

N. Y. C. Installs Big NX Plant at Fostoria, Ohio

All-relay installation at complicated and busy crossing of four railroads eliminates two statutory stops both ways on each road, thus minimizing delays to train movements. New highway crossing protection also installed at 14 crossings in plant area

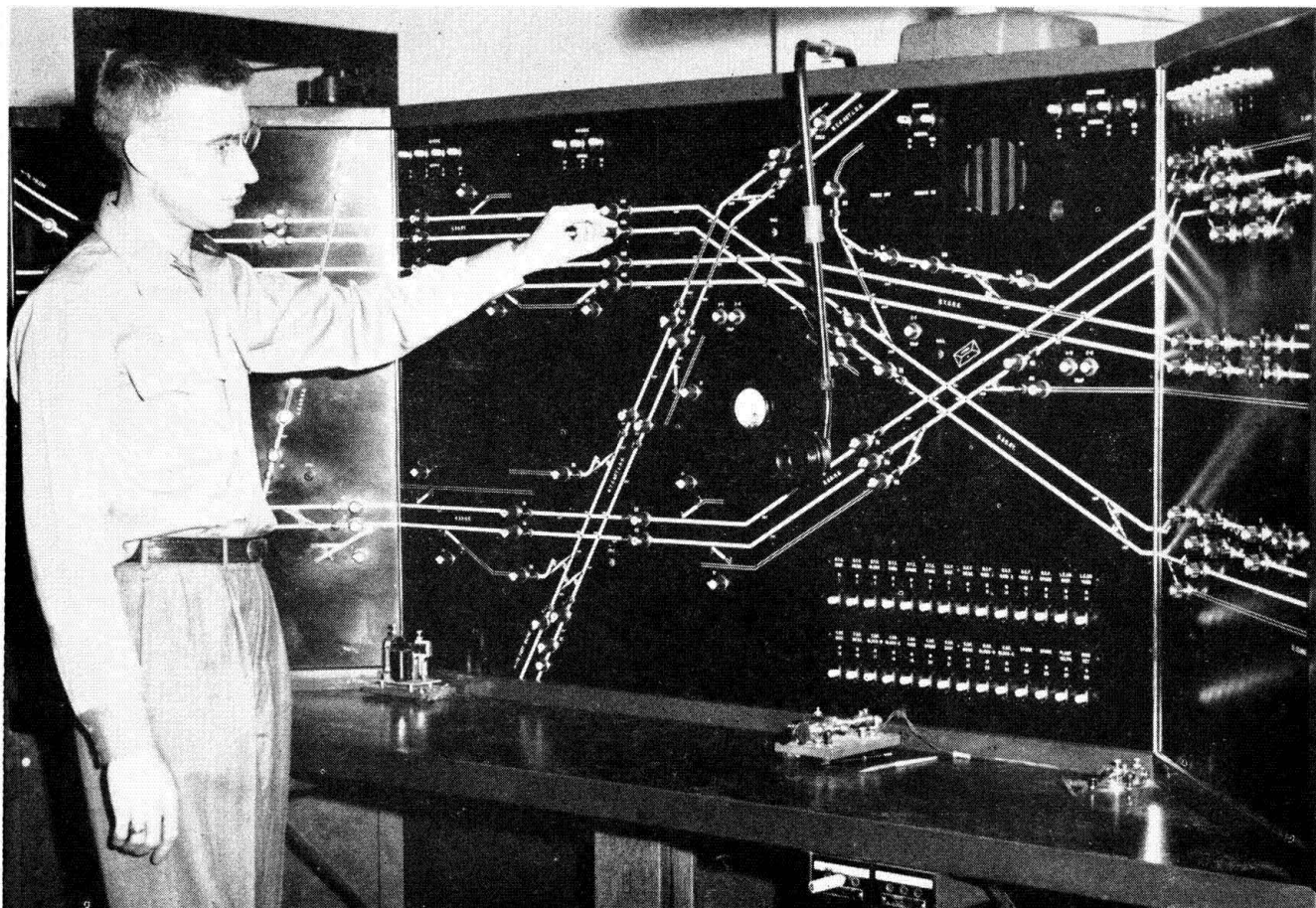
AT Fostoria, Ohio, in the northwest-ern part of the state and 35 mi. southeast of Toledo, the New York Central, in collaboration with three other roads—the Baltimore & Ohio, the New York, Chicago & St. Louis, and the Chesapeake & Ohio—has

installed a large NX entrance-exit interlocking, involving an extensive network of tracks which crisscross each other at that point. Placed in service at a total cost of \$950,000, which was shared proportionately by the four railroads involved, the

