Electric Interlocking at Bellefontaine, Ohio

This Plant Provides High Speed Signal Indications for All Main Line Train Movements With or Against Traffic

By S. J. DEWEY

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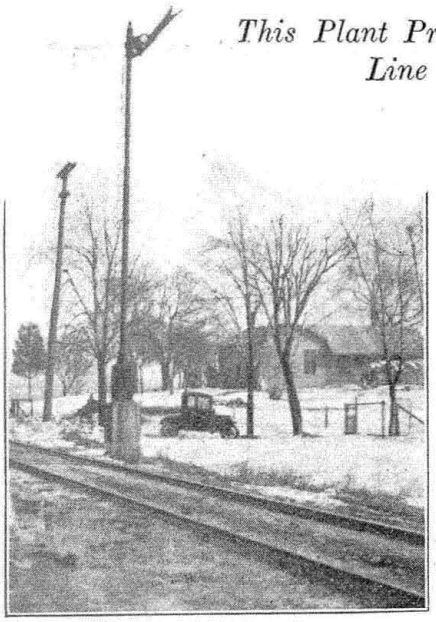
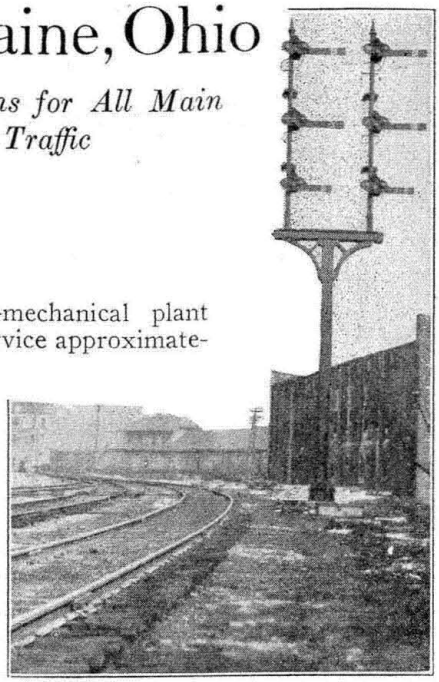


E. B. Distant Signal, Indianapolis Division



E. B. Home Signals, Indianapolis Division

ON Aug. 22, 1919, the Cleveland, Cincinnati, Chicago & St. Louis placed in service a 72-lever Federal Signal Company's type 4 electric interlocking plant at Bellefontaine, Ohio. This plant affords protection for the crossing of the Indianapolis division with the Sandusky division and the Toledo & Ohio Central.

Bellefontaine is situated in the central-western part of Ohio. It is 141 miles west of Cleveland, Ohio, 98 miles south of Toledo, Ohio, and 111 miles north of Cincinnati, Ohio. At this point extensive freight yards and terminals are located on the Indianapolis division and on the Sandusky division of the C. C. C. & St. L. The interlocking plant is subjected to heavy traffic conditions due to interchange between these yards. At this point, also, all passenger trains on the two divisions change engines, and this requires from 5 to 6 movements over the interlocking plant for each passenger train. During a 24-hour period 150 to 175 moves over the interlocking plant are required to handle the passenger traffic alone; this, combined with 23 scheduled freight train movements in addition to extras, and interchange traffic between the division yards, industrial switching, and traffic on the T. & O. C., shows why this junction is one of the busiest points on the Big Four system.

The original all-mechanical plant was taken out of service approximately four years ago. Various changes in the track arrangement were made, due to the conclusion of a contract for double track operation and joint freight house and passenger station facilities with the Sandusky division of the C. C. C. & St. L. and the T. & O. C. The final track arrangement is as shown in Fig. 1. As the new freighthouse was not completed at the time the interlocking plant was placed in service, it was impossible to complete the installation of the tracks and interlocking functions which are indicated by broken lines in Fig. 1. However, all wiring for the operation of these functions is complete within the tower and to the relay boxes outside, so that when it is possible to do so these functions may be installed with but slight changes in the locking. Because of the density of traffic it was decided to install an all-electric interlocking plant to provide the protection for this junction and the contract was awarded to the Federal Signal Company for the complete installation, exclusive of the tower.

