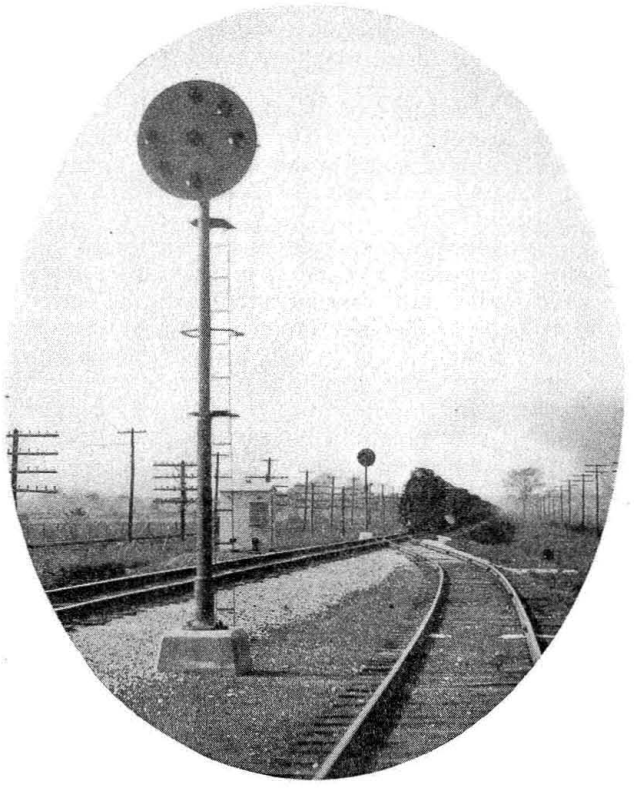
Pennsylvania Installs on 30.3 Miles of

Twelve minutes saved on each freight
First installation of Union



Eastbound train approaching Ben Davis

THE Pennsylvania has recently completed an installation of centralized traffic control on 30.3 miles of single-track line between Ben Davis, Ind., and Almeda, which is a portion of the main line between Indianapolis, Ind., and St. Louis, Mo. As a result of the installation of this centralized control system for the 12 power-operated switches, and the 32 signals which direct the train movements without train orders, the movement of trains, especially the freights, has been greatly facilitated. This result is accomplished chiefly through the elimination of train stops at meeting points when entering and leaving the sidings which results in an estimated saving of 12 min. for each train stop eliminated.

Characteristics of Line and Traffic

Double track extends from Indianapolis to Ben Davis, 6.9 miles, and also from Almeda to Limedale, Ind., 3.1 miles, the second tracking of the intermediate section between Ben Davis and Almeda, 30.3 miles, having been postponed on account of proposed extensive line changes and grade revisions. This section of the line traverses a rather rough rolling country crossing several small streams, short grades up to .83 per cent being numerous and in a few cases extending for about a mile. Curves are numerous, but not of a curvature to interfere with the normal operation of trains.

The traffic on this division consists of 19 regular passenger trains and an average of 16 freight trains daily. Two of the passenger trains make eight local stops in the territory, while the remainder are on fast schedules, making the 30.3 miles in 30 min. eastbound, and 32 min. westbound. Two of the freight trains are locals and the remainder are on fast through schedules. The latest type locomotives are rated to handle 3,400 tons westbound and 3,250 tons eastbound, at a maximum speed of 50 m.p.h.

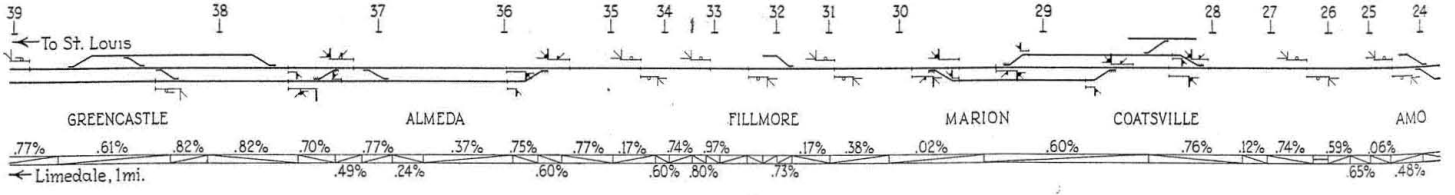
The passing sidings in this territory include advance tracks at Ben Davis and Almeda, a set of lap sidings at Marion, and a single siding at Gibson and Summit. On account of the grade conditions, serious delays were caused when trains were stopped to enter sidings at Summit and Gibson, so much difficulty being experienced at Gibson that this siding was used only when absolutely necessary. Train movements were operated by time-table and train orders, 40 to 45 train orders being issued daily in this territory.