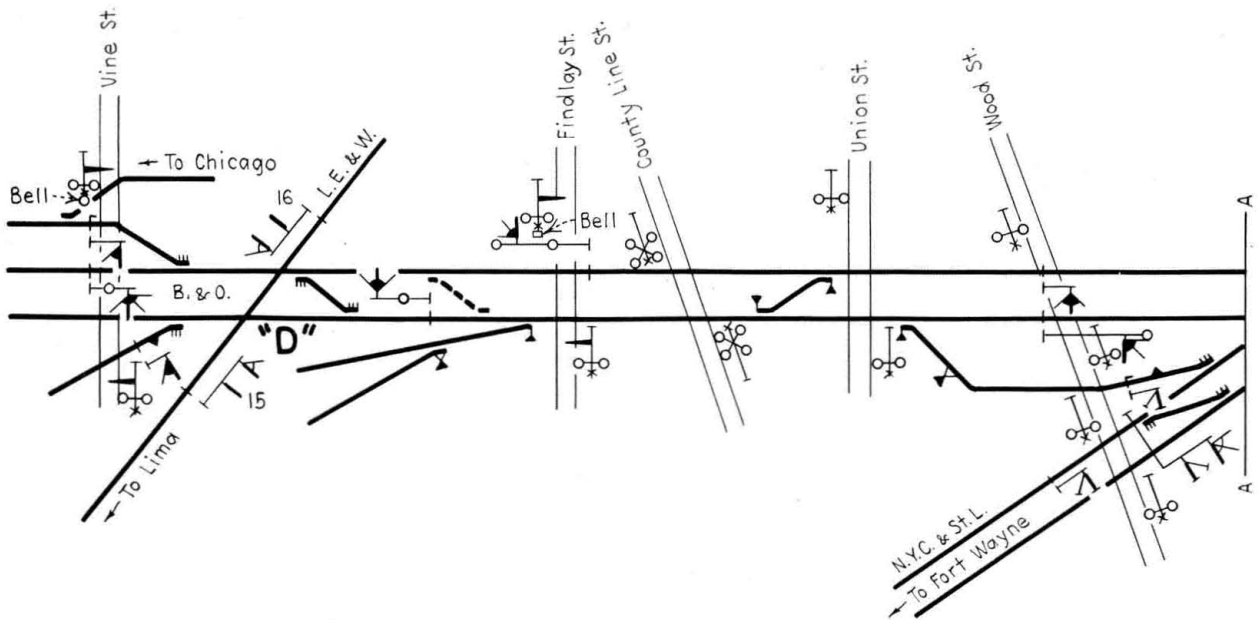
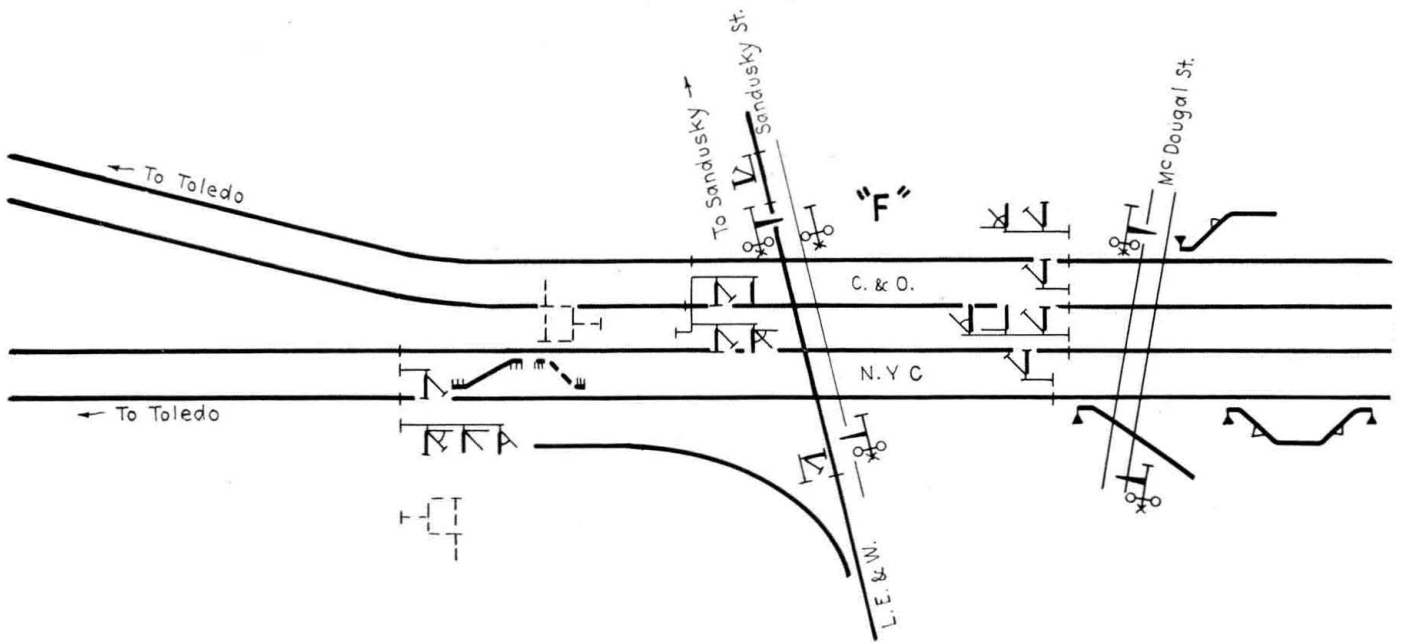
project also included the installation of new automatic short-arm gates and/or flashes at 14 highway crossings in the area of the plant.

