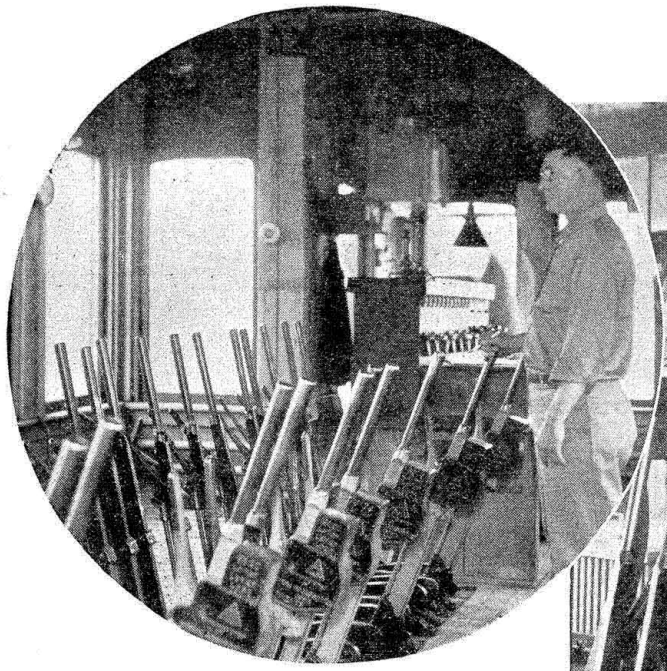
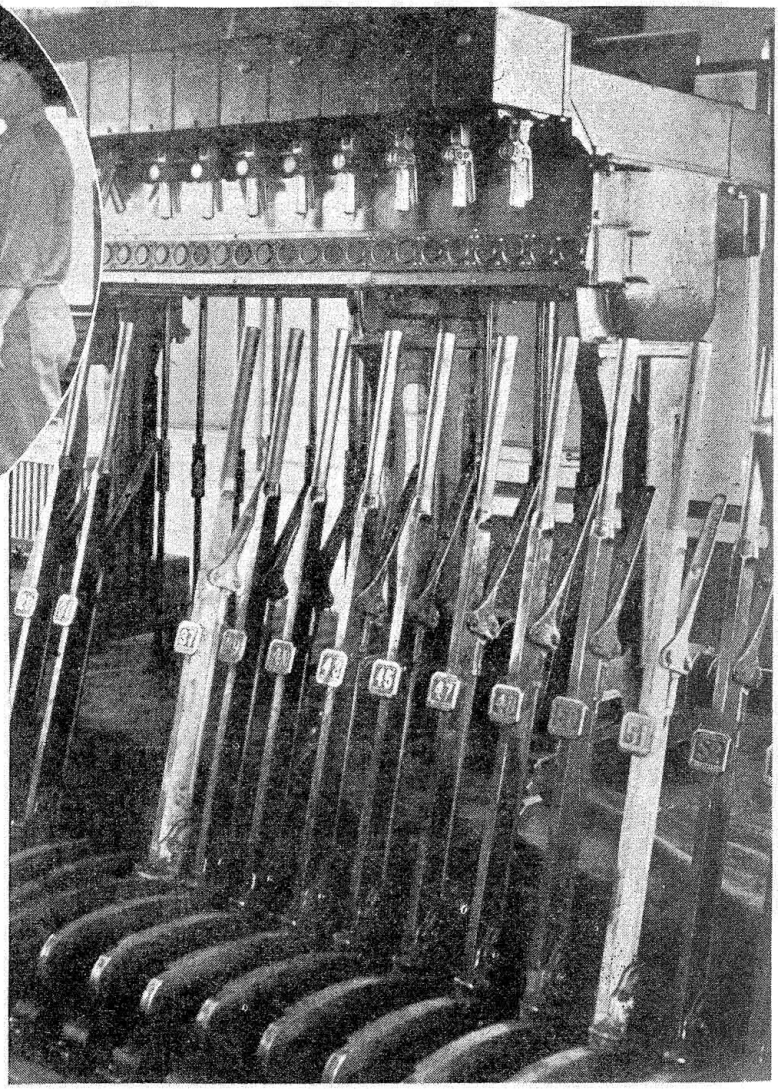


