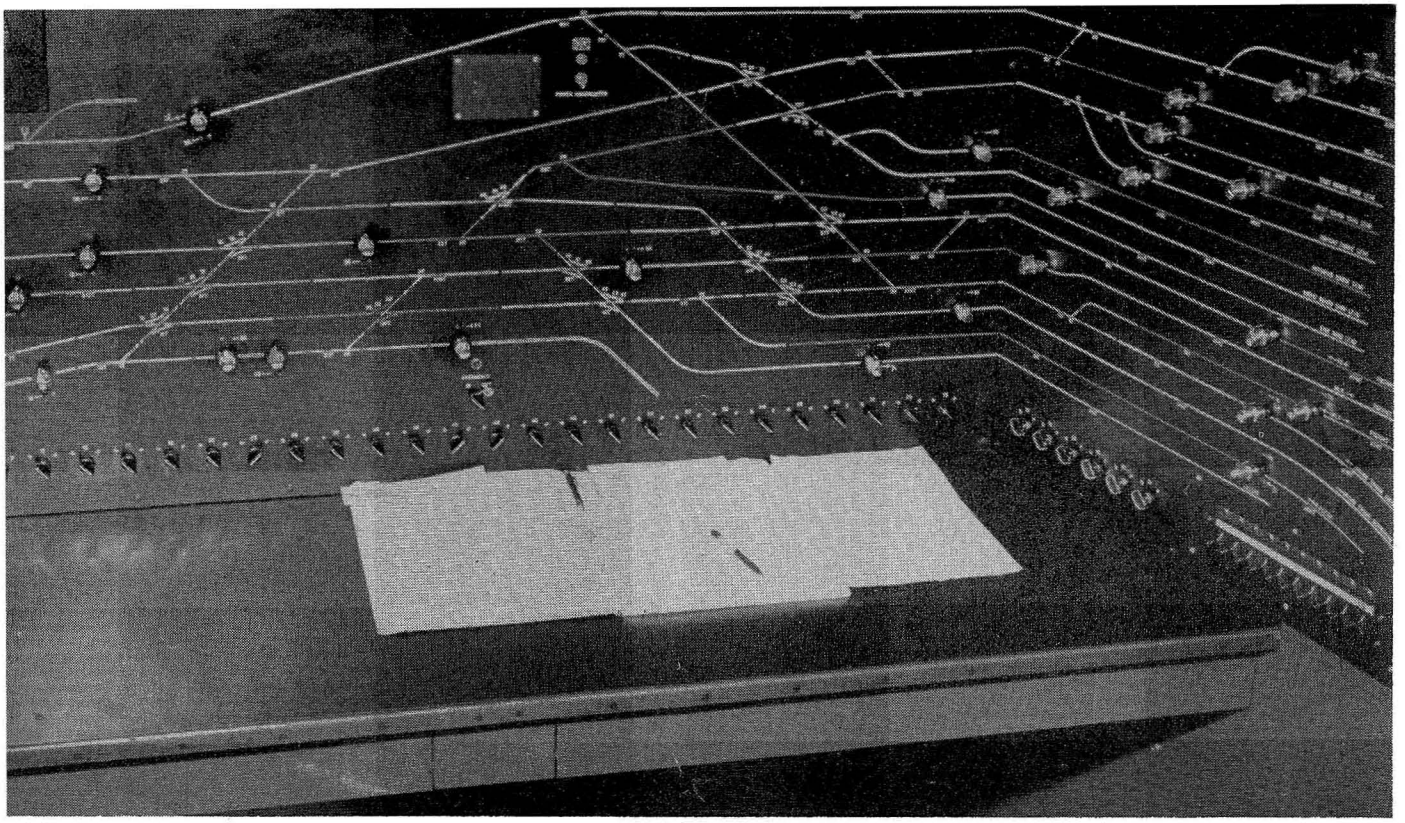


Signals are controlled by knobs on the lines representing the tracks, and the switches are controlled by push-turn levers in a row at the bottom of the panel