About 300 Train Movements Daily

As shown in the accompanying layout diagram of tracks, signals and crossing-protection facilities, the lines involved at Fostoria include the main line of the N.Y.C. between Toledo and Thurston; the B.&O. between Chicago and Akron; the main line of the Nickel Plate between Fort Wayne, Ind., and Bellevue, Ohio; the Lake Erie & Western line of the Nickel Plate between Sandusky, Ohio, and Lima; and the main line of the C.&O. between Columbus and Toledo. All these lines are double-track through the interlocking, except the L.E.&W., which is single track. Daily traffic through the plant averages 6 through passenger trains and 17 freight trains on the N.Y.C.; 14 passenger and 35 freights on the B.&O.; 6 passenger and 19 freights on both lines of the N.Y.C. & St. L.; and 4 passenger and 32 freight trains on the C.&O.—a total average of 133. The speed limits on the various roads through the plant are 30 m.p.h. on the N.Y.C., 45 m.p.h. on the



The panel-type machine controls 68 home signals, 32 switch machines, and 11 electric locks on hand-throw switches



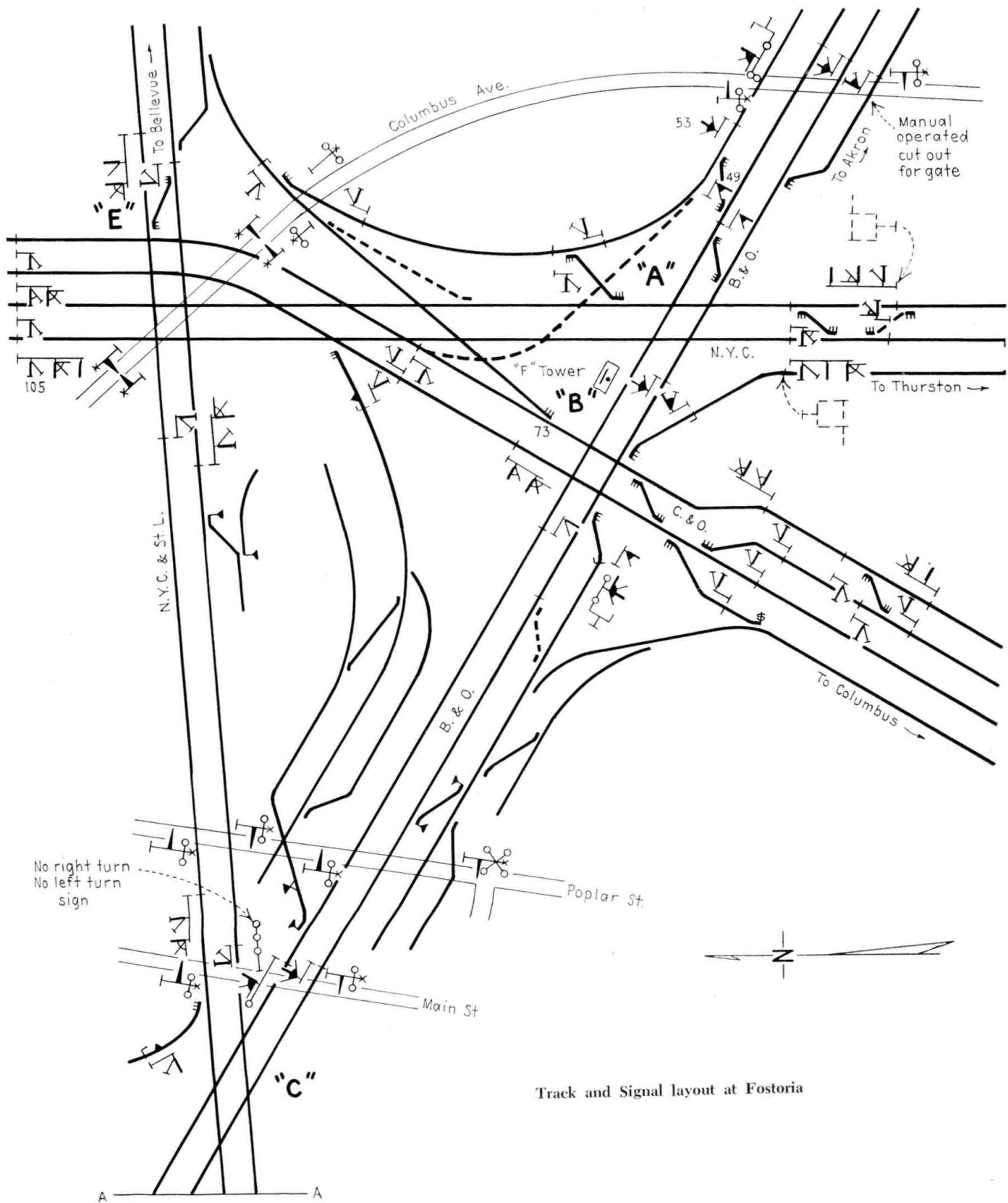
B.&O. 50 m.p.h. on the Nickel Plate, and 30 m.p.h. on the C.&O.

In addition to through traffic, there are roughly 180 switching movements, bringing the total number of train movements through the interlocker up to about 313 every 24-hr. The N.Y.C. maintains one yard engine and crew in Fostoria on an 8-hr. shift daily; the B.&O., the same; the N.Y.C.&St.L., three engines and crews around the clock; and the C.&O., two engines and crews on 8-hr. shift and one around the clock.

Under the previous method of operation through Fostoria, through trains on all roads were required to make two stops in each direction, in addition to any station stops. Tilting-crossbar signals and statutory "Stop" boards were in service, and signalmen were on duty 24-hr. daily at the C.&O.-B.&O.-N.Y.C. crossing (Locations "A" and "B" on the accompanying diagram), B.&O.-Nickel Plate (Location "C"), Nickel Plate-C.&O.-N.Y.C. (Location "E") and the C.&O.-Nickel Plate-N.Y.C. cross-

ing (Location "F"). A 24-lever Saxby & Farmer mechanical interlocking was in service at the B.&O.-Nickel Plate crossing (Location "D").

In any number of instances, a signalman at one crossing would be ready for a train movement, but the signalman at the second crossing would not, because of his crossing being occupied by a conflicting train movement. Consequently, the train would be advanced to the second crossing and stopped which, in turn, blocked other crossings. As a result,



Track and Signal layout at Fostoria

trains piled up behind one another, tied up additional trains on other roads, and blocked highway crossings in Fostoria for extended periods. Long freight trains had to be cut in two to clear these crossings frequently, and drawbars were often pulled in getting them started again. Trains were thus delayed anywhere up to

50 min. in Fostoria—the principal reason for the decision to install the new plant.

