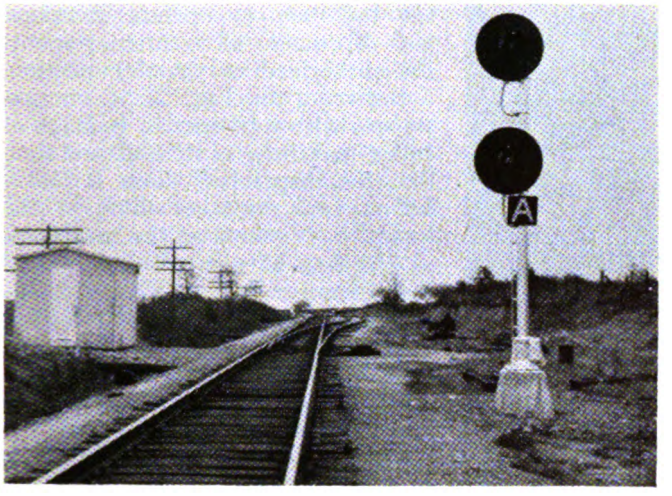
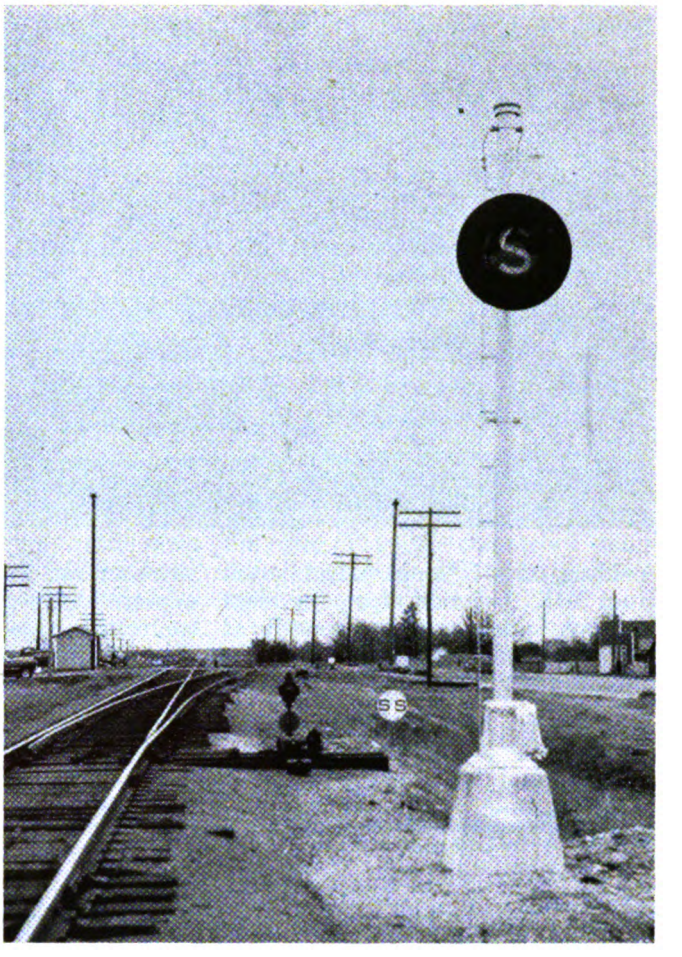
Below—Trains normally enter a siding at end with signals and power switch as shown here. Right—Trains normally depart from a siding at the spring switch end, shown here. If a train is to be directed to enter at this end of a siding, indicator is lighted to display the "S"





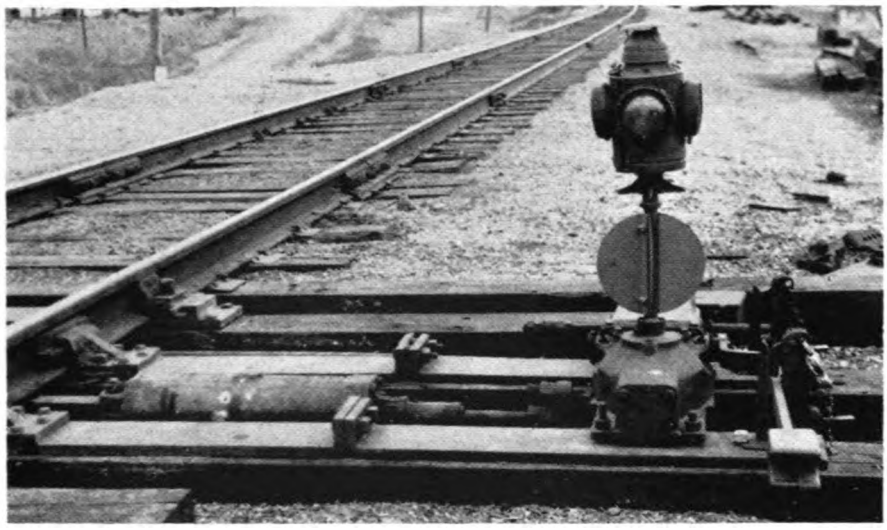
Power Switches And Spring Switches In C.T.C. on the Frisco