Chicago & Western Indiana Installs

Easily Manipulated Interlocking

That is the First of its Kind

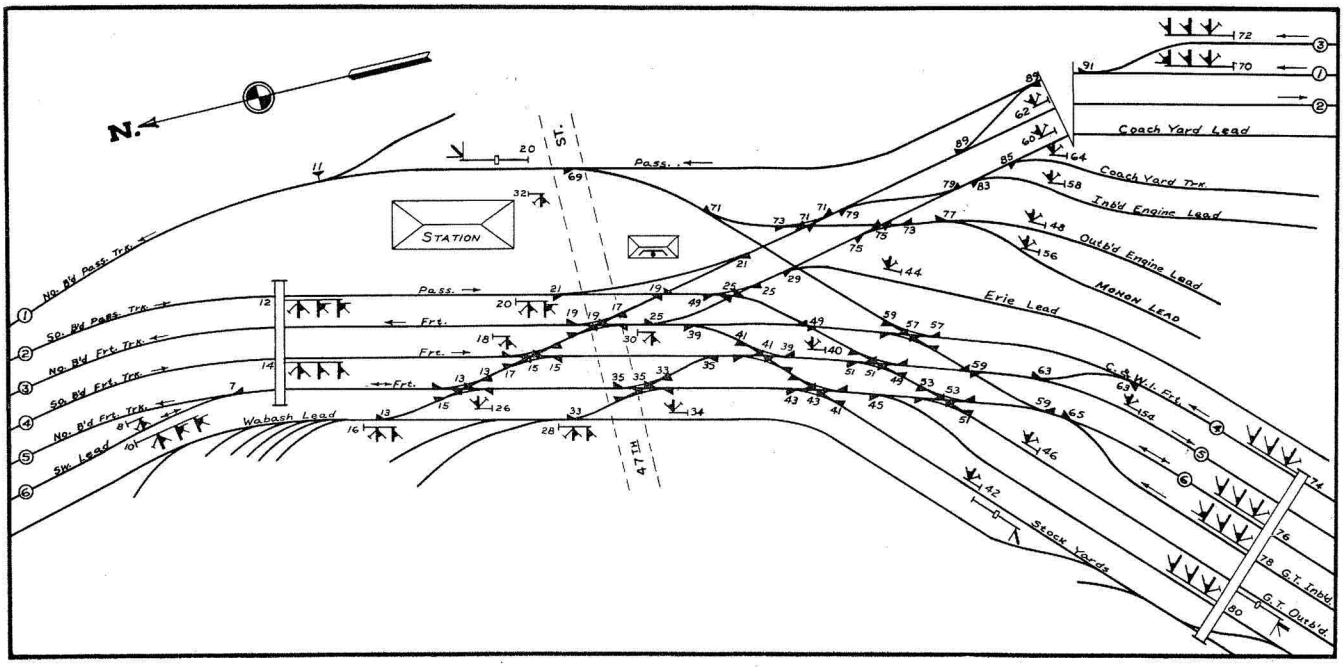
A combination of good ideas produces a modified type of route control interlocking that expedites manipulation at a minimum cost for apparatus and circuits

SIMPLIFIED and fast manipulation derived with a minimum of apparatus and circuits, is the feature of the route control machine of a new interlocking at 47th street junction in Chicago, placed in service recently by the Chicago & Western Indiana. This machine has some operating advantages over the "origin-and-destination lever" machines with automatic switch positioning of the route, in those cases where, for one reason or another, it is preferable to have the operator select the precise route for each individual move rather than to accept the selection sequence built into the system where route establishment is automatic.

This is a big interlocking, with 30 home signals, 3 movable-point frog crossings, 12 slips, 8 crossovers, and 16 single switches (a total of 63 switch machines), and one electric switch lock on a hand-throw switch outside interlocking limits. This new electro-pneumatic interlocking replaces an electro-pneumatic plant with a 120-lever machine which had been in service since 1908. The 1953 project includes new electro-pneumatic switch machines, new searchlight type signals, new plug-in type relays and complete replacement of wiring, cables and battery, so that the interlocking is entirely new, with the exception of the brick tower.

