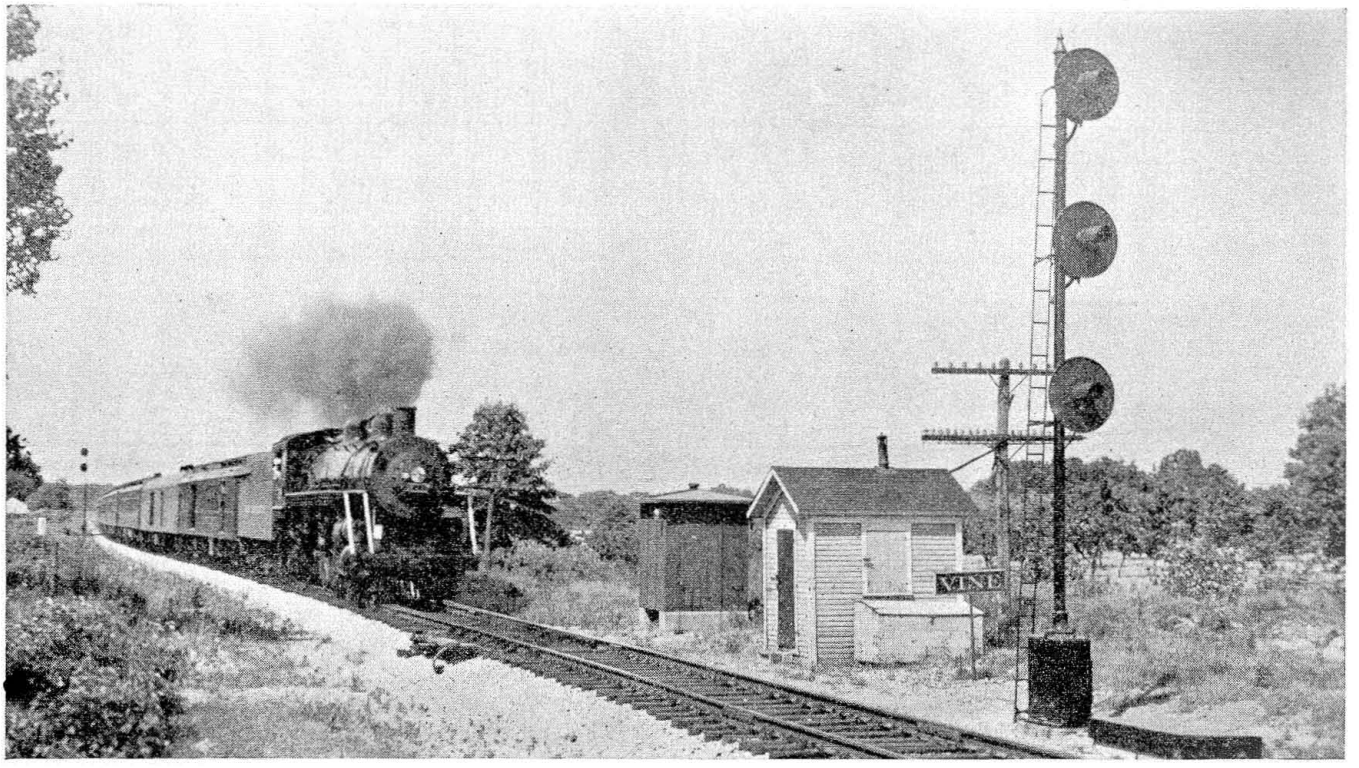


Westbound Pere Marquette passenger train in C.T.C. territory at Vine, Mich. Note power switch and searchlight signals

Pere Marquette Installs C.T.C.

Train movements are facilitated on 47.7 miles of busy single track between St. Joseph, Mich., and Porter, Ind.

THE Pere Marquette has installed centralized traffic control on 47.7 miles of single track between St. Joseph, Mich., and Porter, Ind., on the route between Chicago and Detroit via Grand Rapids, Mich. Between Chicago and Porter, 47.3 miles, the Pere Marquette trains are operated over the tracks of the New York Central and the Baltimore & Ohio Chicago Terminal. Eastward from Porter, the Pere Marquette is, in general, parallel with, but a mile or more from, the south and east shore of Lake Michigan. The curvature is light, and the grades are not excessive, except for two miles from St. Joseph westward, where the line climbs from about 10 ft. above lake level to 85 ft. within two miles. The track is in good condition, with 112-lb. rail, good ties and crushed rock ballast. The maximum permissible speeds are 70 m.p.h. for passenger trains and 40 m.p.h. for freight trains.