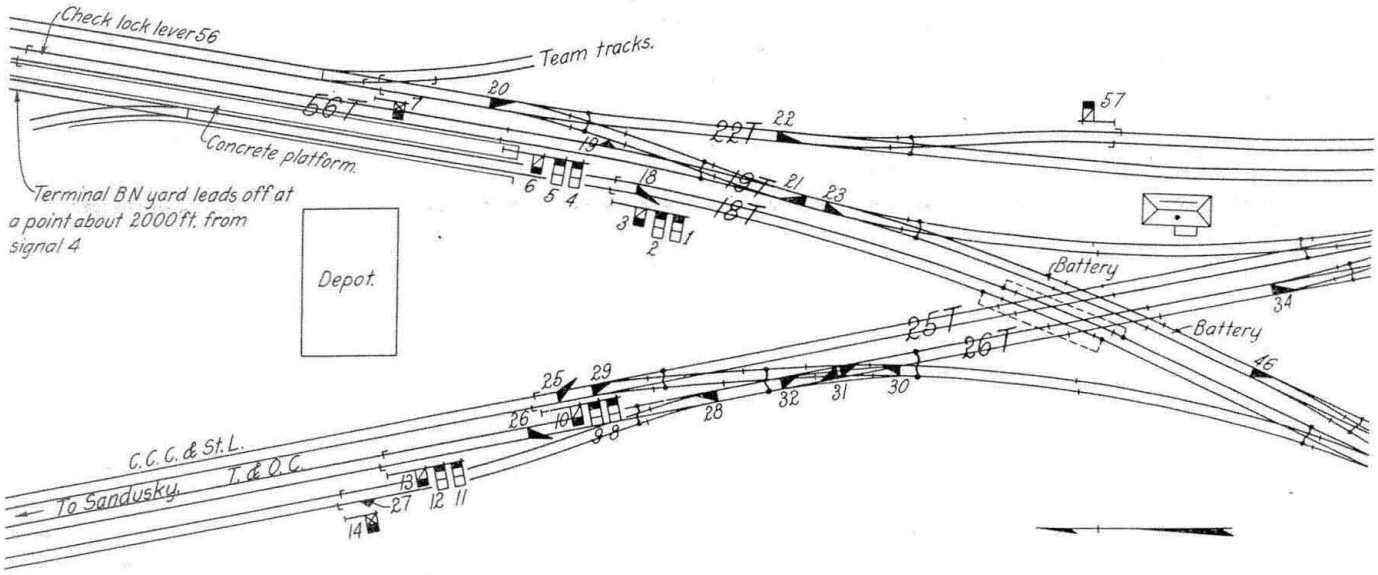
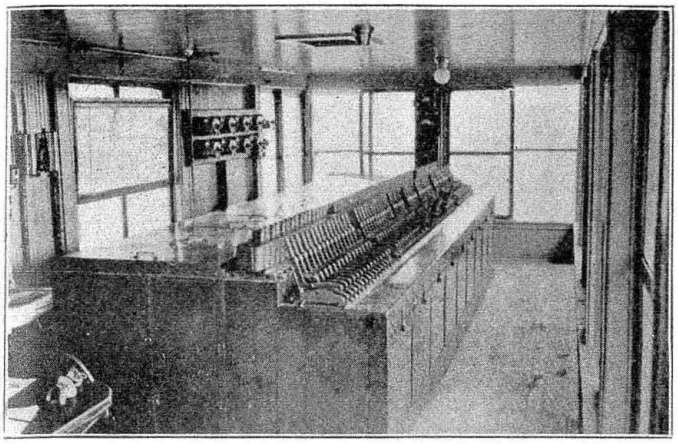


Fig. 1. Track Layout at Bellefontaine, Ohio, Showing the Location of Switch, Signal and Derail Functions.