Delays Reduced—Train Time Saved

Comparing the latest method of operation through Fostoria with the previous, based on 133 through train movements daily, and assuming

that all these trains cleared each other through Fostoria, which they do not necessarily, the elimination of two stops for each train on all roads as a result of the plant would amount to a total saving of 266 stops daily, or 97,090 stops annually. Taking understandable delays into consideration, however, a conservative esti-



Tower is of fireproof brick, precast-concrete and steel-beam construction

mate of the stops saved would be 250 daily, or 91,250 annually.

In addition, through trains are now saving anywhere from 15 to 30 min. in getting through Fostoria. With 133 such movements daily, this represents a total saving in train time of from 33 to 66 hr. daily, or 12,136 to 24,272 hr. annually.

Some Track Changes

The double track on the N.Y.C. through the interlocker is signaled for train movements in both directions, and ends about 1 mi. on each side of the plant, going into single-track C.T.C. territory at those points. The C.T.C. is the Stanley-Berwick installation, placed in service in 1927, and the control machine for which is located in an office about 0.5 mi. north of the interlocker. Prior to the installation of the new plant, and about half way between the plant and ends of double track, there were a pair of power crossovers and associated signals under the control of the C.T.C. dispatcher. As part of the interlocking project, and as shown by dotted lines on the track and signal layout herewith, one crossover was eliminated at each of these locations, bracket signals were replaced with conventional high and dwarf signals, and the controls of these facilities transferred from the C.T.C. system to the interlocking. Also on the Central, to enable proper location of home signal 105 at Location "E", a siding from the southbound main line was removed.

Interchange Tracks Changed

As shown by dotted lines also, the B.&O. interchange track at Location "A" formerly crossed the Central to tie in with the C.&O., and the Nickel Plate interchange track at Location "E" tied in with the N.Y.C. as shown.

To minimize tying up the Central, due to a considerable amount of interchange switching at this point, the B.&O. connection to the C.&O. was cut off, run around to the Nickel Plate interchange, a power crossover installed to the N.Y.C. northbound main track, and the Nickel Plate interchange track extended across the Central to power switch 73 on the C.&O.

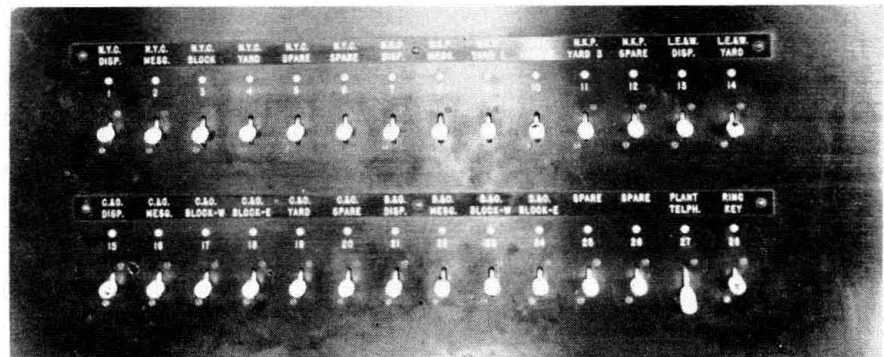
A power switch was installed at the east end of the siding on the

Model 5C, designed for operation on 110 volts d.c.

The interlocking machine, which is sheltered in a new building, known as Tower "F" and shown between Locations "A" and "B" on the accompanying diagram, is of panel-type construction with the conventional arrangement of NX entrance-exit knobs and buttons, track diagram, magnetic route indicators and indication lamps. This type machine, which controls 68 home signals, 32 switch machines and 11 electric locks on hand-throw switches in interlocking limits, was chosen primarily to eliminate individual-lever operation, and thus facilitate and expedite overall manipulation of the machine—an important factor in keeping trains moving through this busy layout, where there is a movement every few minutes.