About 250 Moves Daily

This junction handles trains of several railroads, which use the Dearborn street passenger station, including the C&EI, the Wabash, the Monon, the GTW and the Erie, as well as suburban passenger trains of the C&WI. The coach yard and enginehouse, used by some of these roads, are located just south of the 47th street station, so that numerous light engine and empty coach train moves are made through the plant. A Wabash freight yard is located just north of 47th street and west of the C&WI tracks. Numerous freight houses and team tracks, used by the roads mentioned above, are located between 47th street and the downtown area of Chicago; and, therefore, many freight transfer moves are made daily through the interlocking. Thus, including the 50 passenger trains, scheduled freight trains, and switching moves, this interlocking handles between 225



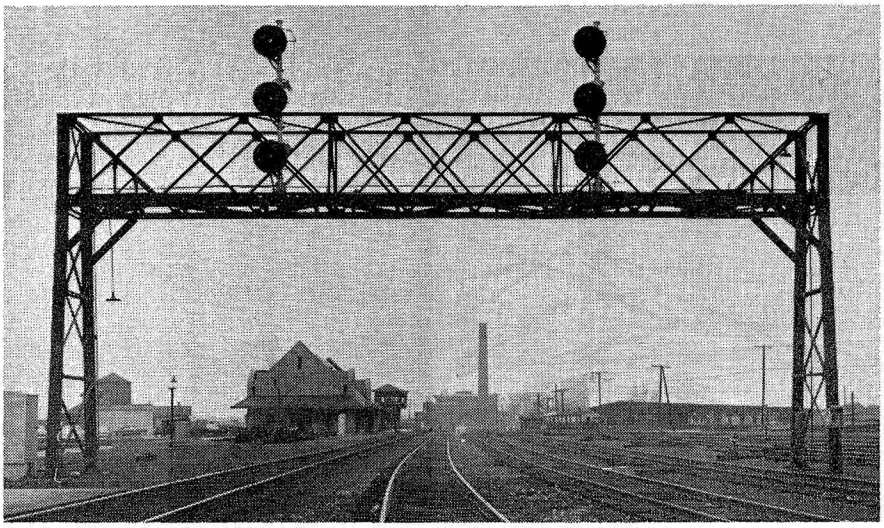
About 250 trains and switching moves are routed through this interlocking each 24 hours

and 250 moves daily. During peak periods, seven non-conflicting moves can be under way at the same time. For instance, on a recent date, four trains were occupying home signal limits simultaneously. Speed in the manipulation of the interlocking was, therefore, the controlling factor in designing many of the new features of the interlocking control panel.

New Panel Machine

The previous interlocking was controlled by a conventional interlocking machine that had 120 levers and was 25 ft. long. The new plant is controlled by a panel-type machine with a desk, arranged so that the leverman, when seated, can reach all the levers and buttons without leaving his chair. The panels are 60 in. high; the main panel is 5 ft. long; and the wings to the right and left are 2½ ft., making a total of 10 ft. This panel is made of sheet-steel with a non-reflecting black surface. The ⅛ in. lines representing each track are engraved into the steel surface, the sections representing each track circuit being painted a different color for easier identification. Countersunk in these ⅛-in. track grooves are sections of "line-o-lite," each ¾ in. long, which are normally dark, but are lighted to indicate: (1) track occupancy (red); and (2) the position of switches (white), thus showing the route lined up. A crossing of two tracks, or a slip switch is represented by a corresponding cross of "line-o-lite," in the corresponding position on the track diagram. Such a cross is lighted when the corresponding track section is occupied. This crossing of "line-o-lite" is a new feature, first used on this machine, the advantage being that it shows, without a missing link, the complete

Seven non-conflicting routes can be lined up through these switches and slips



The new signals are the searchlight type

portions of the plant that are occupied by a train.

On the lines representing tracks on this panel, a chromium plated button is located at each place, corresponding with a home signal. Adjacent to each of these buttons is a small signal symbol, with round red and green indication lights. Below the track diagram is a row of 31 levers which control the 63 power switch machines on the switches, crossovers and slips. One additional lever controls an electric lock on a hand-throw switch. These 32 levers are the so-called push-turn type, each of which is pivoted on a horizontal shaft extending into the control machine. The front edge of each lever is normally inclined 45 deg. to the left, when set to control the corresponding switch to its normal position. Such a lever is turned 90 deg. to the right to reverse the corresponding switch. In either the normal or reverse position, each lever is held in a notch so that it cannot be rotated inadvertently. Push-and-turn action is required to throw such a lever. First, it is pushed about ⅜ in., then it is rotated 90 deg. When the operator releases the lever, it springs back out. This "push, turn, release" changing of position is practically a single instantaneous manipulation, which involves a positive action on the part of the operator, thus making accidental movement of the lever impossible.