The signaling, as installed, provides for three-arm ground signals on the Sandusky division and the T. & O. C., southbound, and on the Indianapolis division, westbound. Three-arm bridge dolls on channel bracket masts are provided on the Sandusky division and T. & O. C.,

northbound, and on the Indianapolis division, eastbound. This arrangement gives complete high speed signal indications for all main line moves with or against the current of traffic. All high speed moves, including those through crossovers, are indicated by the 90-deg. upper quadrant position. Call-on arms are provided for all



The Operating Room and the Interlocking Machine

slow speed moves and indicate in the 45-deg. upper quadrant position. Call-on arms may also be used for the high speed routes whenever it may be desirable or necessary. Dwarf signals are provided for all movements out of sidings and passing tracks and indicate in the 45-deg. upper quadrant position, with the exception of two, which govern through moves between yards, and will indicate in the 90-deg. position for these moves only, and in the 45-deg. position for all other possible routes.

During the interval between dismantling the old plant and the completion of the new plant, the switches were handled by switchmen. All trains were required to observe the crossing stop, and hand signals were given for all movements over the crossings. With the interlocking in service all traffic is handled by one leverman per shift, and costly delays to traffic due to the required stop have been eliminated.

Interlocking Building

The original signal tower consisted of a two-story frame cabin 36 ft. 7 in. by 13 ft. 4 in., supported on a steel sub-structure 24 ft. from the ground line to the floor level of the first story. This tower was remodeled to contain four floors, the steel sub-structure being incased in brick walls, and an interior stairway and reinforced concrete floor added. The ground floor is divided into two rooms, one being used for the power room and the other for the furnace and coal bins. The terminal case in which the outside wiring terminates is located in the

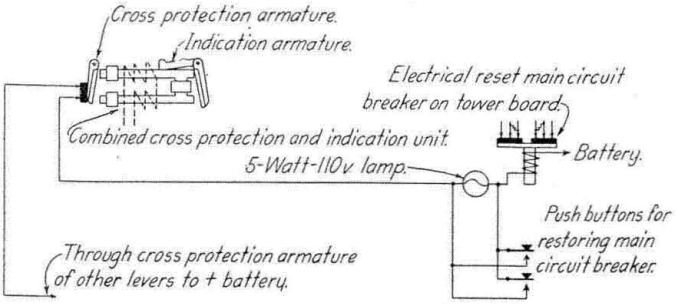
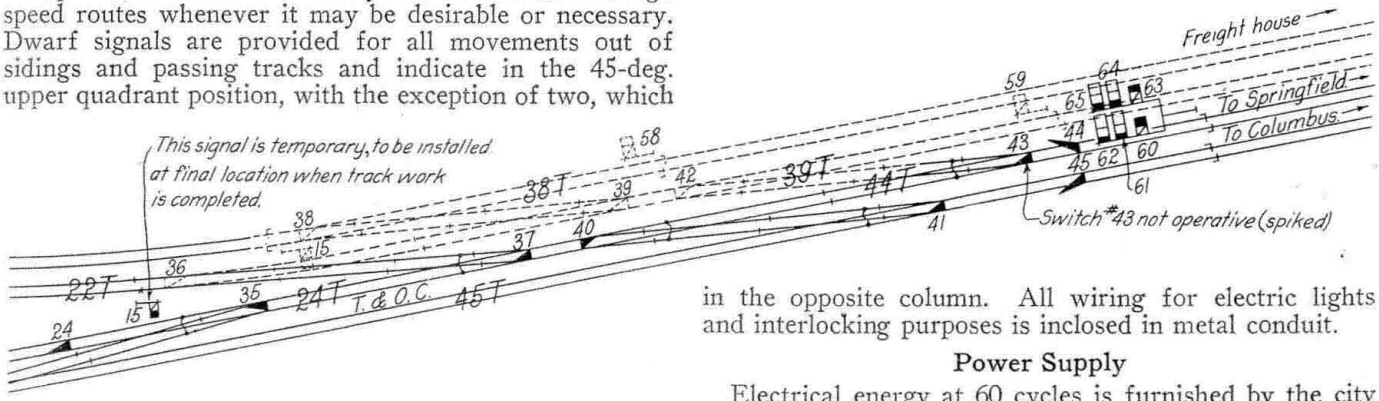


Fig. 2. Circuit for Electrical Reset Main Circuit Breaker.

power room. The second floor is used only as a battery room, the third floor contains the relay room, while the fourth floor is the operating room, which contains the interlocking machine, the operating switchboard, indicators and annunciators. A view of this room is shown in the opposite column. All wiring for electric lights and interlocking purposes is inclosed in metal conduit.