In the territory between Porter and St. Joseph the schedules include four passenger trains each way and four through freight trains each way daily. One local freight train operates from New Buffalo to St. Joseph and return to New Buffalo, and a second local freight operates from New Buffalo to Porter and return. Extra trains are operated as required, so that the number of trains daily ranges from 25 to 30.

The Pere Marquette already had double track for four miles and single track with C.T.C. for 28 miles east from Grand Rapids to Lake Odessa, as well as double track 6 miles and single track with C.T.C. for 33 miles from Grand Rapids west to Fennville. The St. Joseph-Porter section was chosen for the 1946 C.T.C. project because of the train delays previously in this territory.

At New Buffalo, which is about midway between St. Joseph and Porter, all trains stop for coal and water. Also the local freight trains working both ways out of New Buffalo terminate at that point. Some of the through freight trains stop at New Buffalo to set out and pick up cars. Another factor, which complicates operations, is that a large percentage of the trains are bunched during certain hours. On the whole, therefore, there was a greater need for C.T.C. on the St. Joseph-Porter section than on the 47.5 miles between St. Joseph and Fennville.

Layouts of Sidings

A section of two main tracks 3.9 miles long extends from switch No. 38 at St. Joseph, to Vine. Sidings regularly used for passing trains are located at Livingston, Sawyer, New Buffalo, Michigan City and Porter. The switch at the west end of the siding at Porter is included in the interlocking at the junction with the New York Central. The new C.T.C. includes power switches and signals for authorizing train movements at the east switch at Porter, and at both switches at the other sidings named above, as well as at both ends of the two main tracks at Vine and St. Joseph. The track and signal plan of the entire C.T.C. territory is shown in Fig. 1.

The C.T.C. control machine is located in the office at New Buffalo, which is about midway between the