Normally, all the indication lamps on the control panel are dark. When the leverman is to line up a route, he pushes the button representing the home signal at the entrance of the route. When he pushes this signal button, the small round red lamp in the symbol for the signal, adjacent to the button, is lighted. Next the leverman throws the switch levers involved, to establish the track line-up desired. As each switch lever is manipulated, the corresponding track switch or switches, driven by an electro-pneumatic switch machine, changes position. If the switch does not go over and lock up, in the position called for, due to ice or coal obstructing the points, the reverse position corresponding white "line-o-lite" section will flash, as a warning to the leverman. However, normally each switch goes over so quickly that there is no flash.

The white "line-o-lite" sections, which show the position of switches involved, are lighted to indicate the route, and a round amber exit lamp in the route is lighted beside the signal button which represents the exit of the route, i.e., the place where the train will depart from home signal limits. Thus, the route available can be seen on the track model, by following the switch-position lights to the amber exit light.

By this means the leverman can see that he has preliminary controls established for the route he wants, this being an important advantage and a time saver. Then his final action is to push the button that represents the location at which the train will depart from home signal limits. Then, when the signal clears, the red signal indication lamp at the entrance signal symbol is extinguished, the green signal indication lamp is lighted, and the amber exit lamp is extinguished.

When the train accepts and passes the home signal, the repeater indication green lamp goes out. As the train occupies each section of track, the red "line-o-lite" indication for that track section on the panel is lighted. Such a lamp is extinguished when the rear of the train leaves such a track section. The white "line-o-lite" sections, which indicate the position of the switches, stay lighted as long as electric locking is in effect on corresponding switches. Sectional release locking is used, so that locking is released when corresponding sections become unoccupied. After the train departs from home signal limits, the controls revert to normal, with no further attention by the leverman, and the indication lamps on the control panel are all dark. The switch levers and switches can be left in their last-placed positions until changed for the next lineup.

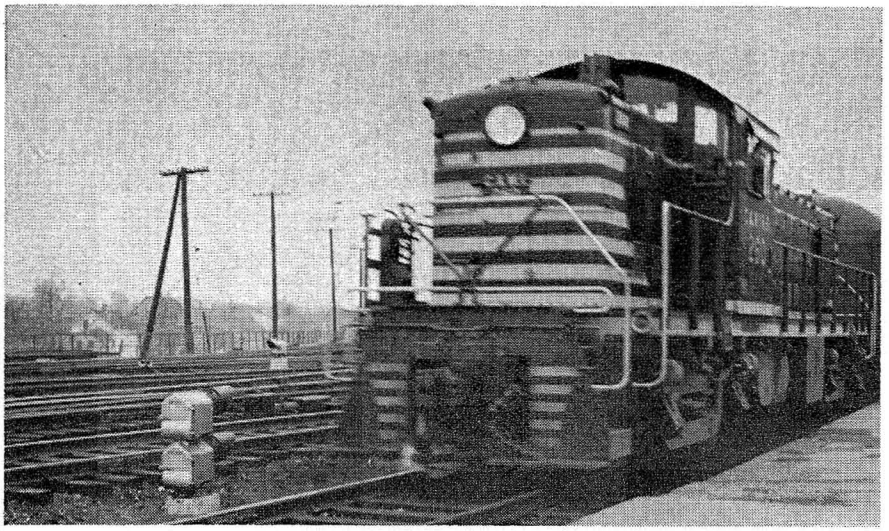
In order to clear a route in which a signal, governing in the same direction, lies between the desired entering and leaving signals, such as in the route from signal 12 to signal 62, the operator first depresses the entrance signal lever 12; this establishes 12 as an entering signal. Then he depresses signal lever 20; this establishes 20 as an exit signal. He then must depress signal lever 20 again to establish signal 20 as an entrance for the route from 20 to signal 62, then depress signal lever 62 to establish an exit at that signal. This last move will clear the route from signal 20 to 62, thus allowing the train to move from signal 12 to signal 62. The above situation exists for any through moves southward past signal 20 to 30, or northward moves past signal 40.

