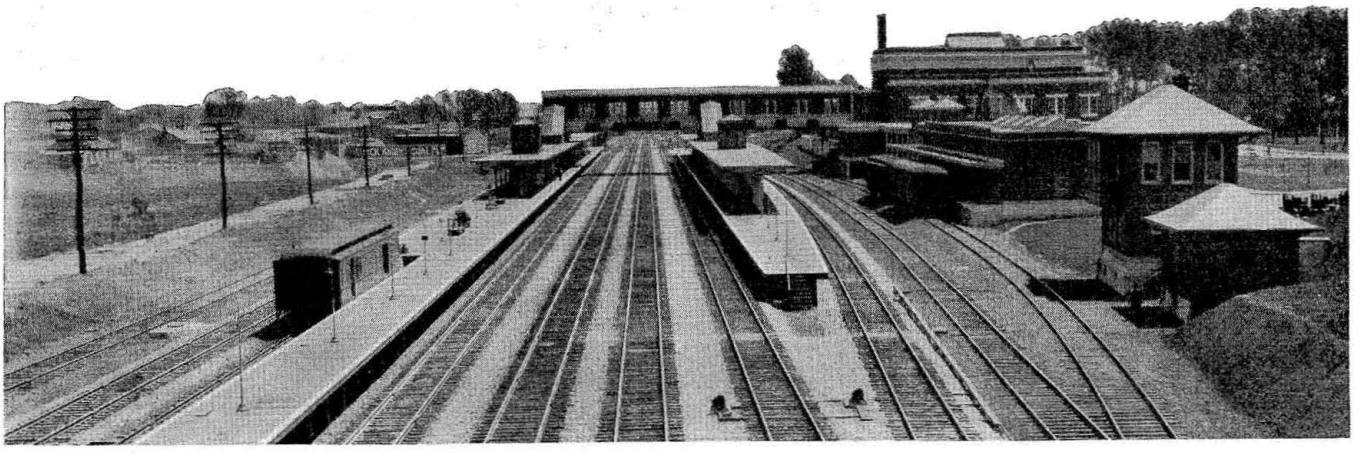


View looking east through station, tower at right

Pennsylvania Installs

Interlocking at Lancaster, Pa.

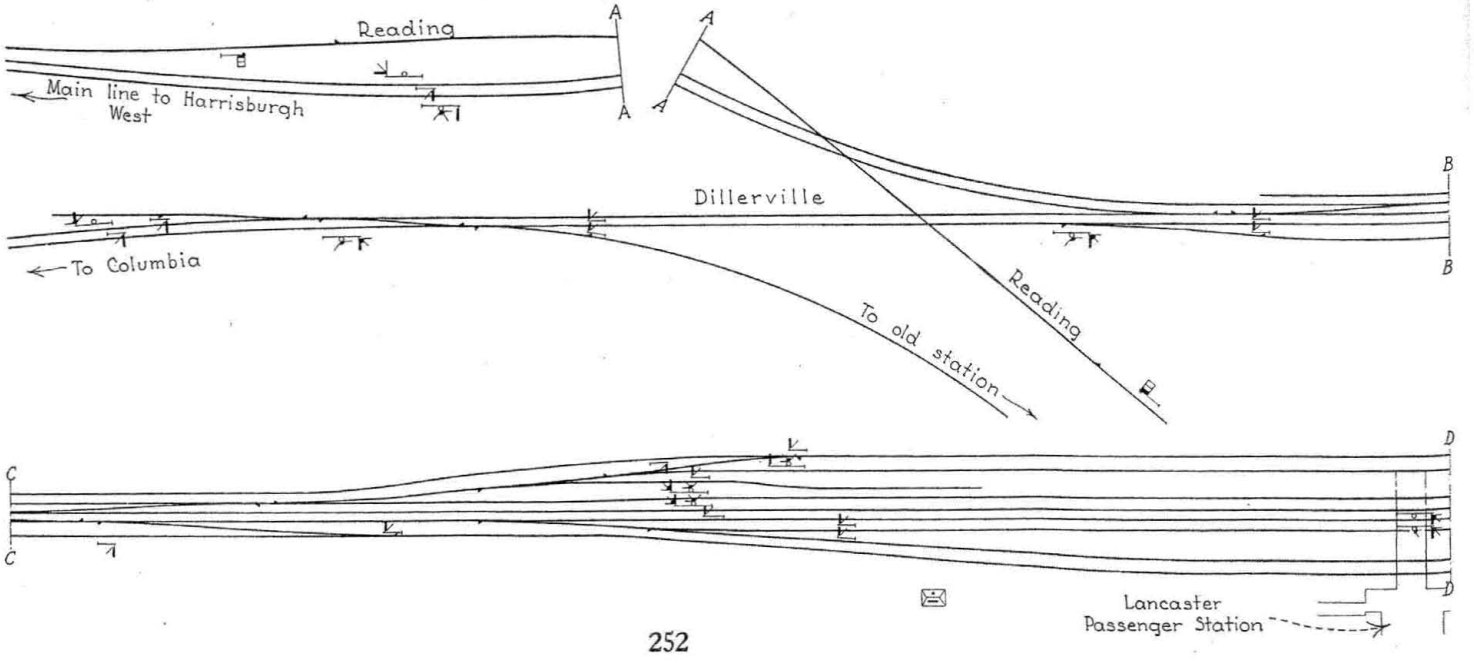
Electro-pneumatic plant with wires distributed in lead cable—Relay cabinets in tower are made of asbestos