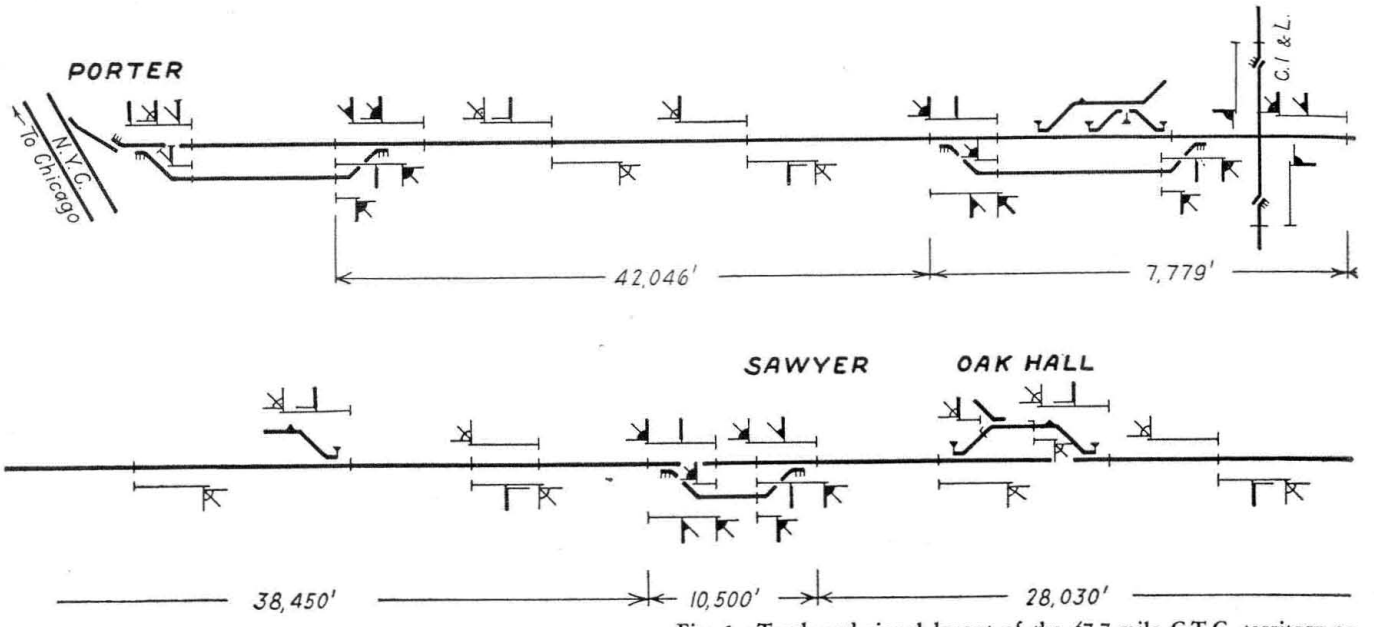


Fig. 1—Track and signal layout of the 47.7-mile C.T.C. territory on

two ends of the territory. This machine is manipulated by an operator who works under the jurisdiction of the dispatcher, located at Waverly, Mich., 90 miles east of New Buffalo.

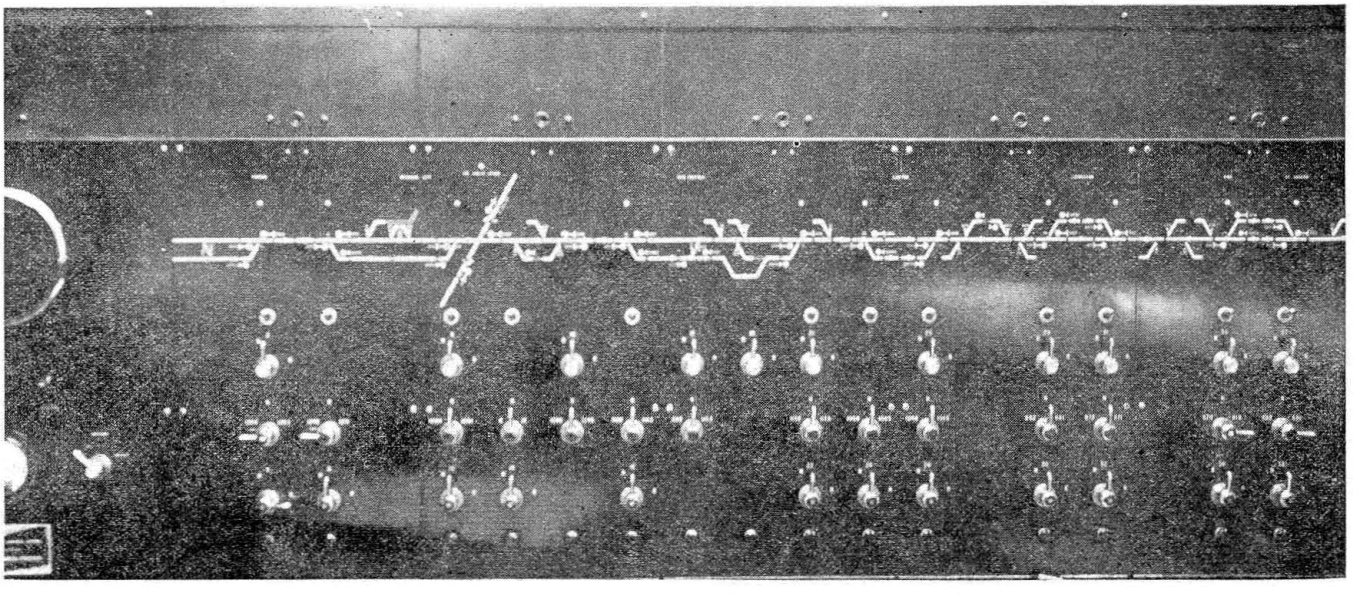
At the top of the panel of the control machine, there is an illuminated track diagram which indicates the locations of sidings, switches and signals. In the lines representing tracks, there are small opal lamps which are lighted when corresponding sections of track are occupied. Each station-to-station block is represented by two independently controlled lamps, so that the man in charge of the machine knows when a train has passed a point half way between the stations. Occupancy of sidings is also indicated, usually by two lamps, thereby providing information as to where the train is on the siding.