To Cancel A Route

If the operator desires to cancel a route after pushing the entrance signal button, but before he depresses the exit signal button, he pulls out on the entrance signal lever, thereby causing the route on the panel to become dark again. No delay is required before setting up a new line-up.

If the operator desires to cancel a route, after pressing the exit button and having cleared the signal in the field, he pulls out on the entrance button; this causes the signal in the field to display "Stop." However, this does not darken the panel immediately. Instead, the green signal indication light becomes dark, and the red signal indication light on the panel will flash, and continue to flash until a predetermined time (for time locking) expires, after which the flashing red signal indication light will darken and the entire route on the panel will become dark.

If necessary to move a train or engine into home signal limits already occupied, such as when making a switching move, then the call-on (lunar) aspect must be used. To display this call-on aspect on a signal, the leverman must not only push the signal button, but also turn it 90 deg., and then push the exit but-



Intermediate home signal 20 permits passenger trains to make station stop while other moves are underway

ton. After the train passes, the signal goes to "Stop" and stays there, but the leverman must turn the signal button back to normal in order to return the controls to normal.

Switching Signals

When switching cars in and out of the freight yard, the Wabash switch engine drills back and forth on the track "Wabash Lead," and, in doing so, occupies home signal limits on this track between signals 16 and 26. Special signal aspects and controls were installed, so that this switching operation could be done efficiently, and with a minimum attention by the leverman.

When no train is due to enter or depart from the yard for a period of 30 minutes, for example, the leverman placed switch 13 normal (if it is not already so). Then he pushes and turns signal lever 26 to the left. This establishes an "entrance," and prepares the circuits to clear signal 16 and signal 26 to display the lunar aspect. Then the leverman pushes signal lever 16. Both signals will then display the lunar aspect, which will remain displayed with track circuit 13T occupied. Thus, the switch engine can drill back and forth. When the switch lead must be cleared to move a train into or out of this yard, the leverman turns lever 26 back to the normal position, this takes away the lunar aspect, and displays the red aspect, thus warning the switcher crew to clear the switch lead as soon as they can do so. Controls, similar to those explained above, apply to the display of the lunar aspect on both signals 28 and 34.

The C&WI suburban passenger trains make a scheduled stop at the 47th station, shown on the plan. Such a southbound suburban train may be due when a conflicting route is being used by some other train. In order to save time, signal 20 was installed at the location shown on the plan, so that a southbound passenger train can pull up and stop short of this signal displaying the Stop aspect to make its station stop. Then when the other train has cleared the plant (or section route release section), signal 20 can be cleared.

Intermediate Home Signals

The enginehouse and coach yard are just south of this 47th Street interlocking. When light engines and some coach trains are being moved through the interlocking they must move up and switch back in the plant limits. For this reason, intermediate home signal 30, which is a dwarf, was installed at the location shown on the plan, so that a switching movement can be reversed here, instead of being required to go all the way back to home signal bridge at 46th street. For a similar reason, intermediate home signal 40 was installed at the location shown on the plan.

Emergency Operation

A new feature in this interlocking is the emergency control, which includes a special emergency lever and circuits. If the switches have been lined up for an approaching train, but the signal will not clear due to some failure of a circuit, the train arrives and stops at the signal. Then the leverman breaks a lead seal on the emergency lever, and turns this lever. This lights a red warning lamp over this lever, and circuits are affected so that all signals are held at Stop; the route relays and route locking relays are de-energized, thus locking all switches in the position where they are. Therefore, the leverman cannot move a switch or clear any signal, thus preventing setting up a conflicting route. Then, after making a check to see that the switches are in the position for the route to be used, the train is flagged through the plant. After the emergency lever is restored to original position, the plant is thereby restored to normal operation, with the exception of the route that has been affected by the failure. Until such time that the failure is corrected, the emergency lever must be used, as explained above, for each movement over that route.