ON April 28, the Pennsylvania placed in service a 59-lever electro-pneumatic interlocking plant in connection with the track layout at the new passenger station at Lancaster, Pa. This new station is located near the edge of the city on the main line between Philadelphia, Pa., and Harrisburg, whereas the old passenger station, located in the center of the main business district, was served by a loop line which left the main route at a point east of the city and returned to it at about a mile further west. On account of the numerous street crossings on this loop line it was necessary to operate trains at reduced speed. Street traffic was likewise congested. All factors considered, it was decided that the city could be served better by placing the new station on the main line. A section of the loop through the main business section was taken up and the rest of it was left for switching connections to industries and freight houses.

Although the new routing of passenger trains that stop at Lancaster saves only four to five minutes in the schedule time of these trains, the new arrangement eliminates numerous crossover movements which delayed other trains as well. It is now also practicable to give better passenger service to the growing city of Lancaster by stopping more of the through trains when passengers wish to take certain trains.

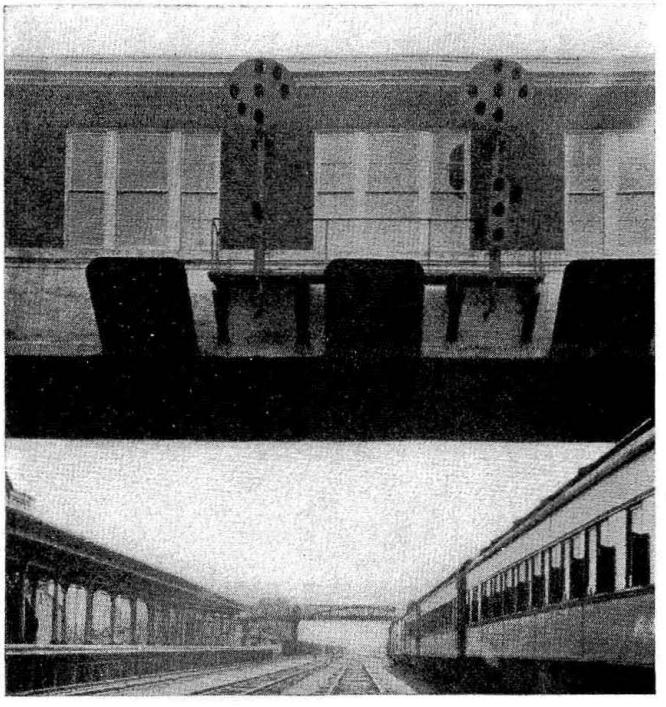
Station Arranged for Through Moves

The main station building is located on an embankment to the south of the main line with an enclosed