Machine Details

The machine consists of a 3 by 5-ft. center panel with a 3 by 2-ft. wing at each end. White track-occupancy lamps and red lock lamps are normally extinguished. The red lock lamps are lighted when routes are lined for train movements. A route is normally lined by operation of the signal knob at the entrance of the route



Telephone keys and indication lamps on the center panel of the control machine

B.&O. between Locations "B" and "C", the siding being extended slightly to bring the switch within the limit of home signal 39. Also on the B.&O., the crossover between main tracks at Location "D" was moved west to save a signal and allow trains to be advanced further than was possible in the old mechanical plant. Other than these changes, the track layout as a whole at Fostoria is the same as it was before the new plant was placed in service.

The new signals on the N.Y.C., Nickel Plate and C.&O. are the General Railway Signal Company's Model-G color-light type, and those on the B.&O., the color-position-light type. The switch machines are the

and by pushing the exit button at the end of the route. When the switches in the route have completed their movement and the home signal has cleared, a green lamp in the signal knob is lighted until the signal is knocked down by the train or taken away by the towerman. All signals must be reinitiated after trains. All signals have the call-on feature, except signals 15 and 16 (Location "D"). On the Nickel Plate, C.&O. and the N.Y.C., signal operation is semi-automatic stick-push initiation, semi-automatic non-stick-turn-up initiation, and non-automatic non-stick-turn-down initiation. On the B.&O., all signals are stick operated with one exception. High sig-

nals are cleared by push initiation of the signal lever, and call-on signals are given by either push initiation or turn-down initiation, depending on track occupancy.

Clearing Opposing Signals for Switching Movements

A considerable amount of switching takes place daily on the B.&O.-Nickel Plate interchange track. For this reason, opposing dwarf signals 53 and 49, governing train movements back and forth on the interchange track over the power crossover between the interchange track and B.&O. westbound main track can be cleared to Restricting simultaneously for such movements by turn-up initiation. This allows switching to take place without further attention on the part of the towerman.

At various points around and near the top edge of the machine are several black key-type levers. These are for individual control of switches, and below each of which is a normally-extinguished white out-of-correspondence lamp. At the lower right-hand side of the center panel of the machine are two rows of similar-type levers, of which there are a total of 28, for cutting in on the various dispatching, block, message, yard and other telephone circuits entering the tower. Above each of these levers is a small, normally-extinguished white lamp, which is controlled by a telephone-type relay across the corresponding communication circuit or selector. When a party calls on the line, the lamp is lighted, remaining

so until acknowledgment by the towerman operating the lever. The right-hand key on the lower row provides ringing current on the message phone circuits, thus eliminating the necessity of a hand-crank generator on the machine.

All hand-throw switches in interlocking limits are equipped with electric switch locks controlled by levers on the machine, the locks on the B.&O. and Nickel Plate only having emergency trainman's releases. A red lamp is lighted in the stem of each lock lever when a signal is cleared over the lock. This light is extinguished when the signal goes to Stop. A yellow appears when the towerman operates the lock lever and the trainman unlocks the switch in the field.

Traffic Levers for N.Y.C. and C.&O.

As mentioned previously, double track, signaled for train movements in both directions, is in service through the plant, going into single track C.T.C. territory about 1 mi. on each side of the interlocking. Traffic direction is in service on these tracks to coordinate the control of signals and train movements between the towerman and C.T.C. dispatcher in Fostoria. Traffic-direction knobs are in service on the interlocking machine, and a blue lamp with a white arrow is lighted when traffic direction is established in the direction desired. Similar conditions are in effect on the C.&O., C.T.C. controlled from Columbus being in service on that road on each side of

the plant. Traffic direction is in service between interlocking limits and the last C.T.C. signal on the northbound and southbound main tracks in approach to the plant.

The installation of insulated rail joints to extend track circuits through the crossings at Locations "A", "E" and "F" on the accompanying track and signal layout was impracticable and, consequently, non-track circuited sections in excess of 35 ft. are in service through the crossings. Standard trap circuits tied in with the sectional-release route locking are thus used at these locations, and a train having accepted a proceed signal over the crossings must clear the trap sections before a route can be relined—either for a similar or conflicting train movement. Because of the possibility of accidental dropping of stick relays in this type trap circuit, special trap-release buttons are located adjacent to the crossing on the control machine. Should an accidental opening of the trap circuit occur, the towerman is warned by a white light in the button. To release the trap under such circumstances, he presses the button, which initiates a 3-min. time interval, effected by a Type-B motor-driven time-element relay. After this period has lapsed, the circuit is released.