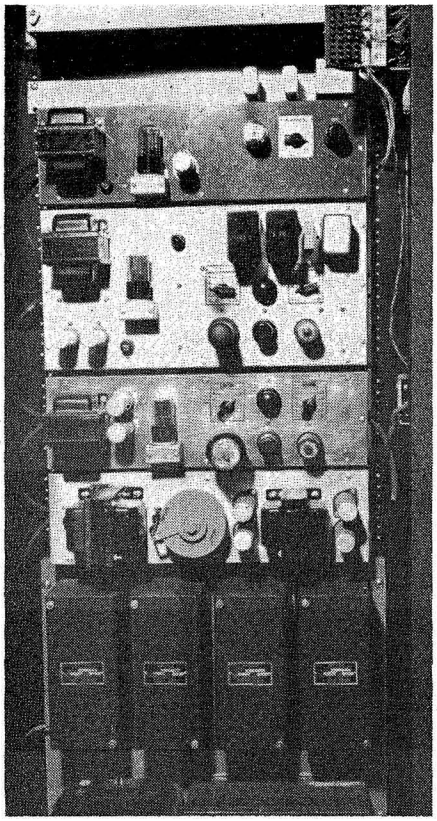
The leverman is required, by rule, to report each instance in which the wire and lead seal, on the emergency lever, is broken, also, this lever is connected to an electrically operated counter, mounted inside the machine case, which registers the number of times that this emergency lever is operated.

Communication Facilities

A special telephone circuit extends from the interlocking machine to receptacles in the junction boxes and relay cases at convenient locations throughout the home signal limits, and in the relay room on the ground floor of the tower. The maintainer has a pocket-sized telephone hand set of the sound-powered type, made by the Wheeler Company, Waterbury, Conn. He can plug this hand set into the jacks at any location mentioned above, to communicate with the leverman, or with some other signalman or inspector at another location in the plant or in the tower.

For use in emergencies, the signal supervisor, F. W. Zabrockas, has a portable battery powered loudspeaker, made by Soundcraft Systems, Pittsburgh 2, Pa. This unit can be placed temporarily at any location in the interlocking area, where it can be plugged into the telephone line. Then the supervisor or towerman can use his phone at the tower to direct the work of men who are within the sound range of the loudspeaker. Also this portable loudspeaker can be used independently. In this instance, the man carrying the loudspeaker uses the microphone attached to this unit. This increases the voice range of the man using the unit, and is, therefore, useful in directing the work of track men or signal crews, especially when making emergency repairs, in case of derailments.

On the interlocking control machine, the incoming telephone circuits from other interlockings and the dispatcher's office, are terminated in a concentration unit which is mounted as part of the control



Selectors for code ringing

machine panel. Eight telephone circuits come into this concentration unit. Three of these are magneto ring-down. Previously the leverman had to listen to all "long and short" code ringing to know when his code was being rung. As part of the improvement, Secode selectors, made by Electrical Communications Corporation, San Francisco, were installed. Now, the incoming code ringing operates these selectors. When the proper code is received at 47th street tower, the bell rings and a lamp lights on the concentration unit, so that the leverman can answer. Thus his bell rings only when he is called.

All telephone circuits are amplified through loud speakers, including intercoms between this 47th street tower and adjacent towers each way, i.e., at 40th street and 59th street. The microphone is mounted flush in the face of the interlocking control machine panel. Two loudspeakers are mounted on top the control machine, one at each end of the main section of the panel. The loudspeaker at the right is used for conversations on telephone circuits as well as intercom. The loudspeaker at the left receives intercom calls from either 40th street or 59th street. Then, when the leverman answers by use of a key on the concentration unit, he puts his microphone and the right-hand loudspeaker on the line. The amplifiers, and other new communications equipment including the concentration unit were furnished by the R. W. Neill Company.

Another feature of this project is that an electric clock is mounted flush in the face of the interlocking control machine panel. If the a.c. power fails, the clock stops. When the a.c. power is restored, a buzzer warning is sounded, so that the leverman will know that he must reset the clock to proper time.