Power Supply

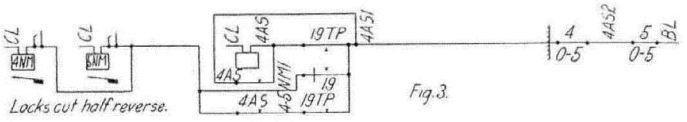
Electrical energy at 60 cycles is furnished by the city of Bellefontaine for all light and power purposes. The lighting current is supplied at 110 volts, and the power current at 220 volts, 60 cycle, single phase. The charging current for the storage batteries, both high and low voltage sets, is obtained from a General Electric Company direct connected motor-generator set consisting of a d.c. 3½ kw. generator and a 4 kw. motor. The generator has a voltage range from 55 to 165 volts. The indication current for signal functions is a.c. and is obtained direct from the city supply. A ½-kva. motor-generator set, operated from the storage battery is installed for indication purposes should the city current fail. All switch boards are R. S. A. type with full equipment, and the power board is equipped with a Ward-Leonard rheostat back of the board mounting.

The high voltage battery consists of 55 lead type storage cells, Electric Storage Battery Company, 160 ampere-hour capacity. These cells are charged as a separate unit. Nineteen lead type storage cells, 320 ampere-hour capacity, are used for low voltage circuits. These are divided into three separate units. One unit of 7 cells is used for repeater circuits and also

for lever and signal lights in case the commercial current fails. The other 2 units consist of 6 cells each and are used for track purposes only. These cells are charged in sets of 6 cells in series and discharged in multiple. The charging of all batteries is controlled from the power switch board. Transformers are installed for the reduction of the commercial current to 14 volts for the lighting of signals and lever lights.

Interlocking Machine

The interlocking machine is of the Federal Signal Company's type 4, having d.c. operation and a.c. indication. The machine consists of 64 working levers and 8 spare spaces. Horizontal locking of the monitor style "A" type is used with the electric locks mounted directly on



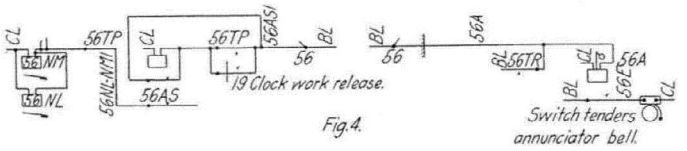


Fig. 3. Typical Route Locking Circuit
Fig. 4. Check Locking Circuit Between Tower and Yard

the tappets. All levers except those for call-on and dwarf signals are equipped with electric lever locks which are furnished with indicating lights and illuminated number plates. The locks are of the solonoid type wound to 25-ohm resistance. The machine is entirely inclosed in a pressed steel case having glass covers over the lever circuit controllers for inspection purposes. Two push buttons are located at convenient places on the machine for restoring the main circuit breaker. The reset circuit forms a part of the cross protecting circuits and is so arranged that the main circuit breaker cannot be restored to the closed position until all trouble has been removed. The main circuit breaker reset circuit is shown in Fig. 2.

Circuits, Wiring, Conduit and Trunking

Route locking circuits, of which Fig. 3 is typical, were installed for all high speed routes. A system of check

