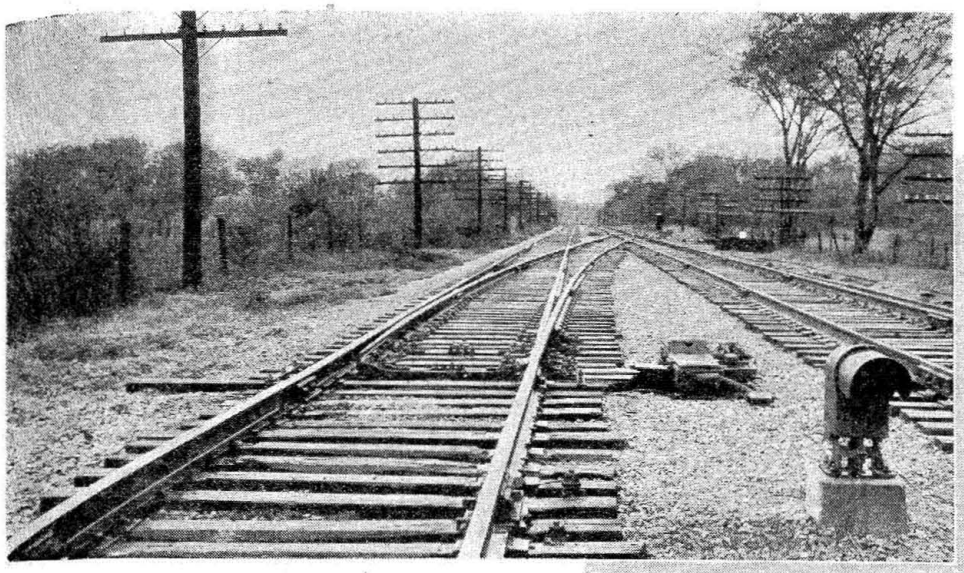
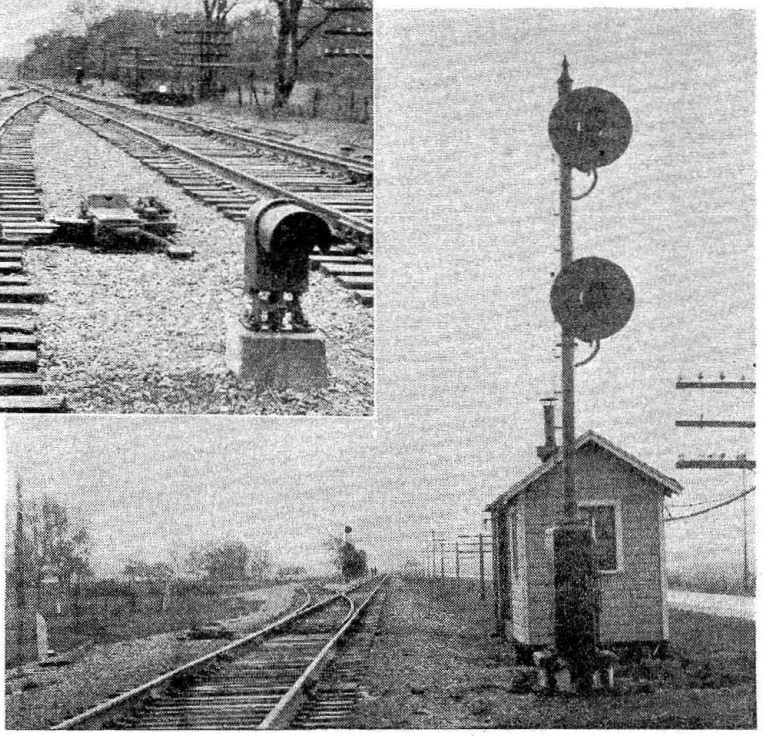


Left—View looking west at crossover 18 which forms the west end of the siding at Waverly

Train time saved on grades and at the sidings and junctions on 33 miles of busy single track



Above—Typical layout at end of power siding, the new frame building is for shelter of trackman when on duty to clean snow from the power switch

C.T.C. Solves Operating Problems

On the Pere Marquette

THE Pere Marquette has recently installed centralized traffic control on 33.4 miles of single track between Grandville, Mich., and Fennville, which is a portion of the through route between Detroit and Chicago via Grand Rapids. From Grand Rapids, double track extends to Grandville, 6 miles, and beyond that point single track extends westward toward Chicago. The reason for providing centralized traffic control between Grandville and Fennville was that this territory includes heavy grades, and there are certain junctions and stations where trains stop to set out or pick up cars.