The solution of this operating problem was to install power-operated switches, which, together with the signals for directing train movements, are controlled from a central point. Operators had previously been employed at Summit and at the end of double track at Almeda, and one relief operator was required, making a total of seven men. By placing the centralized control machine in an existing interlocking tower at Limedale, where the Chicago, Indianapolis & Louisville crosses the Pennsylvania, the offices at Almeda and Summit were discontinued. Limedale is four miles west of Almeda.

The Control Machine

The control of the 12 field stations is assembled in the centralized machine at Limedale. The term "station" designates a group of associated apparatus, such as a switch and the two or more signals governing movements over that switch and into the adjacent block. Each station is controlled by one panel in the control machine, each of which includes a section of the track model, a two-position switch lever, a three-position signal lever, a stick button, and a code-starting button, arranged in order from top to bottom.

The centralized control system, with the attendant switch and signal apparatus, was furnished by the Union Switch & Signal Company, and installed by the railroad company. Several new developments were incorporated in this installation. For example, this is the first extensive installation of the new three-wire coded relay con-



Track and signal plan, indicating grades, for

Centralized Control Single Track

train stop—Second tracking deferred three-wire coded system

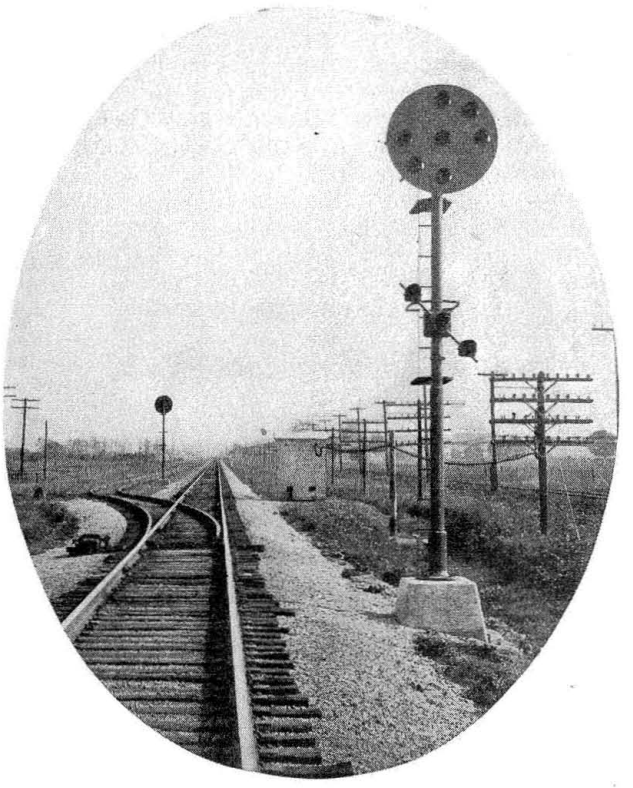
trol system, which was developed to give faster speed in sending out and returning the codes. When the operator is ready to line up the route for a train movement he sets the levers in the desired position and then pushes the starting button, after which only 1 1/5 sec. are required for the code to be transmitted to the field station, interpreted by the receiving unit and to start the operation of the switch and/or signals. This one and one-fifth of a second is to be compared with about 6 sec. required with the two-wire coded system.

A power-switch machine operates in about 16 sec., so that only about 18½ sec. elapses from the time the operator pushes the button until he receives complete indication that the switch has completed its movement and is locked, and that the corresponding signal is displaying the proceed indication. If the switch is already in the desired position and the only change desired in the field is to change the signal indication, only 2 1/5 sec. elapse from the time the operator pushes the starting button until the indication is received.

An unusual feature of the track diagram on the control machine is the continuous indication of the location of all trains on the entire territory; this feature was developed by the railroad company. One lamp is provided in the diagram for each track circuit or group of circuits, in the field, this lamp being extinguished only during the time the corresponding track circuits are occupied. These track sections are from 150 ft. to 3 mi. in length. Likewise, the lamps at the levers give continuous indication of the position of each switch and the indication displayed by each controlled signal.