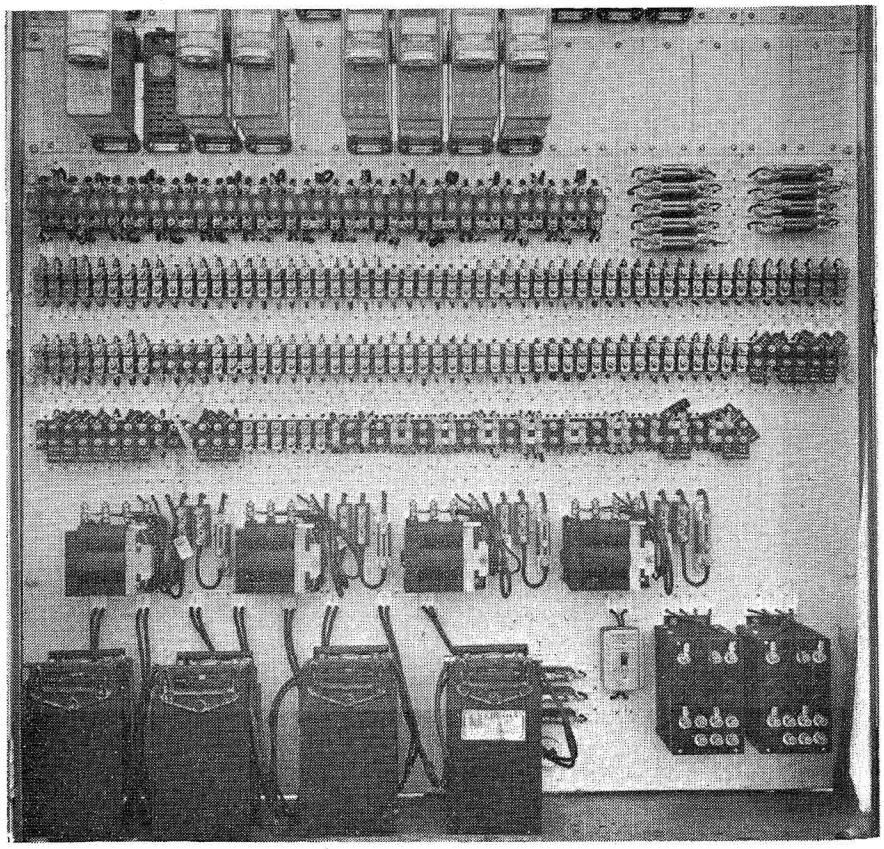
The compressed air, for operation of the electro-pneumatic switches on this interlocking, comes from a compressor in the railroad shop at 49th street, several blocks south of 47th street tower, and also furnishes air for another large interlocking plant at 40th street. Just in case this air supply might fail, an emergency stand-by supply at 47th street was considered desirable. This need was met by purchasing an Ingersol Rand, gasoline engine-driven air compressor, rated at 105 cu. ft. per minute at 100 lb. per sq. in. This machine is on rubber-tired wheels, and is light enough that it can be pulled easily by two men. Normally it is housed in the maintainer's room.

As mentioned earlier in this article, the project being discussed was a complete replacement of a previous interlocking at this same location, the only thing that remains of the old plant being the brick tower building. Of special interest is the fact that the interlocking was continued in service during the entire construction period, and the change over from the control of the old interlocking machine to the new one was made in eight minutes.

Well Organized Construction

New rail was laid through the switches, crossovers and slip layouts, concurrently with the installation of the new interlocking. Therefore new ties, tie plates, switch rods, front rods, lock rods, and entirely new A-5 electro-pneumatic switch machines were installed as the track work progressed. This work was planned ahead of time to have materials on hand, on a definite morning, for two or more certain switch layouts. If the first switch on the list was not available for some reason, the crew could start work at once on the other switch, for which materials were also on hand.

Likewise, during the construction period, old semaphore signals were replaced with new searchlight signals. The old wiring distribution, which was in wood trunking, was replaced with all new circuits in buried cable. New relays and circuit wiring was installed in cases at signal and in the relay room which is on



Track batteries, as well as some relays are located in sheet-metal cases at the home signal bridges

Portable loudspeaker saves steps

the ground floor of the tower.

When each new switch machine or signal was in place, it was, of course, connected to be controlled from the old interlocking machine. These controls circuits were through temporary three-pole double-throw knife switches called transfer switches, with wiring from one set of poles to circuits controlled by the new interlocking machine. Before each function was placed in service, the temporary work, as well as the permanent circuits, were thoroughly tested.