Automatic block signaling on 137 miles of light traffic single-track replaced by simplified centralized traffic control with power switch and C.T.C. controlled signals at one end of each siding, and spring switches at the other end with controlled dwarf signal at clearance point

THE St. Louis-San Francisco is now completing an installation of centralized traffic control that was planned as an experiment to determine the practicability of applying a modified form of centralized traffic control on a single track line that handles comparatively light traffic. On other single track divisions, which handle heavier traffic, this railroad has 527.7 miles of conventional centralized traffic control with a power switch and dispatcher-controlled signals at both ends of sidings. However, on the Springfield-Thayer division, the schedules include only 10 to 18 trains daily—two passenger trains and two through freight trains each way with several extras, and a local freight each way daily except Sunday. Even with this comparatively light traffic, the operating officers were anxious to obtain the benefits of authorizing train movements by signal indication, rather than by train orders. However, in order to justify the cost of the proposed C.T.C., in proportion to the number of trains operated, a decision was made, as a means of reducing first costs, to make an experimental installation of a modified form of C.T.C. in which a power switch and conventional arrangement of signals would be installed at only one end of each siding, while at the other end there would be a spring switch and only two signals, i.e., to direct trains to: (1) leave-siding or (2) to stop, throw the switch and enter the siding. The original estimates indicated that this arrangement would save about $3,000 per siding, compared with the usual practice, i.e., including a power switch and conventional arrangement of three signals controlled by a line coding field station at each end of a siding.

C.T.C. Applied to Only 11 of 18 Previous Sidings

This project starts at "MK" Junction, 1.0 miles from the passenger station at Springfield. The "MK" layout includes a junction of the Ozark branch with the main line, and a junction between the main line to the passenger station and a belt line to the freight yards. An old mechanical interlocking formerly in service at this junction was removed, the new power switches and signals being included in the C.T.C.



Layout at spring switch includes a Type S-211 hand-throw switch stand with a spring and an oil buffer mechanism that is a part of operating rod

A siding, 6,500 ft. long, extends south from "MK" Junction along the main line. A spring switch, formerly at the south end of this siding, was removed, and a new power switch machine and signals at this switch are included in the C.T.C.

Between "MK" and Thayer, 136 miles, the previous automatic block signaling included 18 sidings at which the conventional arrangement of automatic block signaling applied. This includes the siding at "MK." Experience on various C.T.C. territories on the Frisco for the past several years has shown that fewer passing tracks are needed with C.T.C. Therefore, as a part of the 1950 program on the Springfield-Thayer territory, six sidings were converted to house tracks or spurs with no provision for using them to meet trains. At each of three such locations, Turner, Sterling and Brandsville, one switch was removed, thus leaving a spur. At Fordland, Seymour and Burnham, both switches were left in place, but no C.T.C.-controlled signals were installed. This left 10 sidings at which there is a spring switch at one end and a power switch and C.T.C. signaling at the other, and one siding with hold-out signals.