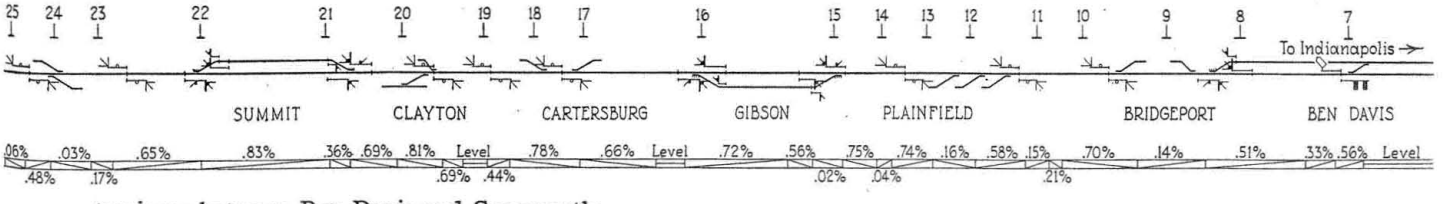
Another new feature on this machine is the use of a second button for each panel on the machine. The top button is used to make the controlled signal "stick" or "non-stick"—that is, if the button is left "in," the signal will not return to the proceed indication as an automatic signal does when a train has passed out of the block. However, if the button is pulled out the signal will return to the proceed indication for a following movement as soon as the preceding train has left the block, just as an automatic signal would do. The bottom button is for starting the controlling code, as used ordinarily on this type of machine.

Improvements have been made also in the train graph which automatically "OS"es the passing of trains at each power-operated switch. This train graph is a part of the control machine, being located in a 30-in. desk at the base of the control panel. A new feature is that the graph needle assembly is so mounted that it can be slid forward or backward so as to be serviced from either the front or rear of the machine. Another feature is the new ink gage telltale needle, which ordinarily makes a continuous line at the edge of the train sheet, but when the ink level in the supply chamber sinks to a certain level, this line is discontinued, thus giving warning that the ink supply should be replenished. This warning is given at least four days before the ink is low enough to prevent operation of the recording pens.



Signaling at typical siding

A decided improvement has been made in the assembly of the coding units: The office-line unit in this new machine is assembled and mounted separately so that static charges, lightning, or high-voltages that may be caused by line crosses, will be confined to this unit, which can readily be replaced if damaged. This line unit, the coding unit, and the storage rack units are all housed in the rear part of the control machine and each is hinged at one end so that it may be swung out for inspection or to be replaced readily in case of trouble.



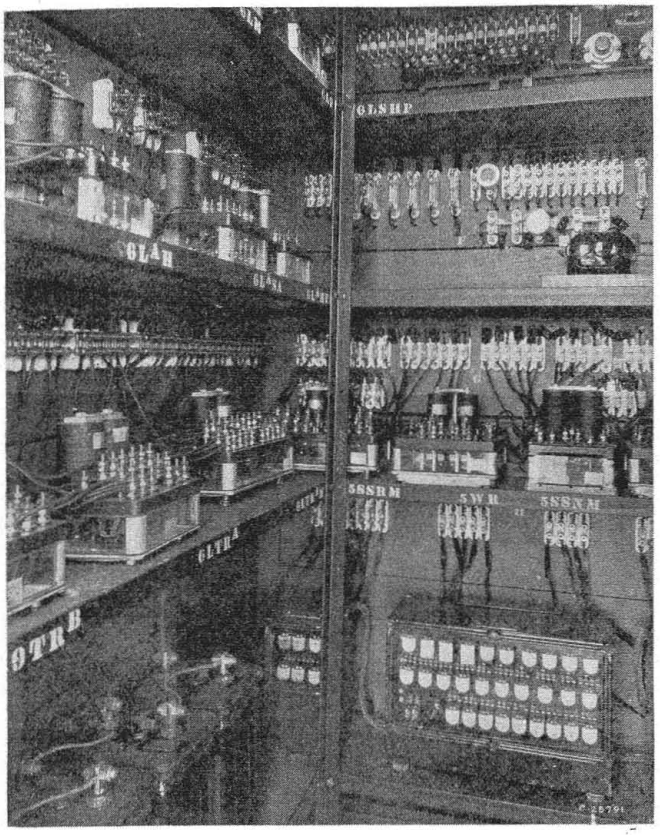
territory between Ben Davis and Greencastle

Code Line Circuit

The coded line circuits are fed from a set of 65 cells of Exide 35 a.h. cells having a pressure of 138 volts at the feed end at Limedale. The three line wires for the coding control circuit are No. 9 hard-drawn copper

with weatherproof covering run on No. 43 Pyrex glass top-grooved insulators. At each field station a five-conductor cable extends from the pole line to the concrete house. A tap connection is made to the common, which runs through, the other two wires being broken and the connection taken to the house where connections are made to a four-pole double-throw knife switch, which can be thrown to the reverse position to cut out the station in case of local trouble. Another switch is provided which may be thrown when the line is open beyond the particular station, so that the remainder of the territory from this station to the control point can continue in service.