In general, the railroad traverses open rolling country between Grandville and Fennville. Starting near M.P. 18 west from Grand Rapids there is a 0.85 per cent grade about 8,750 ft. long ascending westward, and starting near M.P. 27, there is a 0.89 per cent grade about 5,000 ft. long ascending westward. The third westward grade starts near M.P. 31 and ranges from 0.88 to 0.93 per cent for about 7,000 ft., with the crest near the East Saugatuck station. Based on these grades, the tonnage rating of the freight locomotives is 3,400 tons westbound.

The railroad crosses the Kalamazoo river just east of New Richmond, and from a point east of this bridge the line ascends eastward at 1.2 per cent for 12,000 ft. This hill includes six long curves, two of which are 3 deg., one 3 deg. 45 min., one 4 deg. 30 min., and one 4 deg. 45 min. Each eastbound train is assisted up this grade by a helper locomotive which is coupled to the rear when the train stops for water at New Richmond. The rating of the freight locomotives east bound is 4,200 tons with a helper locomotive up this grade.

Serious Train Delays at Waverly

At Waverly, 24.5 miles west of Grand Rapids, there is a junction with a branch line which extends north 32.9 miles to Muskegon, and then on north to Hart, 38.7 miles. Numerous industries are located on this line, especially in the vicinity of Muskegon, which is a city of approximately 50,000 inhabitants. At Holland, which is only 1 mile west of Waverly, there are numerous house tracks and industry spurs. Also from Holland a branch line extends 23.6 miles to Allegan.

A yard at Waverly is used to handle cars going to or coming from the various industries in Holland as well as on the branch lines to Muskegon

and Allegan. Approximately 25 per cent of the through freight trains stop at Waverly to set out or pick up cars. Previously when doing this work, the trains blocked the main track. This caused serious delays and increased the difficulty encountered by the dispatcher in planning train orders.

For these reasons, as a part of the improvements, track changes were made at Waverly so that through freight trains which are to set out or pick up are run in on the long siding to do this work, thus leaving the main track clear.

Formerly there were two separate sidings, the Waverly siding and the Holland siding. A section of track was installed to connect the ends of these sidings, converting the turnouts into crossovers, shown as crossovers 18 and 20 in the plan. The turnout of the yard lead track was moved from the main track to the newly constructed section of track. Thus through freight trains, when setting out or picking up cars, are operated on this through siding, eliminating the blocking of the main track.

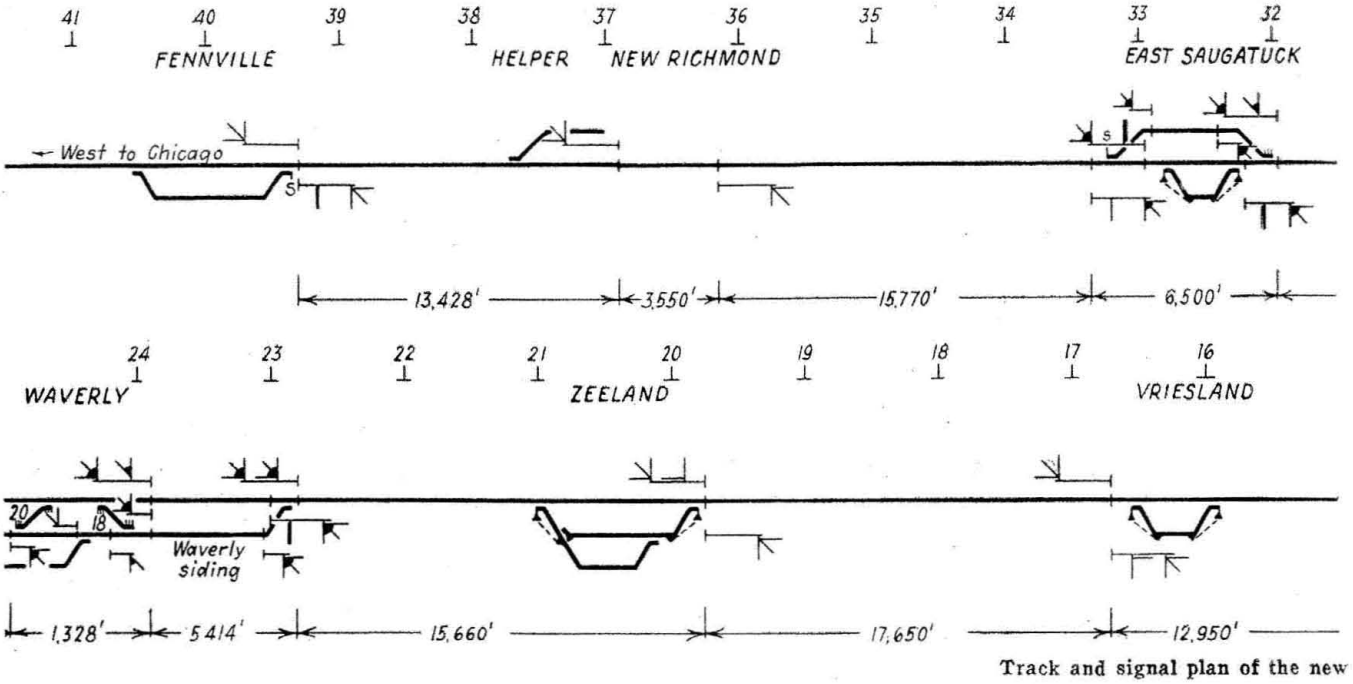
The crossovers at the ends of the newly constructed section of track are controlled by the C.T.C., so that, for ordinary passing moves, these sidings can be used independently. This independent use of the sidings leaves the section of siding between the two crossovers available as a pocket tail track for the yard engine to use when switching in and out of the yard tracks. Alongside the telephone booth on the tail track, there is a pipe mast with two waterproof enclosed lamps, hanging downward, the one lamp is red and the other is yellow. Normally the red lamp is lighted, as a warning to the yard crew not to foul the tail track. When the yard crew needs to us the tail track, the conductor telephones the dispatcher, and, if the track is available, the dispatcher sends out a control that causes the red lamp to be extinguished, and the yellow lamp to be lighted in flashes at the rate of 40 times each minute. If the dispatcher sees that he is going to need the new section of tail track for a through train, he sends out a control that extinguishes the yellow lamp and lights the red one. This is a warning to the yard crew to clear the tail track as soon as possible.