concourse extending out over the tracks. Enclosed stairways extend down from the concourse to two island platforms between the tracks. These platforms are on a level with car floors, which arrangement prevents passengers from stepping on the tracks in the path of trains, thus, permitting high-speed movements of trains not making stops.

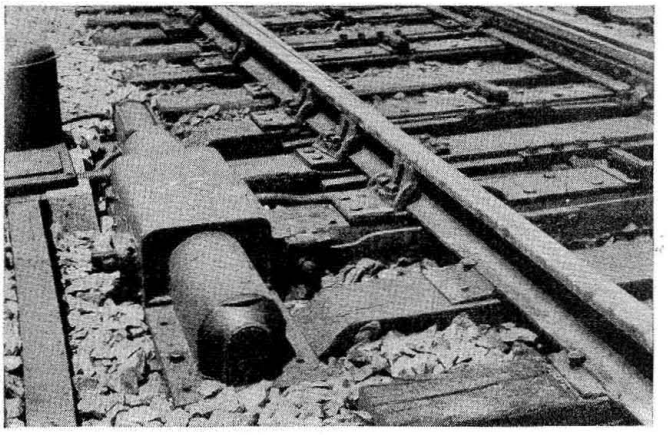
The main line through Lancaster is used primarily for passenger, express and fast freight trains, the tonnage freight trains being routed over a low-grade line along the Susquehanna river several miles south



Position-light signals are used

of Lancaster. A total of 57 through passenger trains operate through this station daily of which 35 make the station stop; 16 branch line trains operate out of and into the station daily. About 14 through express and 38 through freight trains pass through the station daily. Therefore, a total of about 125 trains are operated daily through the station area besides switching movements.

East of the station on both sides of this main line is a stock yard said to be the largest east of Chicago. Stock from the west is shipped to this point and fattened for eastern markets. Considerable switching



The switches are well braced and fitted with heavy rods

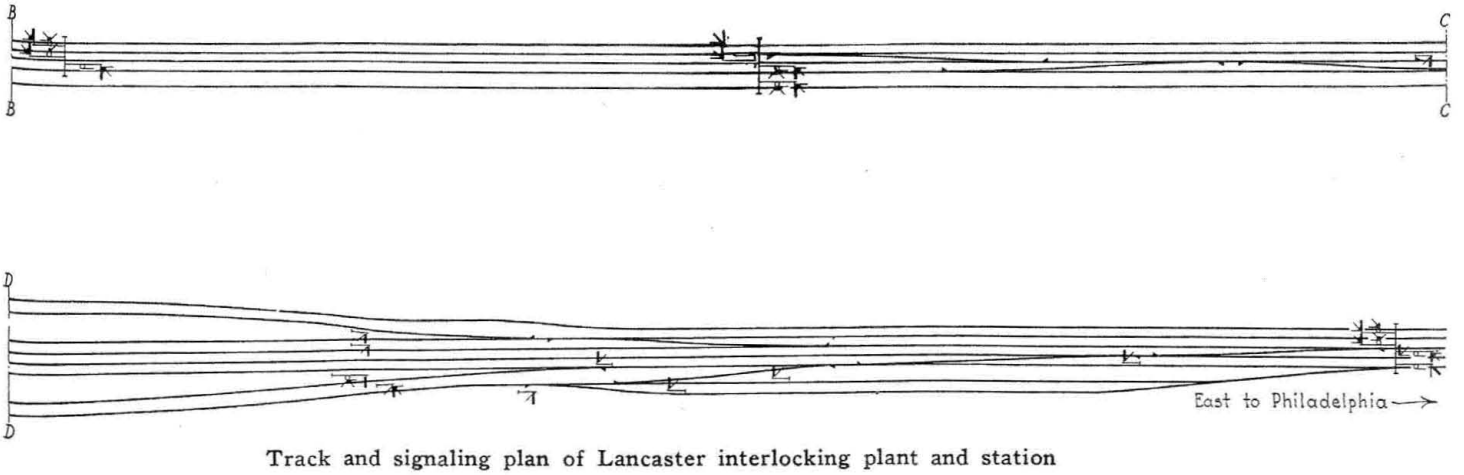
is, therefore, required to serve this stock yard, and the tracks are so laid out that switching movements are made off of the industrial tracks and will not interfere with through train movements.