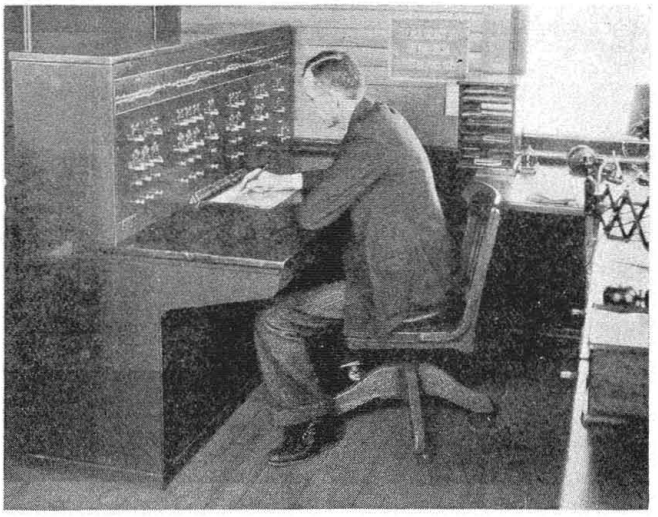
The signals are the Pennsylvania's standard position-light type. The switch machines are the Model M-20 equipped with 20-volt d-c. motors. A concrete house 6 ft. by 6 ft. is located near the switch at each of the field stations, in which the control relays, coding units, and batteries are housed. The circuits are distributed



Interior view of one of the concrete instrument houses

from these houses in underground parkway cable with lead sheath and two wraps of steel tape. One cable of seven No. 14 and five No. 6 wires extends to each switch. For the protection of the parkway cable going to a switch machine an 18-in. piece of 2-in. flexible metal conduit is attached to the wire entrance of the machine, the opposite end of the conduit being connected to the end of a piece of 2-in. galvanized iron pipe. This pipe has a long bend from the horizontal to the vertical plane, with a radius of about 12 in., the pipe extending into the ground about 18 in. A cable containing seven No. 12 conductors extends to each high signal and a cable with five No. 12 conductors to each dwarf signal. The rail connections are made with single-conductor No. 9 parkway cable, the joint between the cable conductor and the stranded cable going to the plug at the rail, being made with a solderless connector located in an Elastite riser with a metal cover.

The a-c. floating supply system is used to supply power for the operation of the signals and the switch machines. A 440-volt alternating current supply line extends throughout the territory. Commercial power



The control machine is located in the tower at the Limedale interlocking

service is used and transformed to the railroad's 440-volt line, at available points, where necessity demands. Line transformers and rectifiers are used to charge the storage batteries at each location. A set of 12 cells of Exide Type DMGO-9 80-a.h. cells is located at each field station for the operation of the switch, the relays and the coding equipment.

Train Accidents

SHOWN below are abstracts of reports made to the Interstate Commerce Commission by W. P. Borland, director of the Bureau of Safety, on train accidents that have been investigated by that Bureau.

Grand Trunk, Belsay, Mich., May 28, 1930, 2:20 p. m.—Westbound passenger train No. 17, while traveling at a speed of approximately 50 m.p.h., was derailed at an open switch of a main-line crossover. The engineman and fireman were killed, and five passengers, four employees and three persons carried under contract were injured. The derailment was caused by an open switch. A lineman had been the last one to open this switch, when he operated his motor car with two trailers through it. He had instructed a laborer to re-set and lock the switch after passing through it, but apparently had not taken sufficient precaution to know that the switch was properly set and locked. Switch-stands here were not so clearly visible as they might have been. Automatic block signals were being installed in this territory, but were not then yet in operation. Had this signal system been in operation at the time, this derailment would no doubt have been prevented.

Texas & Pacific Crossing, Texas & New Orleans, Avondale, La., March 6, 8:15 a. m.—Eastbound T. & N. O. passenger train No. 12 was struck by eastbound T. & P. passenger train No. 22 at a grade crossing of these roads. Considerable damage was done to both trains. The fireman of train No. 12 was killed and the engineman of No. 12 and the conductor and a train porter of No. 22 were injured. Trains are required to make a safety stop before proceeding over this crossing. The engineman of train No. 22 is held blameworthy for not running his train under control.