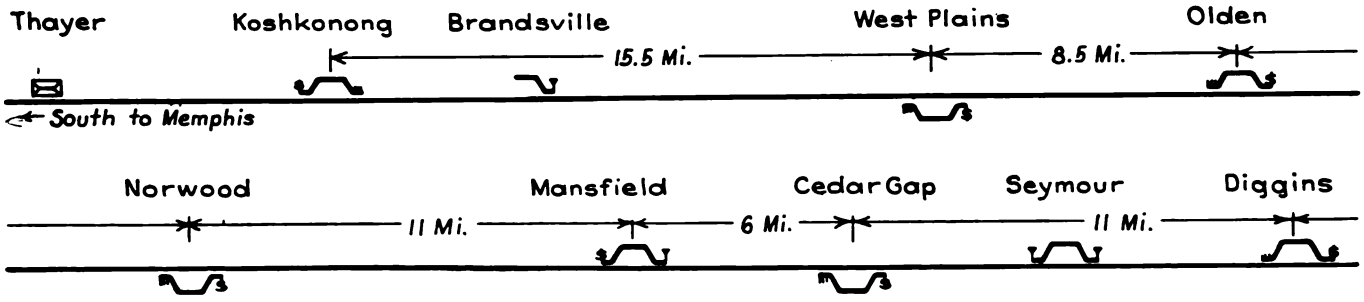


Fig. 1—Track plan of entire 137 miles of centralized traffic control

Basic Signal Arrangement

At Rogersville, the power switch is at the north end and the spring switch at the south end. At Diggins, the reverse is true, the power switch is at the south end, and the spring switch at the north end.

The operating practice, when making a meet, is to use the power switch to head in the train that is to take siding. Then, after the other train has passed, and the leave-siding signal has been cleared, the train on the siding heads out through the spring switch and proceeds without the necessity of stopping to restore the switch to normal. Thus, in this practice, no train stops are required for trainmen to operate switches, and of course, all train movements are authorized by signal indication.

Referring to Fig. 2, if circumstances with reference to tonnage of trains and time of arrival are such that the dispatcher wants a southbound train to take siding at the hand-throw switch at the north end of Diggins, he sends out a control that causes a letter "S" to be displayed on a take-siding indicator, located at the right of the track approaching the facing point of the spring switch at the north end of this siding. At the same time, the Approach aspect is displayed in the intermediate signals 2307 and 2281, located 4,100 ft. and 13,670 ft. respectively, in approach to the switch. These aspects direct the engineman of a southbound train to stop short of the switch. Then the head brakeman goes to the switch and operates the hand-throw stand to line the switch for the train to enter the siding. When the train is in the clear, a trainman restores the switch to normal.

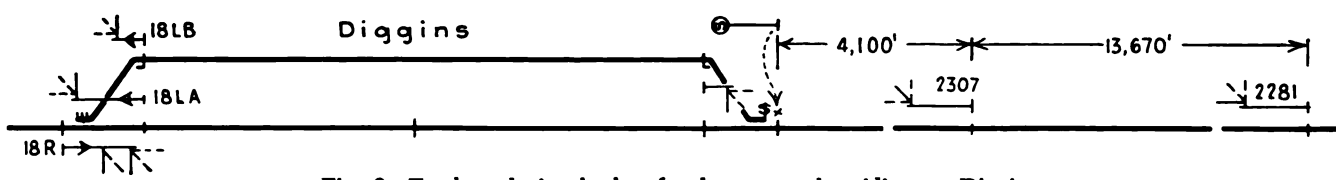
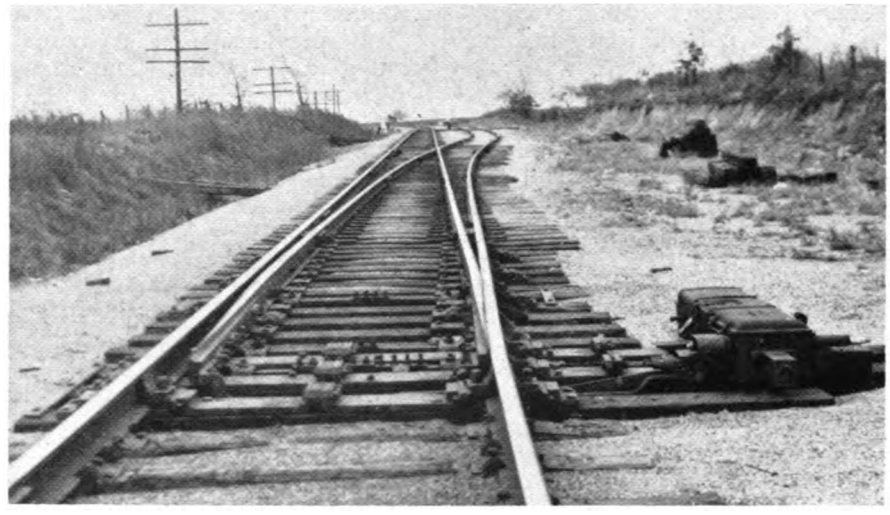