These special features might have been avoided by extending the yard lead farther eastward alongside of the siding, but this would have required the construction of a bridge across a stream which would have been rather expensive.

Change at Zeeland

In the layout at Zeeland, there were formerly two short sidings and several main-line switches leading to separate industry or house track spurs. These layouts were changed so that there is now one long house track and all the spurs are now connected to this one house track, thus leaving only two main-track switches. With this arrangement, the local freight train, which serves these industries, enters the Zeeland siding and may stay there until its switching is completed without interferring with train movements on the main track.

The old siding at Hudsonville was in a bad location because it was on an ascending grade westward, and also because trains on the siding had to be cut for the street crossings. The same disadvantages applied to some extent to the old siding at Zeeland. For these reasons, a new siding with a capacity for 204 cars was constructed in open country west of Hudsonville. The old Hudsonville siding was removed and a new spur was constructed to serve an elevator and to be used as a house track. Incidentally, the new siding at Hudsonville was constructed during the summer months of 1944 by a crew consisting of high school boys. At Vriesland a short siding on the north side of the main track was removed, thus leaving a short siding on the south side for use as a house track only.



Track and signal plan of the new

Had Running Siding Before

The siding at East Saugatuck has a capacity of 118 cars. Previously this was used as the westward main track, a spring switch at the east end being set normally to divert westward trains to this track, and a spring switch at the west end was set to route trains to the straight track. When installing C.T.C., a power switch machine was installed at the east switch, but the spring switch at the west switch was left in service because the grades and curvature are such that it is not practicable to head an eastbound train into this siding. A siding at New Richmond was removed, and a short spur, known as "Helper," was installed to hold the helper locomotive.

The sidings at East Saugatuck, Holland, Waverly and Hudsonville are equipped with power switches

and C.T.C. controlled semi-automatic signals to be used regularly for the passing of through trains. At the east end, the C.T.C. includes the power switch and signals at the end of double track at Grandville. At the west end, the C.T.C. starts with the eastbound station entering signal at the west end of East Saugatuck. The spring switch formerly in service at the east switch at East Saugatuck was installed at the east switch of the siding at Fennville, which is just west of the end of C.T.C.

Locks on Hand-Throw Switches With Pipe-Connected Derails

As a part of the C.T.C. project, electric locks were installed at all the hand-throw switches on the main track. With certain exceptions, a Hayes derail, pipe-connected to the switch was installed as protection to prevent cars or locomotives on the spur tracks from fouling the main track except when the electric lock is released and the switch thrown. As shown in one of the accompanying pictures, an enameled sign which reads "Derail" on both sides is mounted on the switch tie as a warning to a trainman so that he will not throw the switch and derail when the derail could be thrown under a car or locomotive.