Above—A portion of the old mechanical interlocking machine which was installed originally in 1890

Below—The new electro-mechanical interlocking machine electric levers to control signals and mechanical levers to operate switches and crossovers

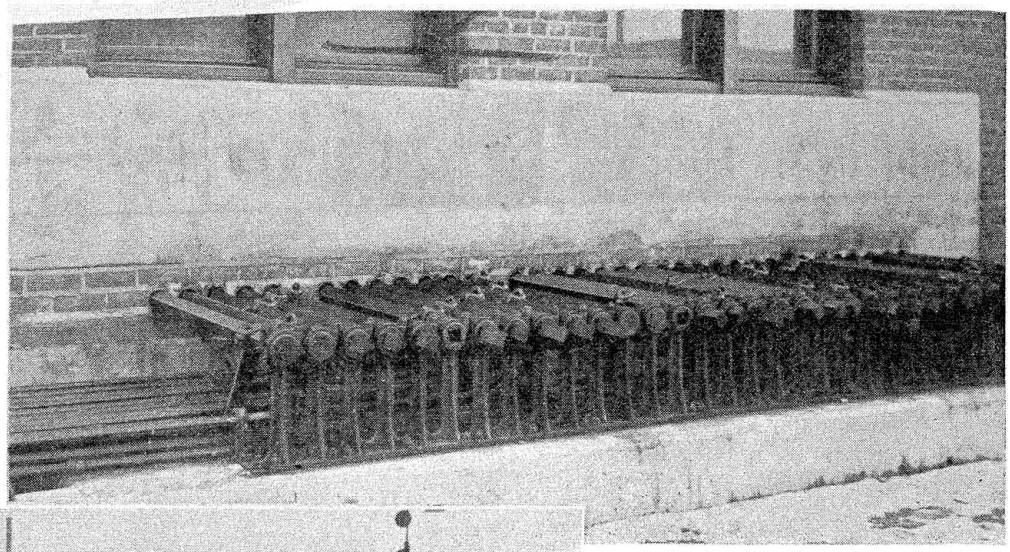


War-Time Replacement Of Interlocking on Pere Marquette

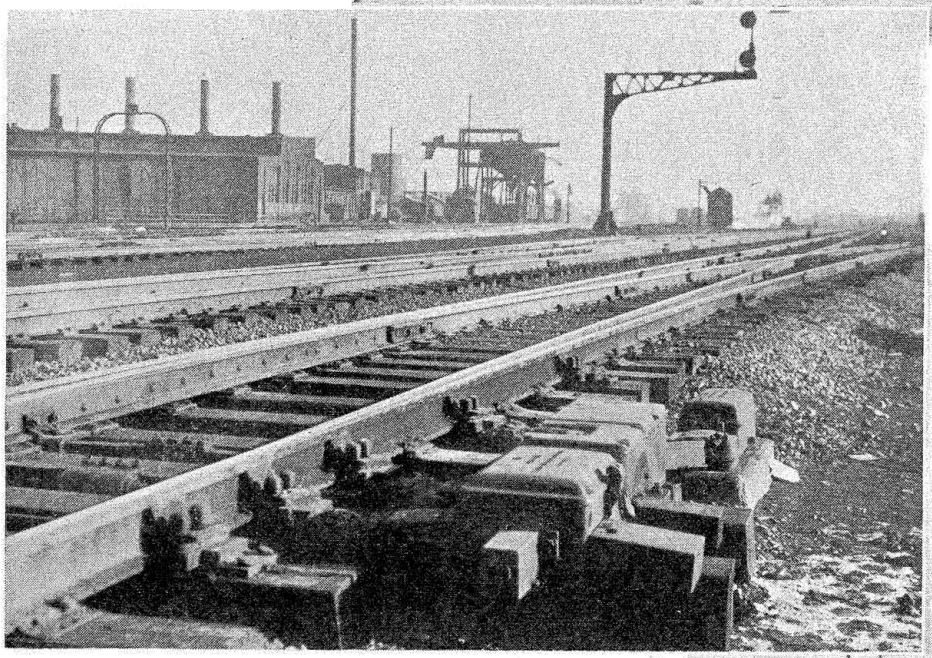
Restrictions in use of new insulated wires and cables led to use of mechanical levers for switches and crossovers with electric levers for signals