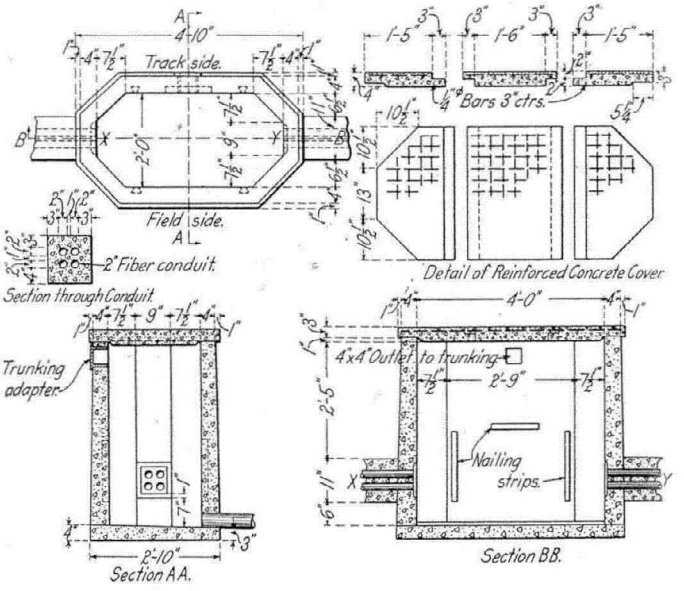
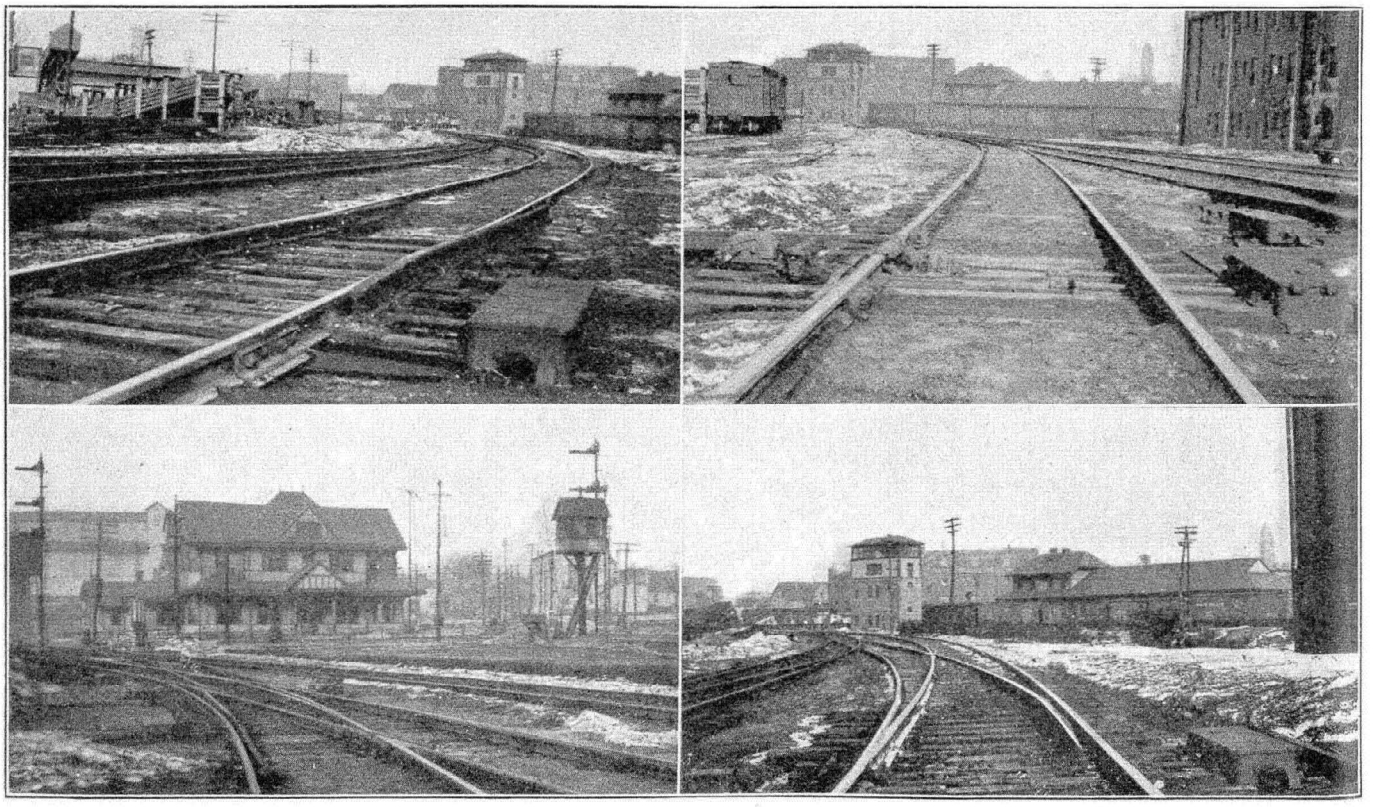