At two locations west of the station at Holland there are street crossings between the switch and the fouling point of a turnout to house tracks. Rather than install a pipe-connection in an oil pipe under the street, a separate switch stand was installed at the fouling to operate the derail, and a separate electric lock was provided in connection with the derail.

Other Main-Track Switches With Hand-Throw Stands, Electric Locks and Dwarfs

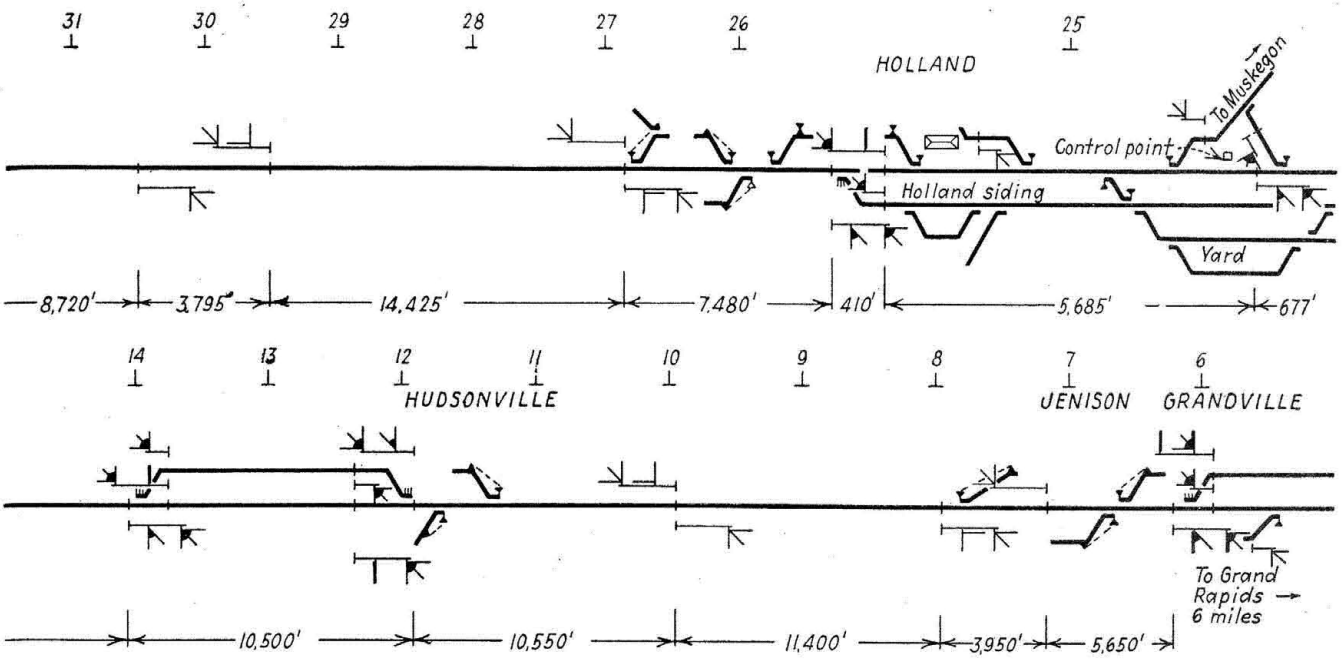
The Muskegon branch makes a wye connection with the main track, one switch being east of the yard office at Waverly and the other switch being just east of Black river. Also, just east of the station at Holland, there is a main-line switch leading to a "house" track. The local passenger train, which is operated on the line to Muskegon, is held on this house track when waiting for connections with through trains.

No cars are left standing on the wye tracks. Therefore, although these are hand-throw switch stands with electric locks, there are no derails at the fouling points. At these locations, however, there is a dwarf signal on the wye tracks at the clearance points. When a train on a wye track is to proceed to the main track, and the lock has been released and switch thrown, the dwarf displays a proceed aspect. Similarly no cars, other than the Muskegon local passenger trains, are ever left standing on the house track at the Holland station; therefore, no derail was installed, but there is a dwarf signal the same as previously discussed.

Important Heavy Traffic on This Line

Three passenger trains are operated each way daily over this territory. One local freight train is operated each way daily on the run between Grand Rapids and New Buffalo. The local freight train for the Muskegon branch originates and terminates at Grand Rapids, and, therefore, this train operates each way daily between Grand Rapids and Waverly. Four scheduled through freight trains are operated each way daily and numerous extra trains are operated as required; therefore, on the average there are about 15 trains each way daily on the new C.T.C. territory. An important consideration is that during certain periods each day the trains are bunched; for example, on numerous days as many as 9 trains are handled between 11:30 a.m. and 1 p.m. In such instances, with the previous timetable and train order system, certain trains were delayed, whereas with the C.T.C., the trains are all kept moving with very little or no delay. The power-operated siding are all long and, therefore, nonstop meets are common occurrences.