The first row of levers below the diagram are for the control of electric locks on the hand-throw switches. Where two or more locks are located in one automatic block, all such locks are controlled by one lever. To release a lock, the operator throws the lever 90 deg. to the right and pushes the code-starting button. This causes a line code to go to the field station nearest the lock, from which point a local line circuit extends to the lock. If no train is approaching or occupying the block in which the lock is located, the lock is released immediately. If a train is occupying the block, the release is effected after a time interval measured automatically by a time-element relay.

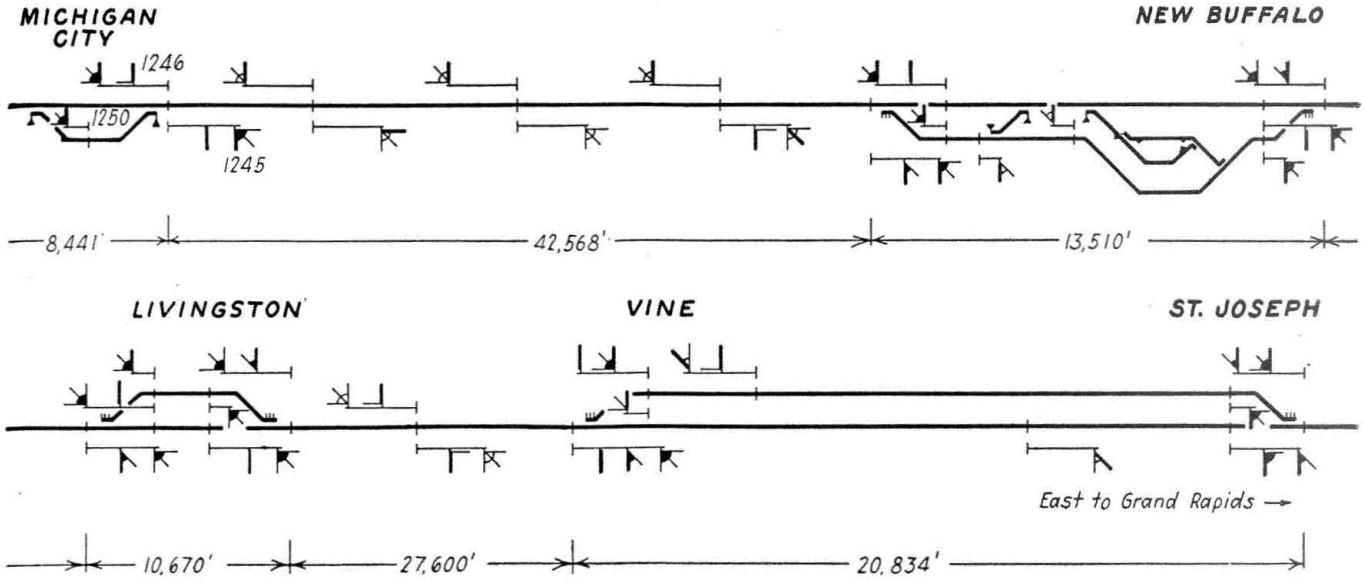
The pick-up of a lock is accomplished by releasing a stick relay at the lock location; therefore, in order to again restore the lock to normal locked condition, the operator must send out a C.T.C. line code control to pick up the stick relay, thus locking the lock again.

Signal and Switch Levers

The signal levers, which are in the second row, stand vertical normally, being thrown to the left to control westward signals or to the right to control eastward signals. When a signal clears, a green lamp is lighted in the face of the corresponding lever. The switch levers, in the third row, stand vertical to control the corresponding switches to the normal position, and are thrown to the right to reverse the switches. When a switch lever is thrown, a yellow lamp is lighted in the lever until the corre-



The new centralized traffic control machine is located at New Buffalo, Mich.



the Pere Marquette between St. Joseph, Mich., and Porter, Ind.

sponding switch is operated and locked in the position corresponding with that of the lever. The code-starting buttons are in a row below the switch levers. The small toggle switches, just below the illuminating diagram and above the signal levers, are for the control of the maintainer's call lamps at the various field stations.