The track layout of the Lancaster station was designed to permit high-speed through movements while other trains are making the station stop. No station platforms are provided for the through track No. 2 and 3. Track No. 2 is signaled for high-speed through movements eastbound, while track No. 3 is signaled for high-speed through movements in either direction. Through trains making the station stop normally use track No. 1 or No. 4.

Plant Includes Extensive Area

The 59-lever electro-pneumatic interlocking plant handles 24 switches and 47 signals in the area 7,346 ft. long, which includes the switches at the east end of the station layout to and including the protection for the crossing of the Reading at Dillerville Junction, at which point the double-track line to Columbia, Pa., branches off. The Dillerville Junction plant included the switches for the west end of the old loop track, and a mechanical interlocking at this point formerly required a leverman on each track. In view of the fact that this mechanical plant has been removed and the functions are now handled in the Lancaster station plant, there is no increase in the number of levermen required on account of the new interlocking facilities.

The interlocking plant was constructed according to the standards of the Pennsylvania, which have been developed through years of experience with the purpose of securing reliable service at the mini-

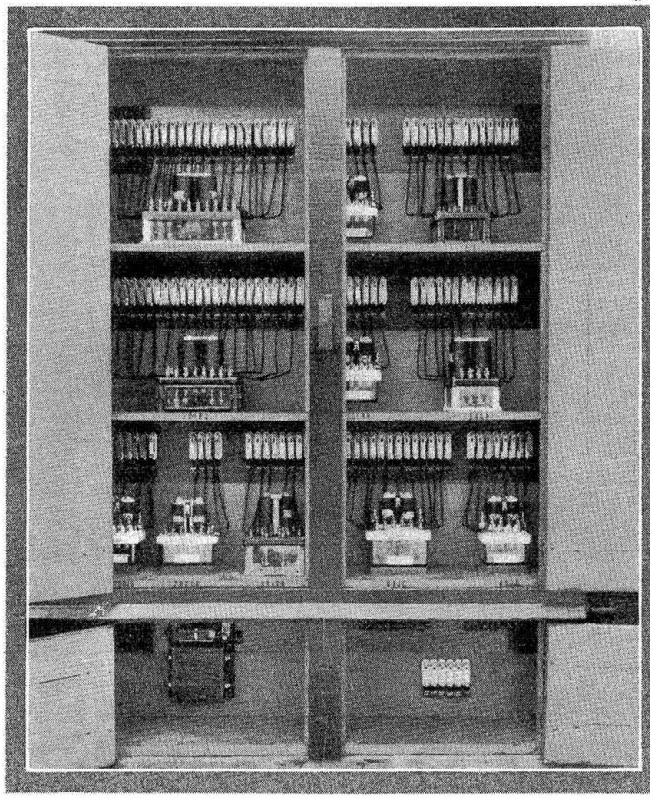


Track and signaling plan of Lancaster interlocking plant and station

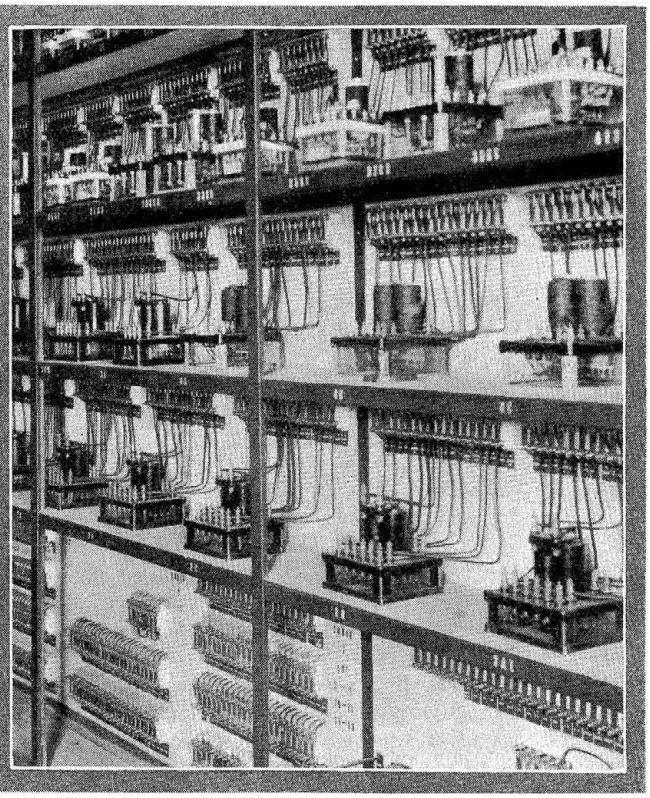
mum expense for labor maintenance and operation.

The relay racks, located in the first floor of the tower, directly below the interlocking machine, are built up of a frame work of angle-iron with ¼-in. asbestos board for the shelves and sides. This asbestos board is smooth and hard, will not warp or crack, and can be sawed and drilled to give smooth edges and holes. The sheets of asbestos are sawed to fit and are held in place by ¼-in. stove bolts passing through the channel iron frame work. The porcelain-based terminals are mounted in place on the rear wall of the cabinets, being held in place by stove bolts passing through the asbestos board. The wires leading to or from the terminals pass through holes in the asbestos board above or below the terminals.