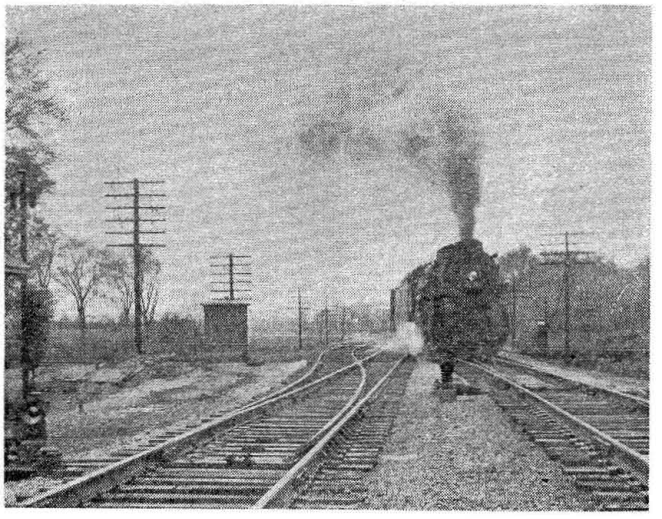
Besides the benefits of saving train time due to operation by signal indication rather than train orders, an important item is the reduction in number of stops by heavy trains, especially on grades. Prior to C.T.C., draw-bars were pulled out on numerous occasions, but only one such instance has happened in this territory during the last two months since the C.T.C. has been in service.



centralized traffic control territory

Minimum of New Materials

This project was planned to require a minimum of new materials as an aid to the war program. The previous automatic signals were of the sema-



View looking west with an eastbound train using crossover 20, hand-throw yard switch at the left with two lamps on the post

phore type with mechanisms in cases at the base of the masts. The old mechanism cases were reused as relay cases at the new intermediate signal locations. The old signal masts were cut off to the proper height for use with the new searchlight signals and the ladders were rebuilt to fit. Thus, in so far as the signals proper were concerned, about the only new equipment was the searchlight signal heads.

Track Circuits Changed

The old automatic signaling was controlled by d-c. track circuits using 4-ohm neutral relays and primary batteries. Although the signals were relocated, thus changing the track circuit lengths and limits, the old track relays and batteries were reused. For the OS detector track circuits at power switches, a special series connected track circuit was used with the primary-secondary relay scheme to secure sensitive shunting and to hold the shunt. New relays are used on these OS track circuits.