Fig. 2.—Track and signal plan for layout at the siding at Diggins

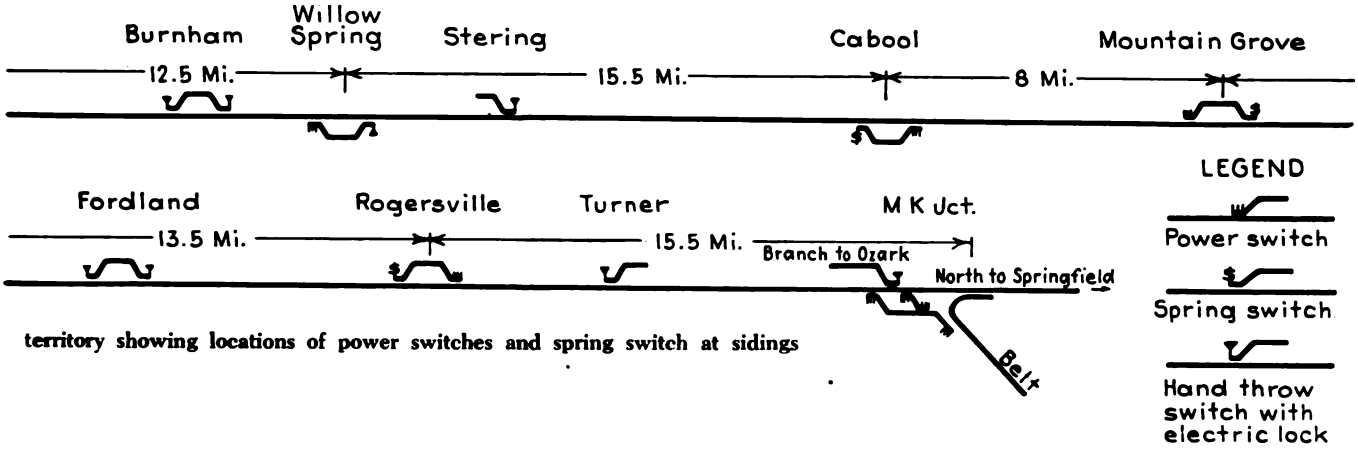
Each take-siding indicator, as shown in one of the pictures herewith, consists of a lamp unit with a 14-in. ground-glass cover. The unit is on a mast to bring the center of the glass cover 10 ft. above the level of the base of rail. Normally, the lamp is dark. When the dispatcher sends out a control, the let-



Power switch layout at one end of the typical siding, showing switch machine, insulated gage plates, rail braces and pair of roller bearings

ter "S", in white, is outlined in black on the ground glass cover, as shown in the picture. The "S" is the only aspect displayed by such a take-siding indicator; the lamp in the unit being dark normally, so that no aspect is displayed. Referring to Fig. 2, the H control of approach signal 2307 extends to signal 18LA. The signaling arrangement at Diggins, as shown in Fig. 2, was applied also at five other sidings, Rogersville, Cedar Gap, Norwood, Olden and Koshkonong.

At Mt. Grove, Cabool and West Plains, there is a passenger station, water tank, and numerous spurs leading to house tracks, industries, etc. Therefore, on numerous occasions, a train or a switch engine may be occupying the main track. In order to eliminate the necessity of establishing switching rights to the next controlled signals beyond the spring switch, a pair of controlled signals is located near the spring switch. This allows a local train to do station work with less disturbance from through trains. At Willow Springs, at the spring switch end of the siding, the controlled signals are located at the clearance point of the siding turnout, the same as at Mansfield.



territory showing locations of power switches and spring switch at sidings

Hold-Out Signals

Another special arrangement was installed at Mansfield. Ordinarily, this siding is not to be used for passing trains and, therefore, a conventional arrangement of C.T.C. signals and power switches did not seem to be justified. While switching at Mansfield, the local freight train may frequently occupy the main track for some time. If the overall C.T.C. control block extended for the 16 miles from Cedar Gap through Mansfield to Norwood, trains could not be advanced, for example, north from Norwood, 11 miles toward Mansfield, if the local freight was switching on the main track at Mansfield. Therefore, the C.T.C. overall block was cut by installing a double location of C.T.C. controlled signals, 30LA and 30R, on the main track opposite the fouling point at the south end of the siding at Mansfield, as shown in Fig. 3. With this arrangement, if the local freight is switching at Mansfield, a northbound train can be advanced to that siding. As the through train approaches, the local freight gets in the clear. Then the dispatcher clears signal 30R, and the train proceeds without stopping.