The control machine also has five buttons for the control of klaxon-type electric horns, used in calling the maintainers and others at outlying points in the plant. One horn is mounted on the tower itself, and



As part of the project, new highway crossing protection was installed at several crossings in the vicinity of the plant

the other four on each of the bungalows in the field. These horns are rated at 110 volts a.c., and are relay controlled.

The new tower, which shelters the interlocking machine, relay and battery room and maintainers' headquarters, is of complete fireproof brick, precast concrete and steel-beam construction. A furnace room and the maintainers' headquarters are located at one end of the building and, directly over these rooms, is the room which contains the machine. This room has a sound-proof tile ceiling with flush-mounted electrical lighting fixtures, and Thermo-pane glass is used in the windows to prevent glare and fogging. The floor in the room is formed from precast concrete slabs, which also serves as the ceiling for the rooms below.

A single-story extension of the building, in which precast concrete slabs form the ceiling and roof, houses the relay and battery room. This room has a concrete floor which

is painted with gray concrete paint to minimize the accumulation of dust and dirt, and resist the action of battery electrolyte should it be split. Wood racks in this room support the storage battery, and are painted with black acid-resistant paint. Power-supply equipment and other apparatus in the room is mounted on standard steel racks, and underground cables are brought into the tower to the racks through troughs in the floor covered with slip-resistant steel plating. Communications circuits enter the tower in lead cable, and are terminated in a protection and terminal box in the maintainers' room, from which point wiring extends to the second floor in steel conduit. Signal wiring between relay racks is in steel chases, and wiring between the racks and machine, of which there are more than 800 conductors, are supported on the ceiling by Raco cable hangers on $\frac{3}{8}$ -in. Copperweld messenger strand.

The building is heated by thermo-

statically-controlled oil heat. The furnace, burner and controls were furnished by the American Radiator & Standard Sanitary Corporation.

The New Highway Crossing Protection

As part of the interlocking project in Fostoria, Western Railroad Supply Company Model-10 automatic short-arm electric gates and flashing-light signals were installed at nine crossings, and flashers only at five crossings, as shown in the accompanying plan. Each gate and flasher assembly includes a standard cross-buck sign, number-of-tracks sign, "Stop on Red Signal" sign, and the gate mechanism from top to bottom.

Gates and flashers were placed in service at Vine, Findley and Poplar streets and Columbus Avenue, on the B.&O., at Main street on the B.&O. and Nickel Plate, Poplar street on the Nickel Plate, and at McDougal and Sandusky streets on the N.Y.C. and the C.&O. Flashers only were installed at County Line and Union streets on the B.&O., and at Wood street on both the B.&O. and the Nickel Plate, and at Columbia Avenue on the joint interchange track.

The circuits for the control of this protection are designed for straight automatic operation. An interesting feature, however, is that interlocking signals governing train movements over the crossings at Main and Findley streets and Columbus Avenue, on the B.&O., and at Sandusky street on the N.Y.C. and C.&O., must be cleared before the gates and flashers will go into operation upon the approach of a train. The purpose of this arrangement is to automatically cut out operation of the protection at the crossings in the event trains are stopped at the home signals, thus avoiding unnecessary tie-up of highway traffic.