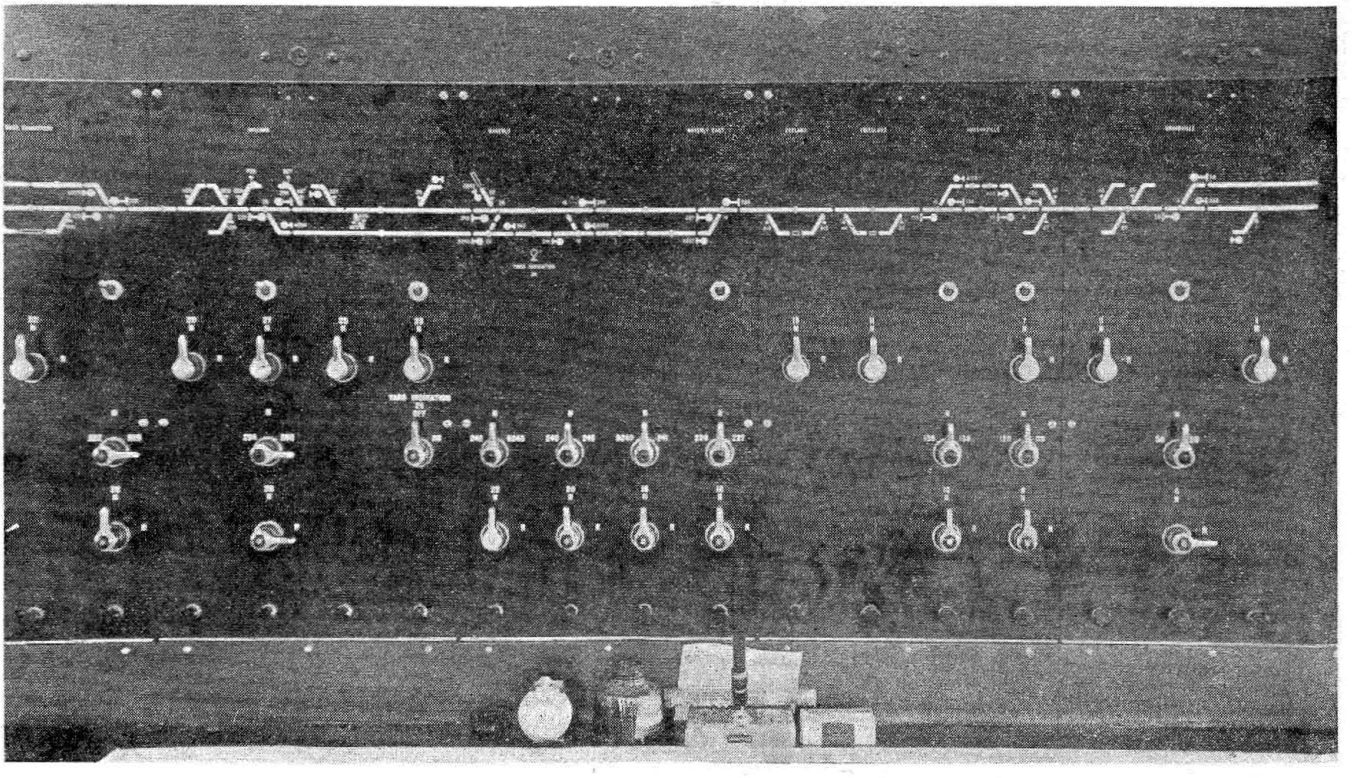
Intermediate Signals Changed

On account of the fact that fewer intermediate signals are needed with C.T.C. than in straight automatic block, the number of intermediates was reduced and those which were left in service were changed. For example, between Hudsonville and Waverly there were previously four intermediate signals for each direction, whereas now there are only two signals for each direction.

Signaling for the Sidings

As a part of the program, track circuits were installed on the sidings where power switches and semi-automatic signals are used, i. e., at Hudsonville, Waverly, Holland and East Saugatuck. Referring to the east end of Hudsonville, for example, when the switch is reversed and signal 120 is controlled to direct a westbound train to enter, the aspect is red over yellow if the siding is not occupied, and at the same time the approach signal 100 displays the Approach Medium aspect, yellow over green. This gives an 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 the turnout is designed. On the other hand, if nothing better than the Approach aspect can be displayed on the distant signal, 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. If the dispatcher wants a second train to close in on a train already on a siding, the second train is stopped short of the signal, and the conductor telephones the dispatcher to get in-



The C.T.C. control machine is located in the dispatcher's office at Waverly

formation concerning the circumstances before any further action is taken, and then the train may proceed with flag protection into the siding.

Approach Locking With Key Release

Approach locking is provided 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, no time interval delay is occasioned if a train has not entered the approach locking section track circuits. On the other hand, if a train has occupied the approach locking section, electric locking is placed in effect automatically at the field location. This locking remains in effect until the train arrives at the field station, and a member of the train crew places his switch padlock key in a special release box and turns the key to operate contacts in this box. This practice was first installed on C.T.C. territory on the Pere Marquette in 1928, and has been used on the C.T.C. projects installed since then on this railroad. A safety reason for this practice is that the train must be brought to a stop if a signal is taken away.

The line wire circuit and relay to check the track relays in the approach sections for the electric approach locking serves to control other features such as approach lighting and track-occupancy indications as well as annunciators on the C.T.C. control machine. The approach locking also includes a line wire circuit to check the normal position of the searchlight mechanisms in the approach signals.

In connection with the crossovers and signals at Waverly, it would be entirely too inconvenient for the switching crew to operate switch key releases. For this reason, motor-driven time-element relays rather than key releases were provided at this location.

Control Machine at Waverly

The C.T.C. control machine is located in an office at Waverly. The dispatchers who operate this machine also handle the remainder of the division between Grand Rapids and Porter, Ind., by train orders.

At the top of the control panel, there is an illuminated diagram which shows the locations of the tracks, 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, as for example between Holland and East Saugatuck, is represented by two independently controlled lamps so that the dispatcher knows when a train has passed the half way mark between the stations. Likewise, on the line representing the long sidings such as that at Hudsonville, there are two independently controlled track-occupancy lamps so that the dispatcher will know if a train has pulled down to one end of this siding.