The C.T.C. line coding equipment is the General Railway Signal Company's Type-K, Class-M double-end system, using two line wires which extend throughout the length of the project, with the line battery and control machine at New Buffalo, which is about midway. A new feature of this project is that only one battery and one set of office coding equipment is arranged to work in connection with field stations east as well as west of the control office, whereas, on some previous projects, a separate battery and set of coding equipment were required for each direction.

Signaling at Turnouts

The turnouts at most of the power switch layouts are No. 16, with 30-ft. points so that trains may make diverging moves at speeds up to 35 m.p.h. As part of the program, track circuits were installed on the sidings which are equipped with power switch machines. Signaling is provided to direct trains, depending on whether a siding is occupied. For example, referring to the layout at the west end of Sawyer as shown in Fig. 2, with the switch reversed and with the siding unoccupied, signal No. 1065 will display an aspect of red-over-yellow to authorize a train to enter the siding, and at the same time the

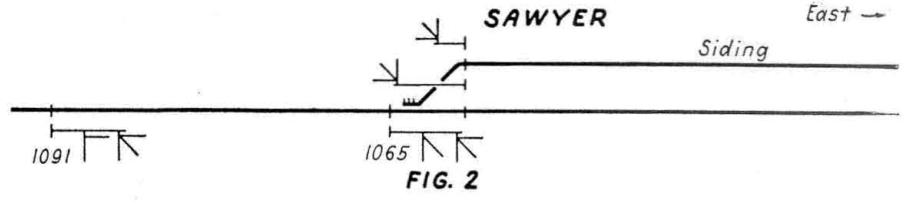


FIG. 2

signal No. 1091 will display the Approach-Medium aspect, yellow-over-green. This gives the engineman advance information that he is to pull his train into an unoccupied siding, and, accordingly, he can bring his train up to and through the turnout at the speed for which it is designed. On the other hand, if the distant signal was the single unit type, capable of displaying Approach as the best aspect, then, according to rule, the engineman must reduce to half authorized speed at the distant signal, and approach the station-entering signal prepared to stop short of that signal. If the siding is occupied, the signal cannot be cleared to direct a train to enter.

The two main tracks between St. Joseph and Vine are both signaled for train movements in both directions, with one intermediate automatic block for right-hand running. Referring to Fig. 3, the signal No. 919 has three units. The aspect green-over-red-over-red is for a straight track line-up to the right-hand track unoccupied. With a train ahead in the automatic block of signal No. 897, the signal No. 919 would display Approach, yellow-over-red-over-red.

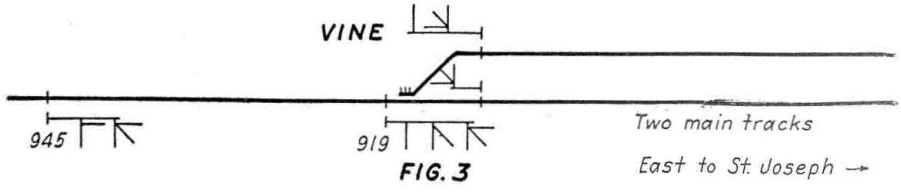


FIG. 3

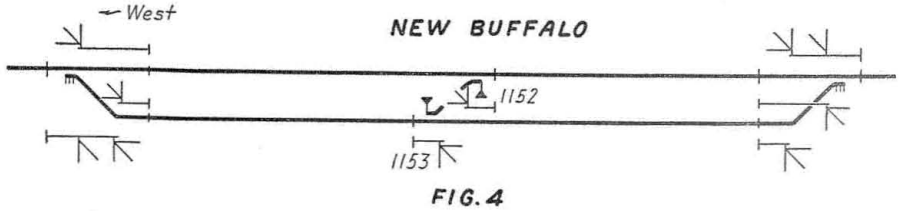
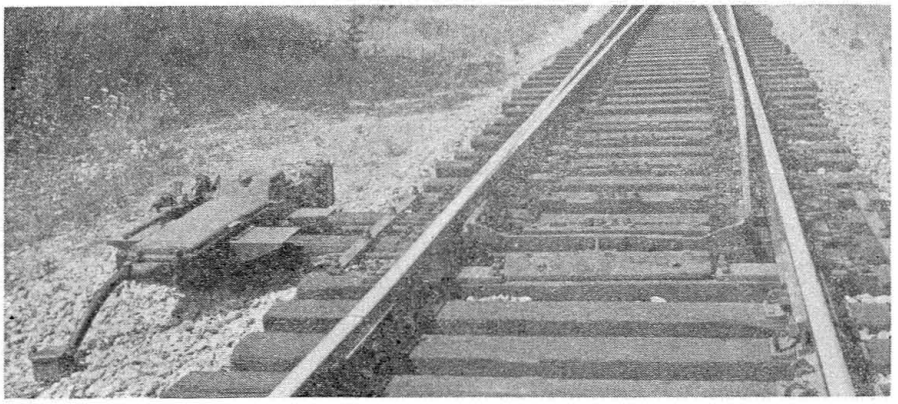