Fig. 5. Details of the Concrete Manhole.

locking circuits is installed between the Indianapolis division yard and the tower as shown in Fig. 4. Clock work time releases, with one minute interval, are used to enable the operator to release any high speed route which has



A Wharton Derail Layout
A Slip Switch Layout

A Hayes Derail Layout
A Single Switch Layout

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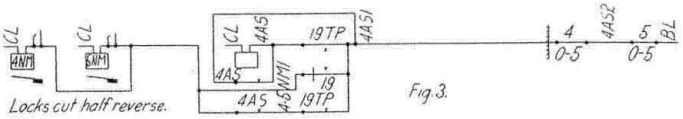

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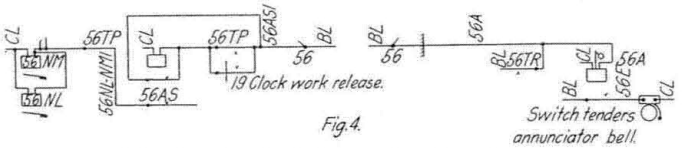

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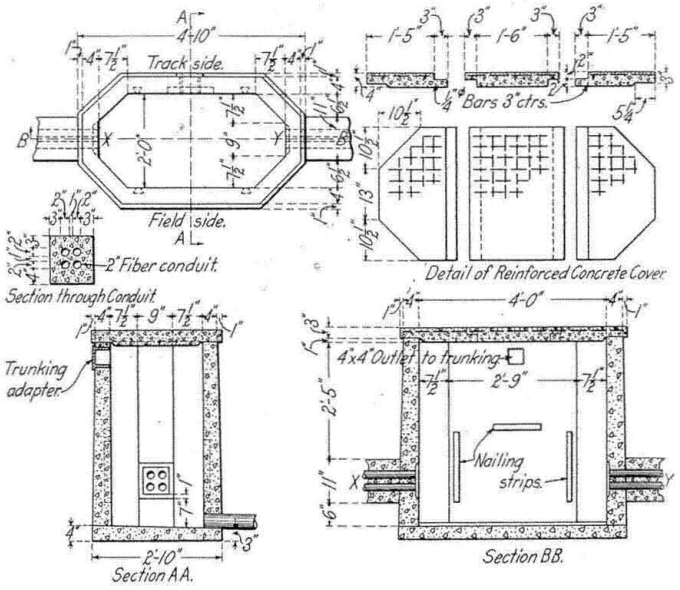