In rare instances, when necessary to direct a northbound train to take siding at Mansfield, the dispatcher sends out a control to light the "S" indicator mounted on signal 30R.

The power switches are operated by Style M-2, 20-volt d.c. switch machines without dual control. Each switch layout has insulated gage plates on three ties; the tie ahead of the point and the first two under the point. Pettibone-Mulliken adjustable rail braces are used on these ties, with such braces on the gage side of the rail on the tie ahead of the point. On two ties, the gage plates extend and are attached to the switch machine, thus preventing

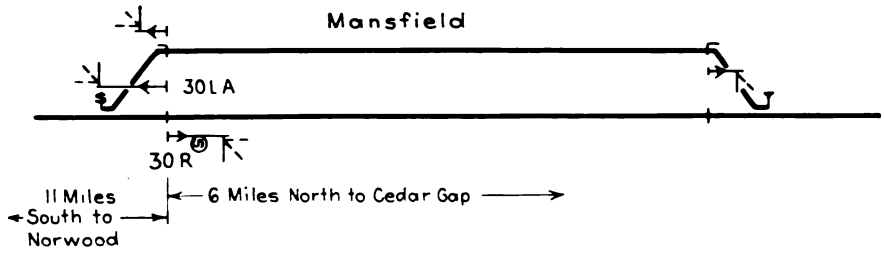


Fig. 3—Hold-out signals for cutting long overall C.T.C. block

lost motion. Each switch is equipped with a pair of roller bearings which ease the operation of the switch by holding the points off the slide plates normally.

Each spring switch is equipped with a Pettibone-Mulliken oil buffer unit. At each such switch the old hand-throw stand was replaced by a Union Switch & Signal Company, Type S-21 hand-throw switch-and-lock mechanism. No lock rods are used, and in the mechanism, the bar and facing-point lock are welded to the block operated by the lever. If the lever is raised, as much as 10 in., the point detector opens, and serves also as a switch circuit controller. At each spring switch, there is a circular disc sign with letters "SS". The spring switch layouts are equipped with insulated gage plates and adjustable rail braces, the same as at the power switches, as explained above.

Dwarfs On Hand-Throw Turnouts

On this territory, there are 79 hand-throw main track switches which were equipped with electric locks. At the clearance point on each such turnout, there is a three-aspect dwarf signal.

When a train is to make a move into a switch with an electric lock, the lock is automatically released when the locomotive or leading car is spotted on a short track circuit just in approach to the facing points. When a train or switch engine on a spur or siding is ready to depart, the conductor telephones to the dispatcher, and if permission is granted, and if no train is occupying approach sections on the main track, the trainman unlocks the lock by pushing a button in the lock housing and reverses the switch. When the switch is reversed, the dwarf signal displays a proceed aspect which is controlled by the position of the switch and by track occupancy on the main track.

On the hand-throw switch layouts at industry spurs, there is a hand-throw derail at the clearance point. At such locations, the lamp in the dwarf signal is normally dark, being lighted when the derail or switch is not in the normal position.

Normally Lighted

The lamps in the new searchlight signals are the double-filament type rated at 13 + 3.5 watts. These signal lamps are normally fed from a transformer at about 8 volts. When a train enters an approach circuit, or when a head block signal clears, the voltage is increased to 9.2 volts. This practice has increased the life of the lamps more than twice what it was previously on continuous burning at 9.2 volts. The reason that the signal lamps are burned constantly is to give men on motor cars some information concerning the approach of trains.

At intermediate signals, the lamps are fed normally from a transformer, but the approach track relay cuts the lamp circuit over to feed from battery. This is done not only to give the battery a little work to keep it active, but also this practice eliminates power-off relays at such locations.

Old Signaling Removed

When installing the C.T.C. system, the old semaphore automatic block signals installed in 1909 were removed. The new signals in the C.T.C. system are the searchlight type. The conventional d.c. track circuits were restored to service, although the locations were changed in most instances. For track circuits, 4,000 ft. or longer, 2-ohm relays are used. For shorter circuits, the relays are 4-ohm. Across each track relay and across each track battery, there is a Western Railroad Supply Company Model-12 lightning arrester with the gap closed against the carbon block. When lightning comes in on the rails, these arresters tend to carry it on along the rails, rather than damaging the relays.