At Delray, in the outskirts of Detroit, Mich., there are several railroad crossings and junctions, involving tracks of the New York Central, the Michigan Central, the Wabash and the Pere Marquette, the interlocking being maintained by the Pere Marquette. The track layout is shown in the accompanying plan. A mechanical interlocking, originally installed in 1890, had been revised from time to time, but the old wire-pull semaphore dwarf signals, and mechanical selectors were continued in service. In 1929, six electric switch machines and five signals were installed east of the crossing, and a set of nine desk levers was installed to control these new functions.

The traffic over this interlocking includes about 90 trains on the first trick daily, about 95 on the second, and 75 on the third, totaling 240 line-ups daily. The old mechanical equipment, including the interlocking machine, was worn beyond the stage where it could be repaired. Furthermore, the plant in several respects did not conform to modern practices, as for example the wire-pull dwarf signals. Throughout the 1930 decade, reconstruction of this interlocking was postponed from time to time for various good reasons. Finally, with the increased war-time traffic, complete reconstruction, as soon as possible, was absolutely imperative. By that time the manufacture of insulated wires and cables was restricted, so that the installation of an all new electric interlocking was not within the range of possibility. For this and other various local reasons, a decision was made to replace the mechanical interlocking

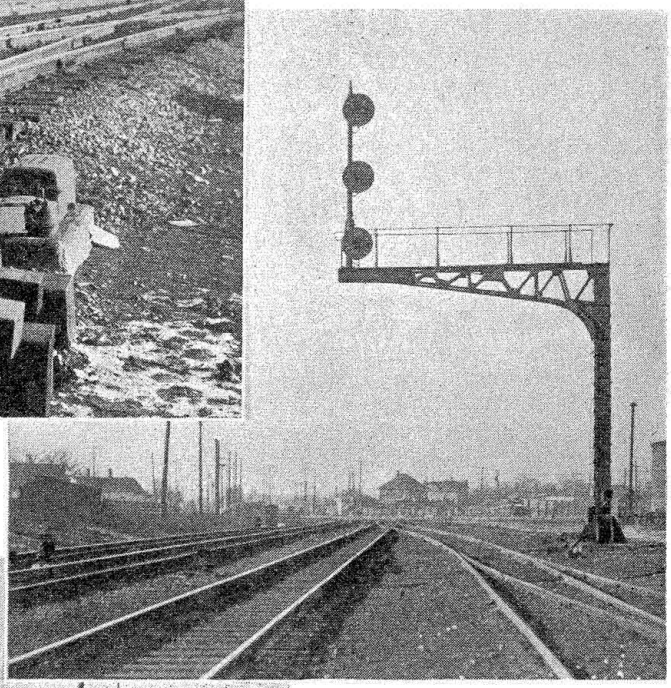


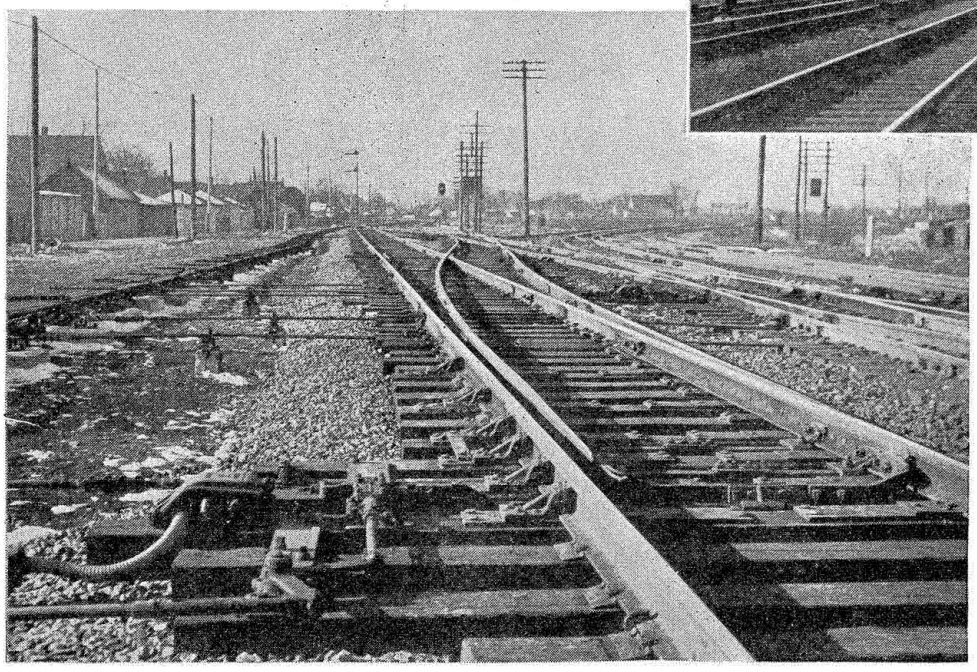
Right—The rocker-shaft leadout is mounted on the solid foundation of steel and concrete



Above—The switches east of the crossing on the Pere Marquette are operated by electric machines

Below—The westward home signal bridge on Pere Marquette





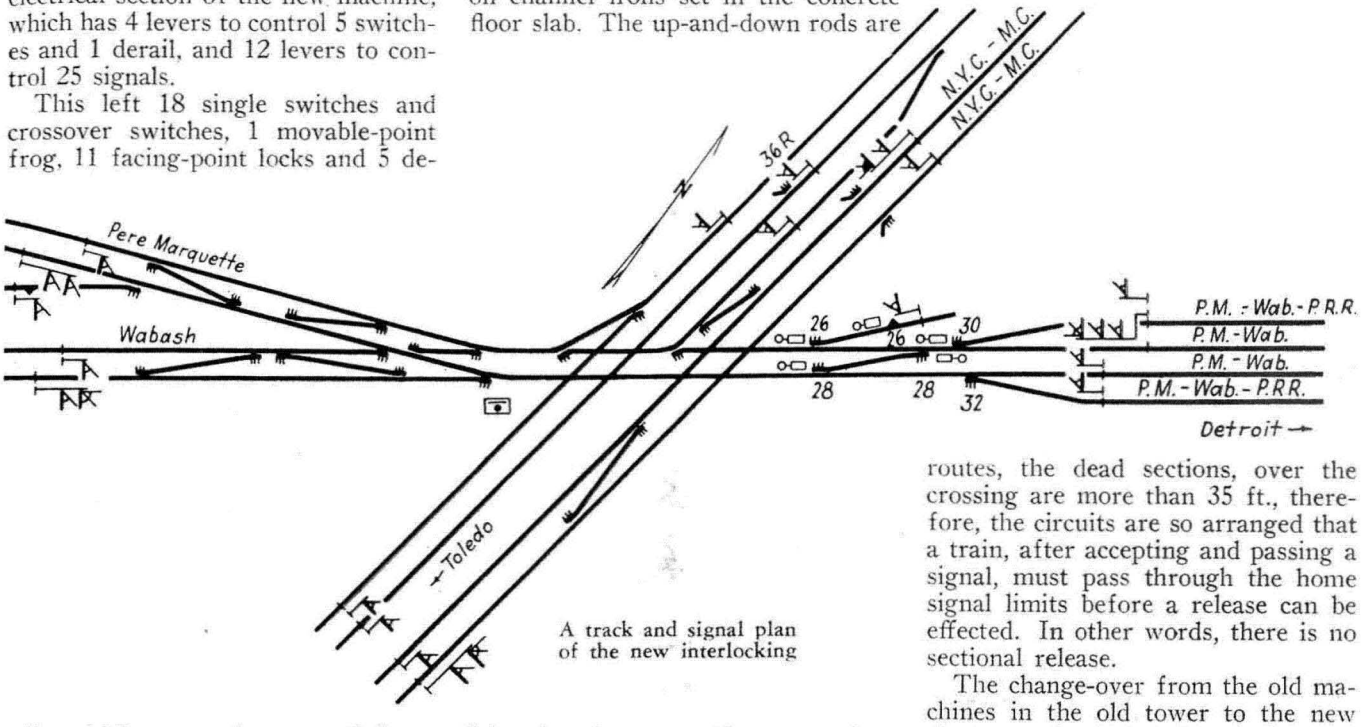
Left—The mechanical switches are equipped with facing-point locks and switch circuit controllers for the switch repeater relay circuits