Electric Lock Levers

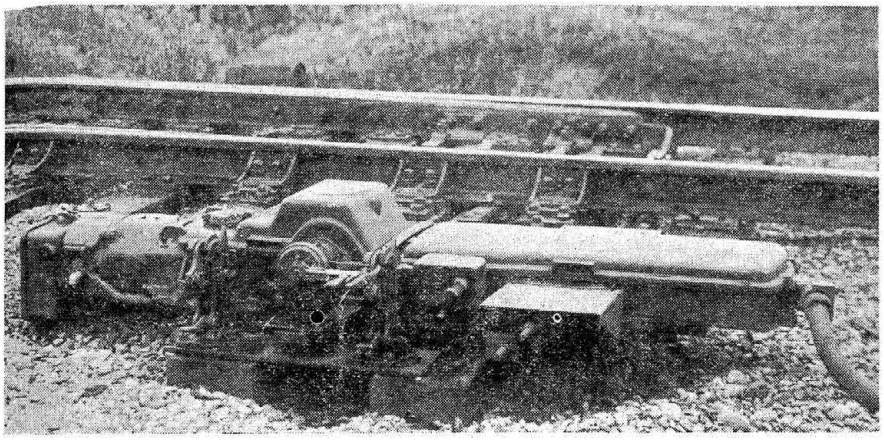
The first row of levers below the track diagram are for the control of electric switch locks on the hand-throw switches. Where there are two or more locks in an automatic block, all can be controlled by one lever. As for example, the electric locks on the three switches between Grandville and signal 77 are all controlled by lock lever 5.

To release a lock, the dispatcher 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 line circuit extends to the location of the lock. If no trains are approaching or occupying the block in which the locks are located, they are released immediately. If a train is occupying the block in which the locks are located, the release is effected through a time interval.

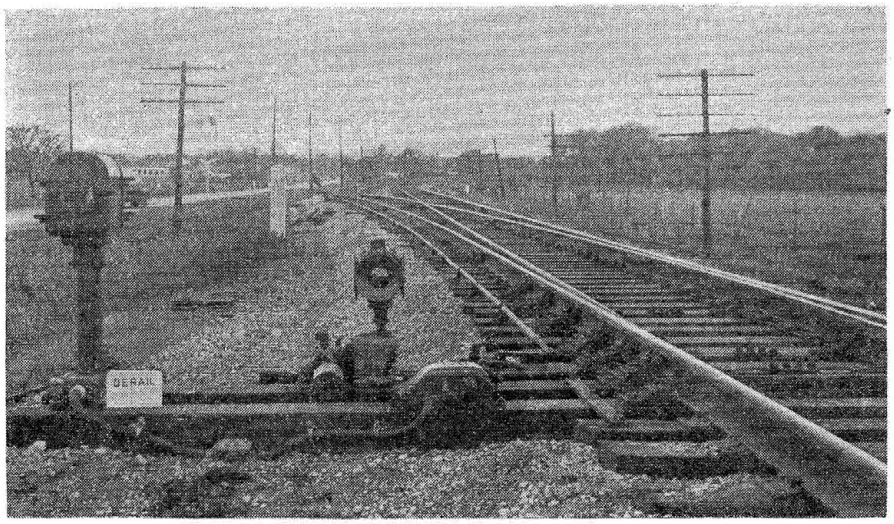
Signal and Switch Levers

The signal levers, which are in the second row, normally stand in the vertical position, being operated to the left to control westward signals or to the right to control eastward signals. When a corresponding signal clears, a green lamp on the barrel of the lever is lighted.

The switch levers, which are in the third row, normally stand vertical to control the corresponding switch to



The electric switch machines are equipped for dual-control



Typical hand-throw switch with electric lock and a pipe-connection to derail

the normal position. Such a lever is thrown 90 deg. to the right to control a switch to the reverse position. When a switch in the field is not in the position corresponding to that of the lever, an opal lamp in the face of the lever is lighted. The code starting buttons are in the row at the bottom of the panel. The small toggle switches, just below the illuminated track diagram and above the levers, are for the control of maintainers' call lamps on the sheet metal houses at the various field stations.

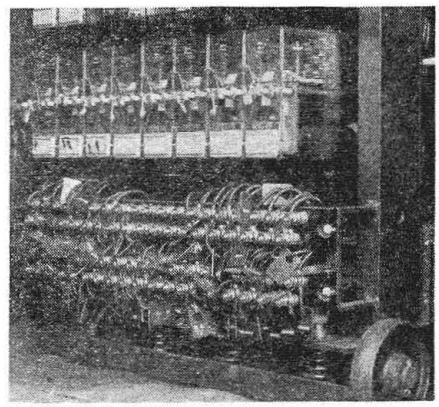
Sheet-Metal Housings

At the power switch locations, new sheet-metal houses were provided for housing the relays, line coding equipment and batteries. As shown in one of the pictures, all the relays in a house are of 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 the left to give ready access to the wiring on the rear.