The relay cabinets are 16 ft. long and extend from the floor to the ceiling, thus containing 5 shelves each 18 in. high, 12 in. deep, in addition to the terminal compartment at the bottom 3 ft. high. One cabinet faces to the track side and one to the field with an open runway and wire space 3 ft. wide between the backs of the two cabinets. The wires from the interlocking machine run down through the concrete floor in 8-in. sections of fiber conduit, and when all of the wires were in place the spare space was filled with fireproof compound so that there is no chance for fire to spread from the first to the second floors of the tower. The wires between terminals in the relay cabinets or to the machine are all laced up neatly in cables.



The relay cases at signal locations are made entirely of wood



The relay cabinet in the tower is made of asbestos board on angle iron

Outside Wires in Lead-Covered Cable

Circuits running from the relay cabinets in the tower to outside instrument cases at various locations over the plant are all in No. 14 solid copper insulated lead-covered cable. In the tower these cable wires terminate on terminals in the lower shelf of the relay cabinets. The lead cables are run in 3-in. creosoted wooden pump-log duct line buried an average of 5 ft. below the rail. When the trench is dug to the proper depth, a 1-in. creosoted board, the width of the duct line, is laid continuously on which the pump-logs are placed. The same kind of a board is placed on top of the pump-log assembly when completed before dirt is thrown in. Where the cable line runs across a bridge of a street under-pass, the cable runs through 3-in. galvanized duct.

A 4,400-volt 60-cycle single-phase power line for the signal system over the division, extends through this plant in a two-conductor No. 4 insulated lead-covered cable. Where this cable is run in the same trench as the signal and communication cables, a layer of dirt one foot thick was thrown in on top of the other ducts and then the power cable duct was laid so as to give a one-foot spacing to reduce inductive interference. The sheaths of the communication and signaling cable are connected to ground at the tower entrance.