with an electro-mechanical plant, including a new electro-mechanical machine in a new tower. This proposal was approved by all concerned including the War Production Board.

When planning the changes, the previously existing electric switch machines were left in place on crossover 28 and single switches 30, 32 and 26, including derail 26. Therefore, the control of these switch machines, as well as the signals for the entire plant, was assigned to levers in the electrical section of the new machine, which has 4 levers to control 5 switches and 1 derail, and 12 levers to control 25 signals.

This left 18 single switches and crossover switches, 1 movable-point frog, 11 facing-point locks and 5 derails which are each operated by a lever in the new mechanical interlocking machine, thus totaling 34 working levers.

The tower walls are brick, and both the ground floor and the second floor are concrete, poured in place. A reinforced concrete beam, 15 in. square in cross section, extends all the way around the hole in the floor where the interlocking machine is set. The interlocking machine is mounted on a reinforced concrete beam which is supported on three concrete piers set in the foundation and the concrete floor at ground level. The bases for the rocker shaft leadout are mounted on channel irons set in the concrete floor slab. The up-and-down rods are 2-in. pipe, thus preventing any springing. All jaws and pins were fitted carefully. With this construction, there is no lost motion between the operation of the levers and the pipe lines extending from the outdoor end of the leadout. A result is that these switches can really be operated quickly and with much less effort than on the old plant.



A track and signal plan of the new interlocking

Good Mechanical Construction

Having accepted the necessity for using mechanical interlocking for part of the project, a decision was that the very best mechanical practices should be applied in the new construction, so that the machine could be operated as easily and quickly as possible, and to minimize the possibilities of failures which might cause train delays. The first important change was to eliminate the main-track derails except for the southward derails on the Michigan Central and the New York Central tracks on which switching is done to leave cars standing, and with the additional factor that these tracks are down grade toward the crossing.

In order to reduce the work required and to facilitate operation, one lever was provided for each crossover switch, whereas in the old machine one lever operated both switches.

Several features are of rigid construction, thus minimizing lost motion.

The S-8 electric levers are mounted over the mechanical interlocking machine in the conventional manner, as shown in one of the pictures. This electric unit includes electric lever locks and indication lamps. Vertical rods, actuated by the levers, extend down and connect to mechanical locking in the mechanical interlocking machine. Thus, the operation of the mechanical levers and the electrical levers must follow a predetermined sequence of manipulation.

The electric locks for certain levers in the mechanical machine, are forced-drop type, and are located on a platform below floor level, being connected by vertical rods to the rockers.

A new system of electrical control circuits and electric locking was installed as part of the program. The system of signal controls is on the SS principle, which included the installation of polar switch-repeater relays for switches, these relays being located in the tower. As an aid to the towerman and maintainer, when locating trouble, a special indicator box was provided which has 13-volt ¼-amp. lamps which are lighted when each corresponding switch is not closed and locked.

