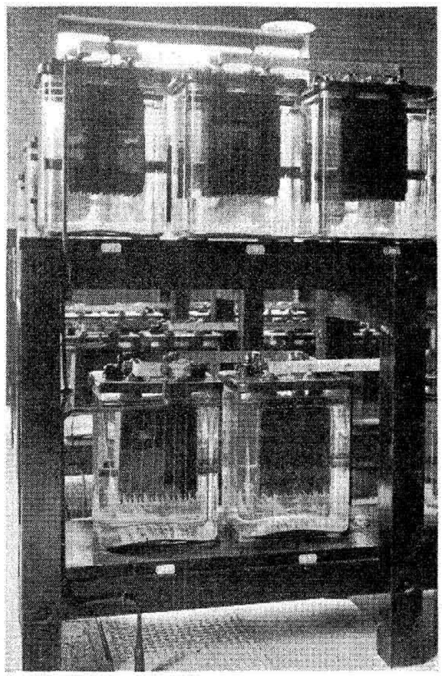
crossing of a street with the four tracks is protected as a whole. The gates, when lowered, obstruct the path of vehicles when approaching the crossing in the normal right-hand lane, but no arms prevent vehicles from departing from a position on the tracks at a crossing. On account of the width of each of the two paved lanes on Cicero avenue, four gate arms, one on each side of each of the two paved lanes, are provided. At each of the remaining five street crossings, 55th, Laramie, Lockwood, Long and Central, where there is only one pavement, each arm is long enough to reach across at least half of the traveled roadway, and such arms are used to obstruct only the approach to a crossing of vehicles using the normal right-hand portion of the pavement. In addition to the street arms, sidewalk arms are used at Lockwood and Long Avenues to afford additional protection for pedestrians.

Automatic Control

The bells, gates and signals are controlled automatically in the usual manner by the presence of trains on track circuits. Special cut-outs, controlled by timing relays, are provided to cut out the signals and bells, as well as to clear the gates, after two minutes, if a train is making a switching move which is not destined to approach or obstruct a crossing Needless delays to street traffic are thus obviated.

The crossing protection equipment, including bells, gates and signals, was furnished by the Western Railroad Supply Company. This equipment is of the convention type, except for the fact that the gate mechanisms include a new feature by means of which the gate arms are power operated when

Left—Primary battery on some track circuits. Below—The main battery for operation of the power switch machines includes 56 cells of battery rated 280 a.h.



being lowered as well as when being raised. The "drive-down" arrangement was provided to insure proper lowering of the gates during windstorms or other adverse circumstances. The lowering operation can be effected only at a certain speed, regardless of an unusual ice load on the arm or if the arm is broken off. This result is accomplished by a special disk-type brake, which is controlled by a fly-ball governor arrangement. This new equipment is shown on the near end of the motor shaft, in the accompanying illustration.

By Railroad Forces

This new interlocking and the street crossing protection at the six streets were planned and installed by the signal department forces of the New York Central, Lines West of Buffalo, under the jurisdiction of J. J. Corcoran, signal engineer, N. Y. C.; the engineering was handled under the supervision of H. D. Abernethy, assistant signal engineer, Lines West. The construction was under the direction of C. E. Rowe, signal supervisor, and W. L. Murphy, assistant supervisor, with headquarters at Chicago. H. F. Warner, construction foreman, had charge of the crew, which included as many as 55 men during the peak of activities. These men came from various parts of the New York Central System, as well as from other roads, to help finish this construction work prior to the time scheduled for cutting the new track arrangement into service. The interlocking was placed in service at 9 a.m., April 30, and official ceremonies, including connections to the new tracks and driving the gold spike, occurred on May 1. The interlocking equipment was furnished by the General Railway Signal Company.

Grade Crossing Accidents

The Bureau of Engineering of the Pennsylvania Public Utility Commission, Harrisburg, Pa., has announced that during 1940 there were 26 fatalities at 2,174 protected crossings, as compared with 35 fatalities the year before at the same number of protected crossings, a decrease of 25.7 per cent. There were 34 fatalities at 9,237 unprotected crossings in 1940, as compared with 20 fatalities at 9,355 unprotected crossings in 1939, an increase of 70 per cent. Injuries resulting from accidents at highway-railroad grade crossings in 1940 totaled 105 at 2,174 protected crossings, as compared with 128 at the same number of crossings the year before, a decrease of 18 per cent. A 5.9 per cent decrease in injuries was in effect when 143 injuries resulted at 9,237 unprotected crossings in 1940, as compared with 152 in 1939 at 9,355 unprotected crossings.

Accidents In Iowa

The Iowa State Commerce Commission, Des Moines, Iowa, has announced that during the fiscal year of 1940 there were 43 fatalities at 90 unprotected and 36 protected crossings, a decrease of 2, as compared with 45 at 78 unprotected and 19 protected crossings in 1939. The total number of accidents during 1940 was 128, as compared with 100 the year before. Included in this total number of accidents there were 147 injuries in 1940, as compared with 125 in 1939, at the same number of protected and unprotected crossings, as mentioned.