Cable joints and junctions are located in concrete manholes spaced about 500 ft. apart in the main duct line. Wires from the manholes to the switches and signals are run in wooden trunking painted with fire-retarding paint.

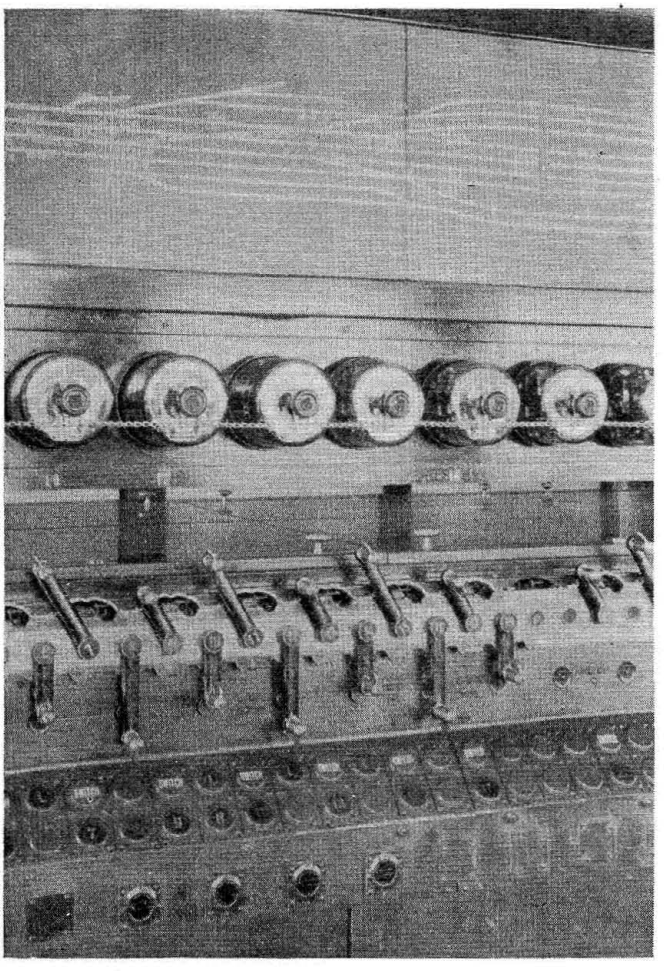
At the signal bridges the lead cables are brought up into the wire space at the rear of the instrument cases, and the wires are extended through holes in the partition to porcelain base terminals on the case side. The rear of the case, covering the wire space is removable in sections which are held in place normally by screws. Wires running from the instrument cases up to signals on the bridges are run in 2-in. conduit.

Certain sections of the track in this plant are used in some line-ups for fast through routes governed by

high signals, and in other line-ups for reduced speed routes governed by dwarf signals. In order to expedite switching movements when the reduced speed routes are being used, a time-release requiring only 12 sec. can be used when desiring to change the route, whereas if the high-speed route is lined up, a second time-release requiring two minutes, enters into the manipulation.

Interesting Features of Machine

The lights mounted on the machine below the levers give information as to the position of trains with



The lower row of lights repeat the operation of the signals

reference to the switches or signals, the lights being extinguished when the section of track involved is occupied. A new and additional feature is used on the Lancaster machine in the form of signal repeater lights, as shown mounted in the third row below the levers. This light flashes red when the lever is operated to display a more favorable indication than stop, and remains red if the signal does not change from the stop indication.

When the train enters the route ahead of the signal, causing it to change to the "stop" indication, this red light will be illuminated and continue to burn so as to show the leverman that the signal is not lined up for the movement he intended. When a train accepts the signal and passes it, the indication changes to stop and the indication light on the machine shows red until the leverman moves the lever to the normal position.

With the lever lights on the machine, it is not considered necessary to provide lights on the track diagram mounted in a frame over the top of machine.