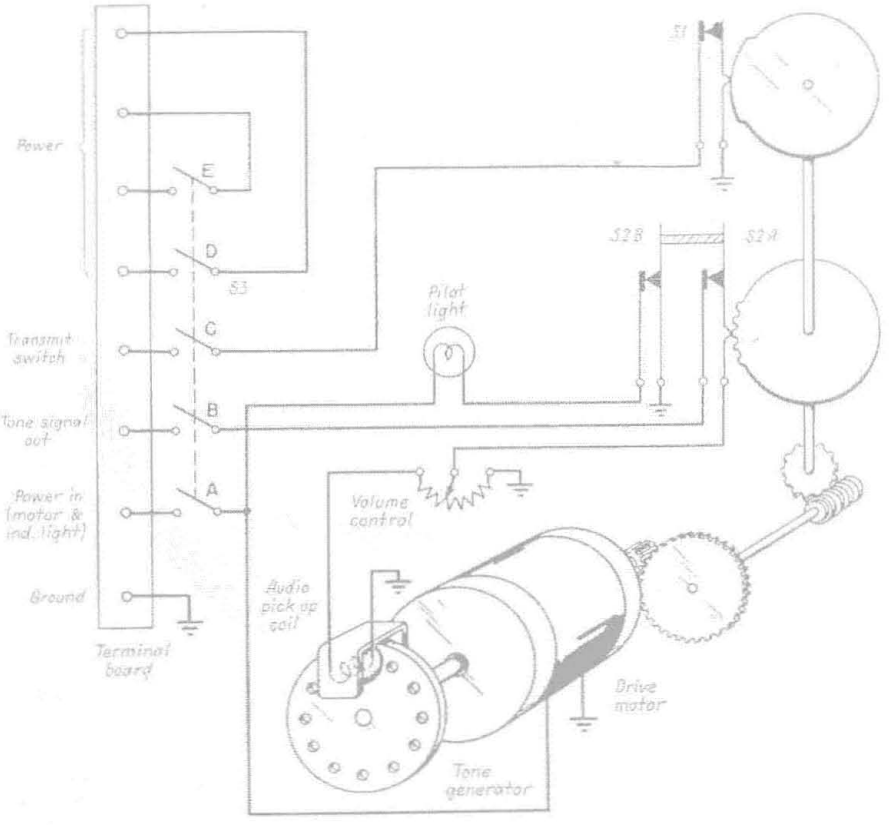
The new electric locking is controlled as time locking. On certain routes, the dead sections, over the crossing are more than 35 ft., therefore, the circuits are so arranged that a train, after accepting and passing a signal, must pass through the home signal limits before a release can be effected. In other words, there is no sectional release.

The change-over from the old machines in the old tower to the new electro-mechanical machine in the new tower, required numerous changes in pipe lines and wiring, and the plant had to be out of service eight days to permit this work to be done. At that time, more than 250 train movements were being made every 24 hours over this plant. The problem was to keep these trains moving without serious delay, and at the same time prevent accidents.

Red flags by day, and lanterns at night, were set 50 ft. from the crossings on each track, the flags being placed in short sections of 2-in. pipe set vertically on cross ties in the center of the track. The hand-throw switch stands, which were installed temporarily on the switches, were operated by groundmen who worked under the supervision of the towerman in the tower where he could see most of the entire layout. In the tower and in the vicinity of the location where each groundman was stationed, there were combined loud-speakers and transmitters. These six instruments were connected so that the towerman could give instructions to any of the groundmen to line certain switches, and then the

(Continued on page 336)

Three switches (S1, S2A and S2B) are actuated by a pair of specially shaped cams on a common shaft which is connected to a 12-volt constant speed d.c. motor through a worm and gear arrangement. The motor also drives a disk-type tone generator. The tone generator is a metal wheel, with small holes at regular intervals around its outer edge, which rotates in a magnetic field created by the current in a field coil. Interruptions in this steady magnetic field, caused by the holes in the rotating wheel, produce a continuous 750-cycle audio tone which is coupled to the volume level control by a pick-up coil. When switch S2A is closed, the signal is fed into the transmitter modulator input.