The line coding equipment is made up of individual plug-in relays in a case with a transparent front cover. This case is hinged on the left side so that it can be swung around to facilitate inspections.

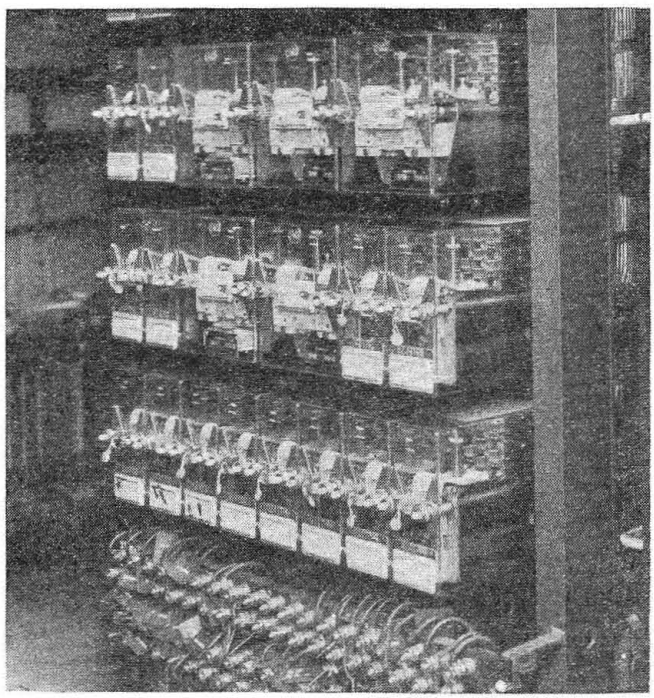
Each track circuit is operated by three cells of 500-a.h. Edison primary battery. The short OS track circuits are each fed by two cells of 1,000 a.h. Edison primary battery, one such cell being shown in the foreground of the picture inside a sheet-metal house.

At each intermediate signal location there is a set of 5 cells of Exide DMGO-7 storage battery, and at each power switch there is a set of 12 cells of the same type of storage battery to feed the switch motor and the line coding equipment and two sets of 5 cells each set for line circuits.



Bottom of relay rack showing spring mounting and wheel to support rack when it is being swung around

The old line wires, which are No. 10 copper with weatherproof covering, were reused as line control circuits for the new signals. Similarly the previous polar line relays were reused where possible for intermediate signals. The C.T.C. line coding system operates on two new No. 8 Copperweld wires with weatherproof covering.



Quick-detachable plug-in relays mounted in rack in metal house

The 110 volts a-c. power for charging storage batteries is purchased locally at numerous places and is extended both directions from each feed location on No. 8 copper line wires. Gaps the length of an automatic block are left between the ends of the feed from one station and the end of the next, thus saving wire.

This installation of C.T.C. was planned and installed by 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, signals and other new signal equipment, such as relays and rectifiers, were furnished by the General Railway Signal Company.

Army and ODT See No Let-up in Rail Traffic

Spokesmen of the Army, the Office of Defense Transportation and the Association of American Railroads are unanimous in their opinions that the next few months will see the railroads faced with their most difficult task since the beginning of the war. These men express the opinion that V-E Day has intensified the rail transportation problem rather than relieved it.

According to Major General Charles P. Gross, chief of the Transportation Corps, the problem of logistics and supply resulting from stepping up the pace of the war with Japan while the return of men and materials from the European theater is underway, leads him to the conclusion that "from a supply and transportation standpoint, the hardest part of the struggle still looms ahead."

General Gross explained that about 3,100,000 men will be withdrawn from Europe within about a year, and that the great majority will come to the United States, either for discharge or for furloughs at home and retraining before being sent to the Pacific theater of war. In either event the movement of such a vast number of men in so short a time is expected to throw an additional strain on over-burdened railway passenger facilities.

In a similar statement, J. Monroe Johnson, director of the Office of Defense Transportation declared: "The next 12 to 15 months will be the most critical in the history of American transportation . . .

"All forms of transportation have for the past three years carried the heaviest freight and passenger burdens in the country's history. They have been strained to the utmost. Now seriously short of materials and equipment and skilled manpower, these facilities must continue to carry a load which shows no prospect of diminishing. On the contrary, transport demands will be heavier in the difficult days ahead. It will be many months before our coastal shipping again takes its share of the country's freight traffic; before the tankers carry the greater part of our oil products to the East coast; before inter-city automobile passenger traffic regains its pre-war volume. In the meantime, rail, highway, and inland waterway transport must continue to bear these extra burdens in addition to carrying military materiel and personnel."