FIG. 4

With the switch reversed for a diverging move to the left track, signal No. 919 would be controlled to display red-over-yellow-over-red.

At New Buffalo the siding is 2.3 miles long, and, at a location near the



An electric switch machine on a power-operated switch

center, there is a crossover between the siding and the main track, as shown in the accompanying sketch, Fig. 4. This crossover is operated by hand-throw stands which are equipped with electric locks. These locks, as well as the two dwarf signals 1152 and 1153 on the siding, are controlled from the C.T.C. machine, without use of code. These signals and the crossover permit various special train movements to be made when setting out or picking up cars, or when making special meets.

Hold-Out Signals

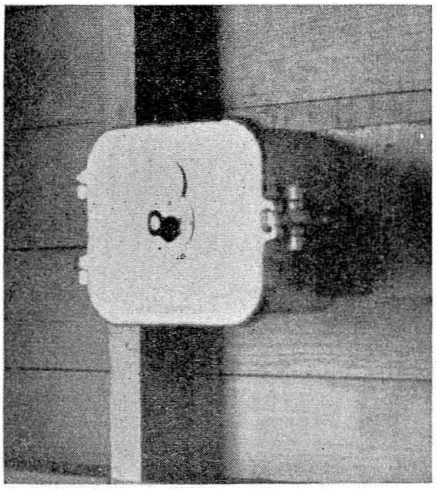
Referring to the plan, Fig. 1, the two outlying signals No. 1245 and 1246, east of Michigan City, are C.T.C. lever controlled absolute Stop signals, the purpose being to permit switching moves to be made in Michigan City, while, at the same time, a westbound train can leave New Buffalo and proceed toward signal 1246.

Signaling at Interlocking

A single-track branch line of the Monon crosses the Pere Marquette just west of Michigan City, this crossing being protected by a mechanical interlocking, which formerly included the switch at the east end of the Michigan City siding. When installing the C.T.C., a power machine was provided at this switch, and all of the Pere Marquette signals are the searchlight type under control of the C.T.C. system. Thus, the mechanical interlocking was reduced to the control of two derails and two home signals on the Monon, and a check lock lever. Normally the Monon signals are at the Stop and the derails are in the derailing position.

Approach Locking With Special Key Release

Approach locking was installed in connection with the operation of power switches and semi-automatic signals. If a signal, which has been cleared, is taken away by lever control, the switch can be operated without a time interval delay if no train has entered the approach locking section track circuits. But, if a train has occupied such a section, then the electric locking is placed in effect automatically at the field station, and this



Special key release which operates in connection with approach locking

locking stays in effect until the train arrives at the field station, and a member of the train crew places his switch padlock key in a release box and turns the key to operate contacts in the box. This practice has the safety feature of requiring the train to stop when a signal is taken away. This special arrangement was first installed on C.T.C. territory on the Pere Marquette in 1928, and has been included in all the C.T.C. projects installed on this railroad since that time.

Another item of interest is that the line wire circuit and relay, which are used in the approach locking to check the track relays in the approach track circuits, serve also to control other features, such as approach lighting and track-occupancy indications. The approach locking also includes a line wire circuit to check the normal position of the searchlight type mechanisms in the approach signals.