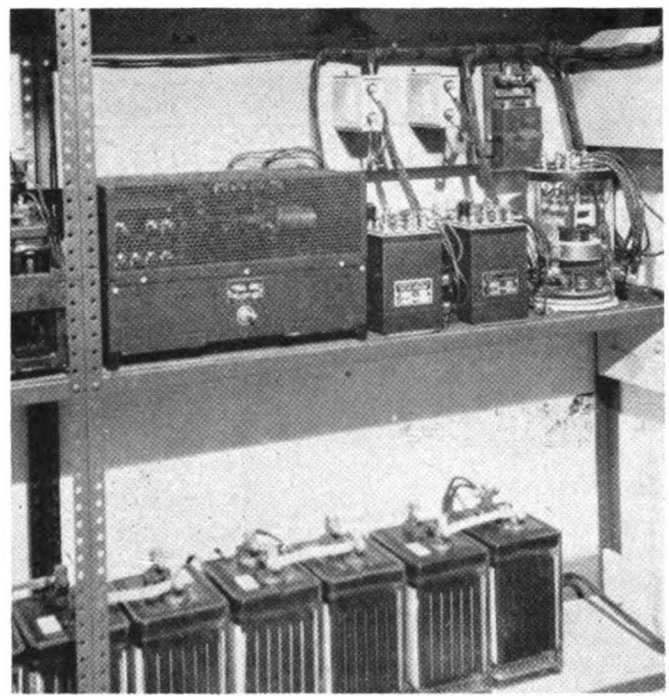
In the old automatic block signaling, the line of control circuits for both directions were on three wires, one of which was common. The new system has a two-wire line circuit for each direction, thus totaling four wires. When overhauling the pole line, the old line wire that was in defective condition was replaced. These replacements, as well as the additional line wire, are No. 12 Copperweld with weatherproof covering. Two new No. 8 Copperweld weatherproof wires were installed for the C.T.C. line code circuit, and two No. 8 copper weatherproof wires were installed for the a.c. power distribution circuits.

At each power switch, there is an 8 ft. by 10 ft. concrete house, which includes a room 7 ft. by 8 ft. to house relays, batteries and other equipment, and a second room 3 ft. by 8 ft., used as a telephone booth. These houses were made and wired in the Frisco shop at Springfield, Mo.

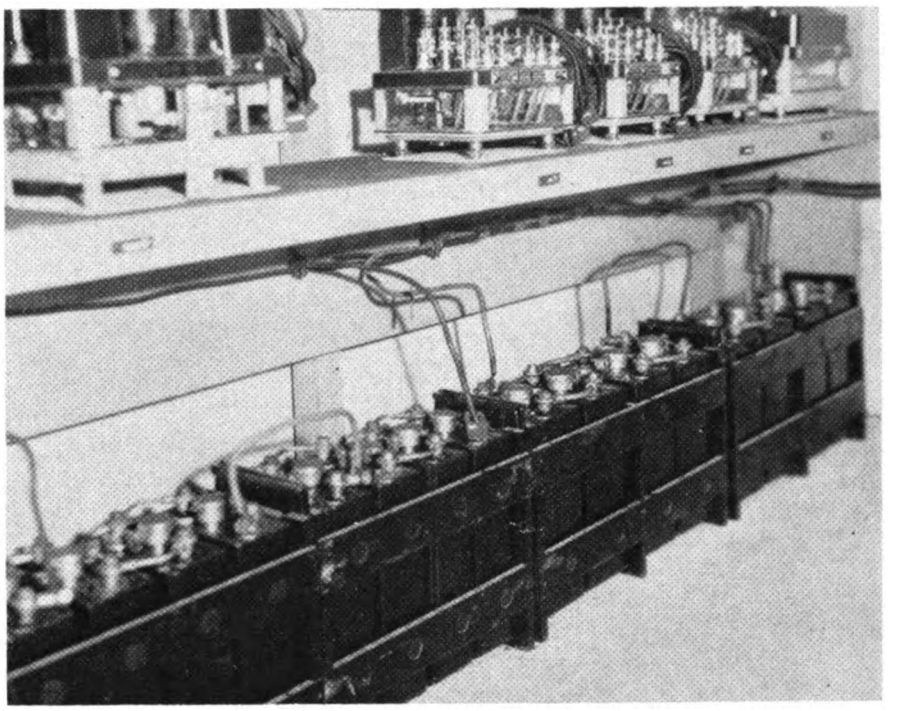
In each instrument house, there is a small panel with levers for direct control of the switch and signals at that location. A master lever is sealed in the normal position. This small panel is for use during emergency, such as destruction of the C.T.C. code line in a sleet storm, and for testing.