Schematic diagram showing the operation of the Slowtone warning unit

Switches Ganged

Switches S2A and S2B are ganged together and operate simultaneously. S2A is actuated by the five teeth occuping an 80-deg. arc on the rim of the cam. Each one of the teeth closes S2A momentarily and allows the tone to be fed to the modulator for an interval lasting 0.12 second. At the same time, since S2B is mechanically connected to S2A, it closes the pilot light circuit for the same interval and produces a flash for each tone pulse. This provides visual indications that the unit is operating. The rotor of S1 is exactly alined with that of S2A so that its single actuating segment closes the switch while the five teeth are pulsing the warning tone. Switch S1 operates the press-to-talk relay on the communications unit which places the equipment in the transmit position for the 1.5 second period required by the five teeth to complete their cycle. For the remainder of the 360-deg. rotation, S1 is open and the equipment is in the "receive" position for a period of approximately 3.5 seconds.

Total Time

Thus, a total of about five seconds is required to complete one revolution of the rotors. One and a half seconds of this period is used to emit the five tone pulses while the transmitter is on the air. During the remaining 3.5 seconds, the equipment is in the receive position in which position it remains until one revolution is completed.

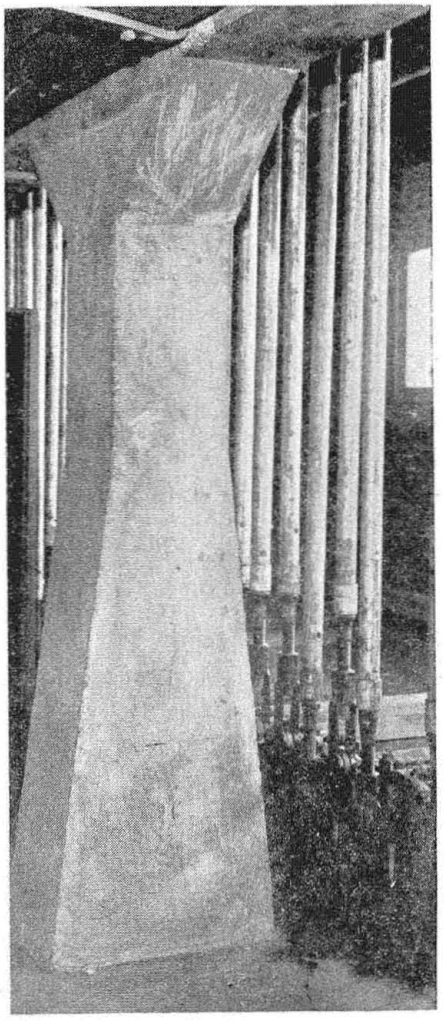
The demonstration of this test installation of radio telephone train communication and Slowtone warning was made under the supervision of P. B. Tanner, of the Bendix Radio Division of the Bendix Aviation Corporation, with the co-operation of J. R. DePriest, superintendent telegraph and signals, and John Ryscuck, assistant electronics engineer, of the Seaboard Air Line Railway.

Interlocking on P.M.

(Continued from page 329)

groundman could report back to the towerman when this had been done. When a route was complete and a train had stopped at the entrance to the plant, the towerman issued instructions to a groundman to lift the flag or lantern from the center of the track, as a signal for the train to proceed. This procedure, including the intercommunication facilities, proved to be a great success in reducing delays and eliminating accidents, during the time the plant was out of service.

This interlocking was planned and installed by forces of the Pere Marquette, under the direction of H. C. Lorenzen, signal engineer and superintendent of telegraph. The major items of interlocking equipment were furnished by the Union Switch &



Concrete column under the machine

Signal Company. In general, the operation of this interlocking has been satisfactory since it was placed in service, and the use of the mechanically operated switches and facing-point locks, as compared with an all electric plant has not caused many serious train delays.