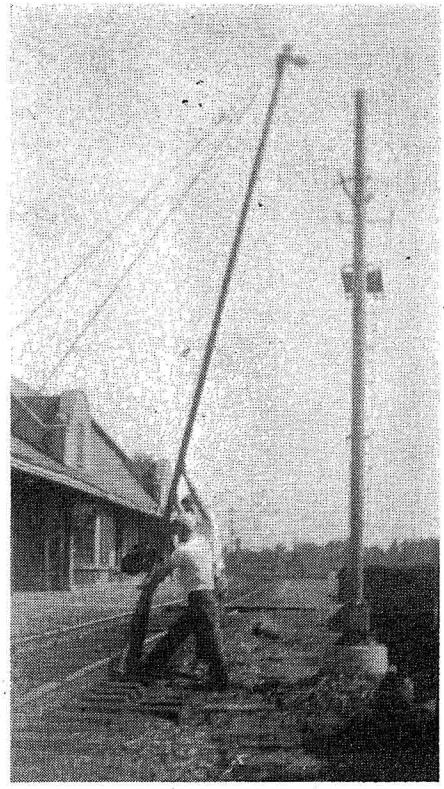
This step-by-step procedure had the advantage that the work of cutting over from the old interlocking machine to the new one was concentrated through a series of individual transfer knife switches, and, whenever traffic conditions permitted, the functions were operated and routes set up by the new machine. In this manner, all detailed checking of circuits were made before the final cut over, which was accomplished in a minimum of time. The actual time consumed in the final cut over, from service until the new all-relay machine was controlling all functions, was only 8 minutes.

The change was made at 6 a.m. From then until 2 p.m. no signals were cleared. After a train arrived and stopped at its home signal, a man on the ground, under the leverman's direction, by talk-back loudspeakers, identified the train, and then flagged it through the plant limits. From 2 p.m. until 6 a.m. the next day, trains were brought to a stop at their home signals, which were then cleared for train to proceed through the plant at restricted speed.

The track relays are the retained neutral biased d.c. type rated at 4 ohms. All but 10 of the track relays are in the tower, and all the switch control and signal control relays are in the tower. All the relays are the plug-in type, mounted in racks. Solderless terminals made by Aircraft-Marine, are used on the wiring. The lightning arresters were made by Railroad Accessories Corp.

On this project, numerous jobs, such as taking down old signal masts, and erecting new ones, were handled easily by means of a special lightweight portable derrick, made for the C&WI by the Sagen Derrick Co., Chicago. This derrick has a boom made of a metal pipe, about 2¾ in. in diameter, and can be extended from 22 to 26 ft. in length. The base of this boom is welded to a base cross piece made of 1½ in. angle iron, 5 ft. 6 in. long, with angle braces of 1¾ by 1¾ in. angle iron from the base piece up to the boom. A double geared, hand-cranked winch is mounted on the mast, and a ⅜-in. flexible steel cable is used.

When preparing to lift a signal mast, the base of the derrick is placed on the track ties and braced against the rail. Then the boom is lowered to the angle needed to pick up the load, and is guyed in this position by three wire ropes to the opposite rail. Then, when the hitch has been made and hooked up, the winch is cranked to raise the load. This derrick is readily portable, and proved to be very useful for numerous jobs during the construction of this interlocking, as well as elsewhere on the railroad.



Portable derrick saves lifting

This interlocking was planned and constructed by Chicago & Western Indiana forces under the direction of Harry W. Dunn, signal engineer. F. W. Zabrockas, signal supervisor, had charge of construction forces. The major items of equipment, including the control machine, were furnished by the Union Switch & Signal Division of Westinghouse Air Brake Company.

Standing, left to right, F. W. Zabrockas, signal supervisor; H. A. Strosinski, signal inspector; G. C. Zulfer, signalman; V. G. Mowery, foreman; J. A. Ronkoske, signalman; R. J. Wallerman, foreman; T. E. Shanahan, assistant signalman; J. F. Schuh, assistant signalman; C. R. Leipold, signalman; E. Zabrockas, assistant signalman; H. W. Dunn, signal and electrical engineer. Kneeling, l. to r., J. Maniscalco, signalman; G. Barwegan, signalman; G. P. Haugh, signalman; L. M. Barry, signalman; J. A. O'derio, leading signalman.