In the part of each house used as a telephone booth, there is a three-way switch, by means of which the phone can be connected either to the regular telephone train dispatcher's line, or to the telephone circuit superimposed on the C.T.C. code line.

Because most of the signals are at new locations, new underground cables were installed throughout.



Code line unit for feeding a code line shown on upper shelf. Local circuits are fed by the storage battery on lower shelf



At typical power switch, machine is fed by a set of 21 cells of battery, 12 of which also feeds the line code equipment

The seven-conductor cables to signals are No. 14, and the track connections and switch motor circuits are single and 10-conductor No. 9. The wiring in the houses and cases is No. 14 flexible. The insulated wires and cable are of Kerite manufacture. Raco Clearview type arresters are used on the code line and on the local line circuits. The ground rods are ⅝ in. by 7 ft. Copperweld. The wiring connections at terminals, arresters and relays are the solderless type made by Aircraft-Marine Corporation.

The 440-volt a.c. distribution circuit extends in both directions from various towns where commercial power is available. The 440-110 volt line transformers at all locations are rated at 500 v.a., thus being interchangeable in case of replacements. These transformers are the air-cooled type made by General Electric Company. The transformers at power feed points are 2 kva. made by the Jefferson Electric Company and have connections to step the voltage either up or down in units of 10 volts.

At each power switch, there is a set of 20 cells of Edison B6H, 120-a.h. storage battery for operation of the switch motor. Twelve of these cells are used also to feed the line code equipment, and eight feed the signal lamps under certain conditions. Eight cells of B4H battery feeds the line circuits, and a similar battery is used at each intermediate signal.

At each electric lock on a hand-throw main track switch, there is a set of 16 cells of 500-a.h. Edison primary cells. These cells were reused from the previous automatic block signaling. Each track circuit under 500 ft. is fed by four cells of Edison 500-a.h. primary battery. Each track circuit over 500 ft. long is fed by two cells and there is an automatic unit rectifier across the battery to take all but about 20 m.a. of the load.

At the dispatcher's office, the code line circuit is fed by a type 603 Union Switch & Signal Company code line unit, rated at 115 volt, 50/100 cycle a.c., 30-220 volt, 0.4 amp. d.c., shown on the second shelf in one of the pictures herewith. The local circuits in the office are fed from two sets of 8 cells each of 120-a.h. Manchex type Exide storage batteries.

A telephone communication circuit is superimposed on the two C.T.C. code line wires. This system includes no ringing for calling. When an employee desires to talk with the dispatcher, he blows or whistles into the field telephone transmitter. This operates a voice-actuated relay in the office which lights a lamp and rings a bell on the dispatcher's machine. Then the dispatcher plugs in his telephone set to answer.

Motor Car Indicators

This project includes indicators to provide information concerning the approach of trains, for the benefit of men using motor cars. At each spring switch and at the instrument house at each power switch, there is a lamp-type indicator which is normally lighted. When an approaching train passes the next siding or when the dispatcher lines up for an approaching train, the white lamp is extinguished, and stays dark until the train passes beyond that indicator.

Also 130 semaphore type motor car indicators are provided at various places between sidings where the view of approaching trains is restricted. At these locations no a.c. power is available to feed indicator lamps, and, therefore, the indicators are of the semaphore type with 670-ohm coils. These indicators are controlled through contacts of track relays or contacts of DNL relays in series with signal line circuits. Details of the controls of such indicators are given in an article on page 370 of the June 1949 issue.

This C.T.C. project was planned and constructed by railroad forces under the direction of R. W. Troth, superintendent of communications and signals, the major items of signaling equipment being furnished by the Union Switch & Signal Company.

Holland

(Continued from page 305)

the tower in case of necessity. A central telephone exchange is located on the control panel in the tower, providing 6 connections with the platforms, 8 connections to signals and 6 connections to switches, relay cases, etc. Here are also located the telephone connections to neighboring posts and the loudspeaker installation of the station. A considerable amount of the shunting is carried out at the station, and dir··· telephone communication between the tower and the various strategically placed instruments in the yard has proved of great value.

An average of about 75 freight trains enter 's Hertogenbosch each day in addition to some 95 electric or diesel-electric passenger trains, and experience has already shown that this does not by any means represent the maximum capacity of this NX installation.