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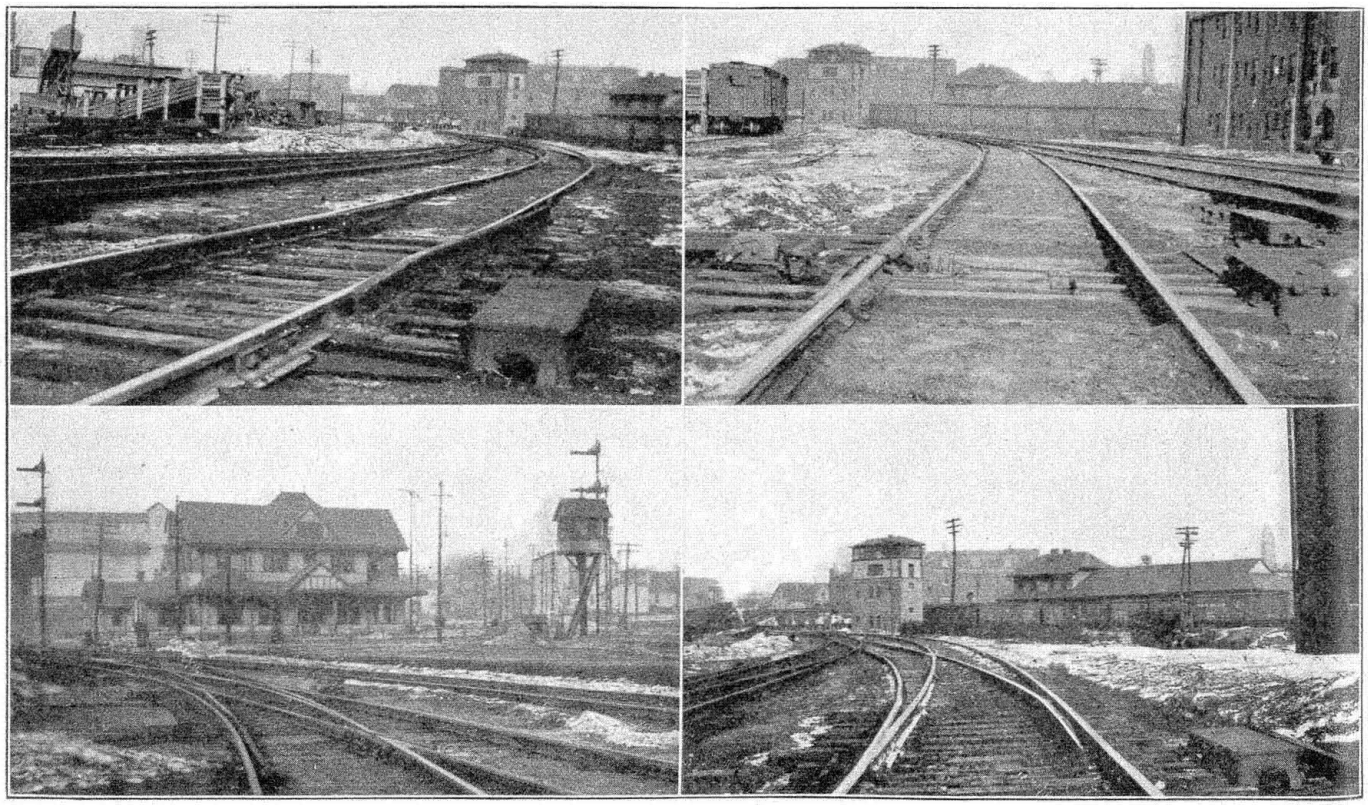

A Wharton Derail Layout
A Slip Switch Layout

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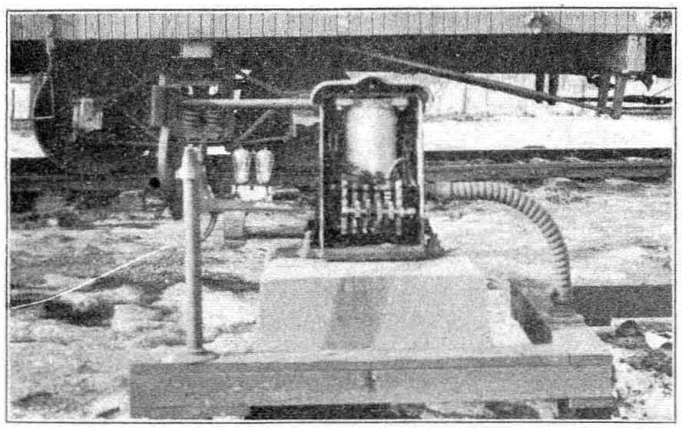
tion. The case is of such arrangement that it affords complete protection for all relays and at the same time does not necessitate crowding. The front of the relay case is provided with sliding glass doors, and the back, which is solid, is removable, so as to provide for easy access and inspection.

The terminal board, which is located in the power room, is so arranged that no wiring is exposed and proper spacing of terminals provides convenience in the testing of circuits. The terminal case is provided with glass doors on the front, which are removable. On each terminal connecting strap is designated the nomenclature of the wire or wires terminating thereon.

Signals, Switches, Lighting and Track Circuits

All signal and switch mechanisms are of the Federal Signal Company's design. High signals are type 4 top post, switch machines are type 41, each switch and derail being operated from a separate lever. Dwarf signals are style "B" solonoid with the exception of two that operate in three positions, which are type 4, motor driven.

All signals are electrically lighted, 14-volt a.c. being used. This is obtained through transformers from the city supply. Auxiliary circuits are installed which allow



Solenoid Dwarf Showing the Two Electric Lamps

signal lights to be operated from the low voltage battery in case of emergency. Each signal is equipped with a New York Central lines' standard sheet steel lamp box containing two bulbs. The lighting of all signals is controlled by means of switches on the operating board in the operating room.