Two Types of Relays

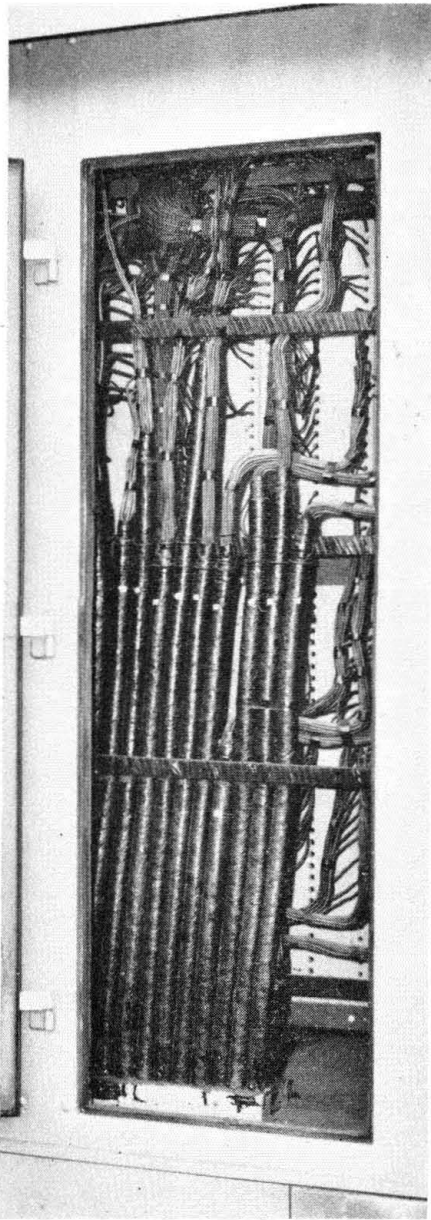
The majority of relays on this project in the tower and field are the plug-in Type B. There are 935 such relays in the tower and 576 in the field, or a total of 1,511. In addition, there are 469 Type-A relays in hinged cabinets in the tower, used on all non-vital circuits. These are smaller relays than the Type B, the use of which eliminated five full racks of the latter in the tower. To facilitate identification of Type-A relay groups in the tower, the cabinets were neatly marked with small white numerals and letters, painted on with a small metal stencil and brush. In the field, the relays and other associated ap-



There are 1,511 Type-B relays on this installation—935 in the tower, and 576 in the field

paratus is sheltered in 8-ft. by 10-ft. and 8-ft. by 12-ft. bungalows at Locations "C", "D", "E" and "F". At the balance of field locations, the relays are housed in standard six-way relay cases.

The main battery at the tower for switch-machine operation consists of 56 cells of EP-11 storage battery, rated at 200 ah. A split battery, consisting of 12 cells of EP-11, 6 cells for each side, rated at 200 ah, on the 8-hr. rate, is in service for operation of the B and A-type relays used in NX and supervisory circuits. A second relay-operating battery consists



Wiring at rear of bungalow

of six cells of FP-17, rated at 640 ah. on the 8-hr. rate, which is used for switch and signal control, indication and locking. Each track circuit in the plant is fed by one cell of 120-ah. storage battery, except a few circuits

Instrument case, showing terminals and Type-B relays on hinged mounting



on the L.E.&W., which are fed by 500-ah. caustic soda primary battery. The storage battery for this project was furnished by the Gould Storage Battery Corporation, and the primary battery by the Primary Battery Division of Thomas A. Edison, Inc. Commercial power for charging storage batteries at the tower is cut through Trumbull Electric Manufacturing Company enclosed-type safety switches.

Aerial and Underground Cable

Aerial cable varying from 5 to 75 conductors is used on the B.&O. and Nickel Plate in this plant, the balance of field circuits on the other roads being in underground cable varying from 1 to 15 conductors. Power circuits are in one cable, No. 4 conductors being used for 440-volt a.c. circuits and No. 6 conductors for 110-volt d.c. circuits to power switch machines. Wiring in the tower relay racks and in the cases and bungalows in the field is No. 14 flexible for control circuits and No. 6 flexible for power circuits. All wire and cable for the project was furnished by the Kerite Company.

The track and line circuits are pro-

tected by Type-W Raco lightning arresters. Insulated joints were furnished by the Rail Joint Company. Double insulated joints were used on some rigid-frog crossings—this being the first instance in which such practice has been followed on the New York Central.

By Signal Forces of All Roads

This plant was placed in service under the jurisdiction of H. D. Abernethy, assistant signal engineer of the New York Central, and under the immediate supervision of W. N. Hunt, assistant engineer-signals, and W. R. Waide, signal supervisor, the regular signal construction forces of all roads involved participating in the work. Signal foremen on the project were E. C. Howell, C. M. Heaster and D. E. Cahill. The major items of signal and interlocking equipment were furnished by the General Railway Signal Company, and the highway crossing protection by the Western Railroad Supply Company. The plant is maintained by E. C. Howell, leading signal maintainer, C. V. Hagley, signalman, and H. W. Hogan, assistant signal maintainer.