Electric Locks and Pipe-Connected Derails on Hand-Throw Switches

As part of the C.T.C. project, electric locks were installed on the hand-throw switches leading to spur tracks or industry tracks. At such layouts, a practice of the Pere Marquette is to install also a pipe-connected derail to prevent cars or locomotives on the spur track from fouling the main track, except when the electric lock is released and the switch reversed.

At a location west of the Monon crossing in Michigan City, there are two crossovers between the main track and a spur, an interesting feature being the arrangement of an extra stand and connections to facing-point locks, by means of which one electric lock serves to lock both switches on the spur track.

Under ordinary circumstances no signals are provided on the spur tracks where hand-throw switch stands and electric locks are in service. A switch on the siding at Oakhall leads to a spur which extends some distance to a sand pit, as shown in Fig. 5. A local freight train which sets out and picks up cars at the pit may be gone some time. No main-track intermediate automatic signals are located near the siding to give automatic protection for a train leaving the siding. For these reasons a leave-siding dwarf signal was installed at each end of the siding so that a departing train has protection. When the electric lock on the hand-throw switch is released and the trainman throws the switch, the corresponding leave-siding dwarf signal will display a proceed aspect being so controlled by the automatic block signal circuits rather than direct lever control.

For similar reasons, the eastward leave-siding signal No. 1250, shown in Fig. 1, was installed at the west end of the hand-throw siding east of

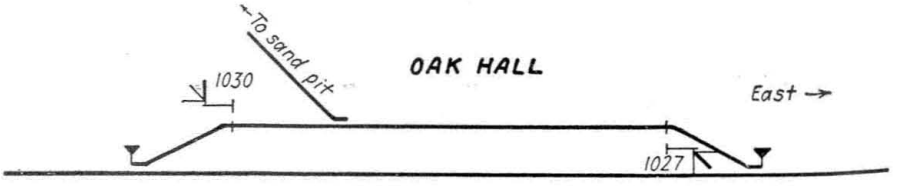


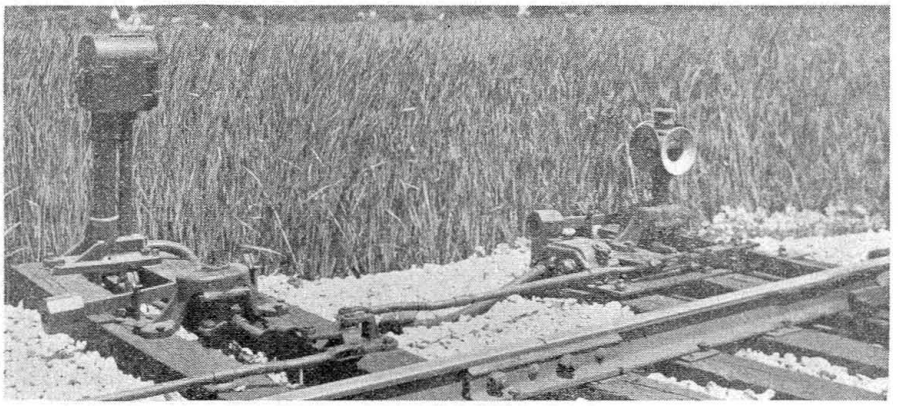
FIG. 5

the Monon crossing at Michigan City. No corresponding leave-siding signal was needed at the east end because eastward intermediate automatic signal No. 1245 is located just east of this switch so that it can be observed by a crew on the siding.