Track circuits are d.c., and the operating current is obtained from the track storage battery. All rail is 90 lb. ASCE section and all insulated rail joints are Keystone. No. 6 B. & S gage copper-weld bond wires are used for the track bonding. The resistance units between the battery and the track are all of the fixed type varying from 1 ohm to 3 ohms and are located on terminal blocks in the terminal case. The tower, insulated joints, rail anchor blocks, cast iron rail braces, main motor-generator set, lock and switch rod insulations, were furnished and installed by the C. C. C. & St. L.

The Telegraph and Telephone Division, A. R. A., will not hold a spring meeting at St. Louis, Mo., on March 30, 31 and April 1. A circular under date of January 21 was sent out by J. F. Caskey, chairman of the T. & T. Division, A. R. A., and superintendent telegraph, Lehigh Valley, saying that in order to conserve the best interests of the division the Committee of Direction has decided not to hold the spring meeting. The fall session will be held on September 22, 23, 24. Formal notice covering the place of the meeting, which is the annual meeting, will be sent out later.

WATCH THE SECOND HAND

As a "timely" safety precaution, C. E. Burchfield, superintendent of the Appalachia division on the Southern, suggests that everyone should form the habit of glancing at the second hand of his watch when looking to see what time it is in order to be sure that the timepiece is running.

"Ninety-nine times out of every hundred," says Mr. Burchfield in a letter to the men of his division, "when we pull our watches from our pocket to look for the time the only thing that we look at is the minute hand and the hour hand. An hour later, you may look at your watch and find the hands in the same place, which means that your watch has stopped. If when taking your watch from your pocket to ascertain the time you will glance at the second hand for the smallest part of a second, you will know that your watch is running."

This precaution, Mr. Burchfield points out, may mean the saving of the employee's life or the life of his friend.

SECTIONAL COMMITTEE ACTIVITIES

THE meeting of the Chicago Sectional Committee, scheduled for the afternoon and evening of February 20, as announced on page 88 of the February issue of the *Railway Signal Engineer,* was postponed to a later date because of the threatened strike of the maintenance of way employees at that time. This meeting will be held the latter part of March, or some time in April, and will consist of a program devoted to educational matters for the men and of the relation of signaling to train operation.

The St. Louis Sectional Committee

A meeting of the St. Louis Sectional Committee was held on Friday, February 20, at the railroad Y. M. C. A., 20th and Eugenia Street, St. Louis, Mo. The meeting consisted of a one-day session and was called to order at 9:30 a. m. Two papers were presented on subjects of special interest to signalmen. The paper presented at the morning session was on the storage cell during charge and discharge, illustrated with lantern slides showing a miniature transparent cell in action. This paper was presented by H. M. Beck, engineer Electric Storage Battery Company. The afternoon session was devoted to a paper, illustrated by lantern slides, on production testing and use of insulating fibre for rail joints, by H. F. Roach, president Reinforced Rail Joint Company. A report of this meeting appears upon page 115.

The April meeting will be held on Friday, April 16, and the program will consist of two papers; one by J. P. Millwood of the Okonite Company on wire installation, illustrated by lamp slides, and a paper by H. P. Gage of the Corning Glass Works, on the electric lamp and the semaphore lens.

The May meeting will be held on Friday, May 21, and will consist of a paper by J. M. Spangler, manager railroad department, National Carbon Company, on the building, testing and using of dry cells. This paper will also be illustrated by lantern slides.

The St. Paul Sectional Committee

The St. Paul Sectional Committee will hold its next meeting in St. Paul on March 20. The meeting will open at 9:00 a. m. and is to be held in Room 710, on the eleventh floor of the Railroad building, at Fifth and Jackson streets, St. Paul. Among the subjects of interest to be presented at this meeting are: Lenses and Roundels, by a representative of the Corning Glass Company; Primary Batteries, by a representative of the Thomas A. Edison, Inc., and Concrete for Signal Work, by a representative of the Massey Concrete Products Corporation.