Minimum of New Materials

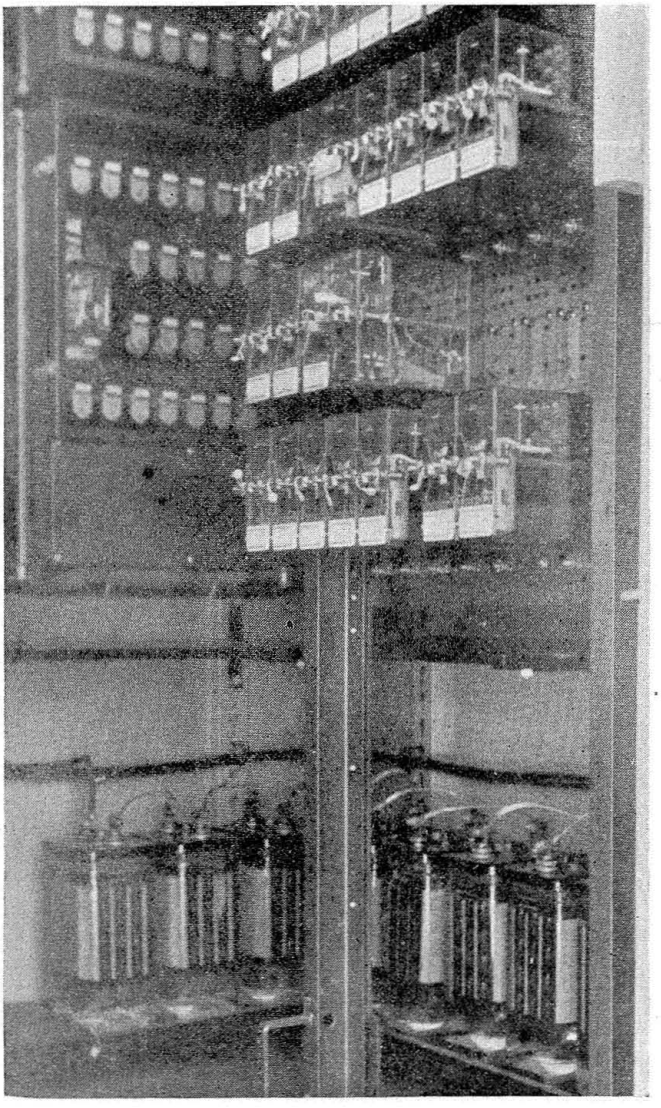
This project which was originally planned more than a year ago, was designed to require a minimum of new materials as an aid in the war. The previous automatic signals were of the semaphore type, with mechanisms in cases at the base of the masts. The old mechanism cases were reused as relay cases at the intermediate signal locations. The old signal masts were cut off for use with searchlight signals. Thus in so far as the signals proper are concerned, about the only new equipment was the searchlight signal heads, all of the signals now being the searchlight type.

The previous automatic signaling was controlled by d.c. track circuits using 4-ohm neutral relays with primary battery. Although signals were moved to change some of the blocks, the track relays and batteries were reused. For the OS detector track sections at power switches, special series-connected track circuits were installed with the primary-secondary relay scheme to insure sensitive shunting.



One electric lock serves two main-line hand-throw switches at Michigan City, Ind.

At the power switch locations, new sheet-metal houses were installed for the relays, batteries and line coding equipment. All the relays in these houses are the plug-in quick-detachable type, and are mounted in a receptacle panel which is supported in an angle-iron frame with spring mounting. This frame as a whole is hinged at the left side, with a wheel at the right, so that the frame can be swung around to give access to the wiring at the rear.



A portion of the line-coding equipment, plug-in relays and storage battery in a sheet-metal house at power switch location

In this territory the signaling line wires are on a crossarm on a pole line which also carries the telegraph and telephone wires. The C.T.C. code line is on No. 8 copper line wires from New Buffalo east to St. Joseph, and on No. 10 copper wire west to Porter. The three line wires for the automatic signal controls are No. 10 Copperweld. Two No. 8 copper wires are used to distribute 110-volt a.c. power each direction from several feed locations. All of the line wires have double braid weatherproof covering. At each power switch location, there is a set of 12 cells of 72 a.h. Exide lead storage battery which feeds the switch machine and the C.T.C. line code equipment. Two separate sets of six cells of the same type feed the signal line circuits. Each of the OS track circuits on turnouts is fed by two 1,000-a.h. Edison primary batteries. The other track circuits are each fed by three cells of 500-a.h. primary batteries.

A standard practice on C.T.C. territories on the Pere Marquette is to install a small frame building near each power switch, this building being provided primarily as a warming room when necessary for a track man to stay on the job day and night during severe snowstorms in order to keep the switch clear of snow or ice.

This installation of C.T.C. was planned and installed by the signal forces of the Pere Marquette, under the direction of H. C. Lorenzen, signal engineer and superintendent of telegraph. The C.T.C. control machine, line coding system, power switch machines and other new signaling equipment was furnished by the General Railway Signal Company.