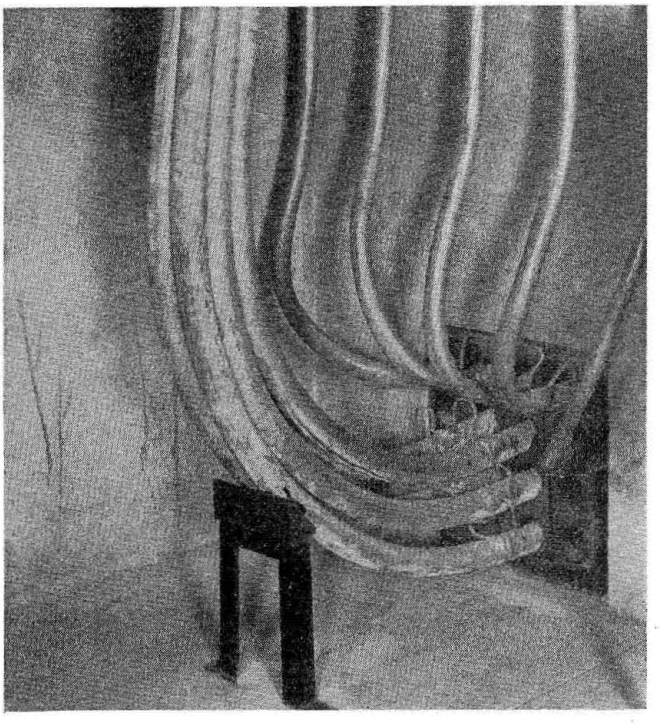
The main tracks throughout the station layout are constructed of 130-lb. rail, with heavy tie-plates, sawed ties, and rock ballast. For the high-speed routes No. 15 turnout and frogs are used with reinforced switch points. The switches are well braced as shown in the photograph, with four heavy gage plates insulated at the center. The front rod, of which the lock rod connection forms a part, is made according to Pennsylvania standard plan No. S-305.

The Type-A1 electro-pneumatic switch machines are mounted on four ties with the top of the machine on a level with the top of the rail. The Style-C electro-pneumatic valve control unit is mounted on a concrete foundation with the wires to the switch machine run in flexible metal conduit.

The signals used throughout the plant are the position-light type, giving indications according to the Pennsylvania aspect chart. It should be noted that not more than two signal units are required to give the various indications required for the several possible routes.

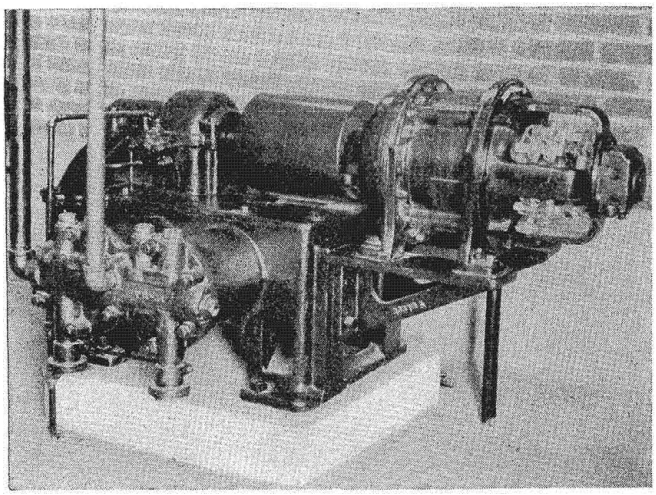
Automatic Air Compressors

Two automatically controlled 35-cu. ft. per min. air compressors are provided to furnish air pressure to operate the switches in this plant. Each compressor is driven by a 220-volt, single-phase 5-hp. motor. The control is so arranged that one compressor starts when the pressure in the main reservoir is reduced to 55 lb., while the other compressor will not cut in unless the pressure is, for some unusual reason, reduced to 50 lb. Both compressors cut out at 65-lb. pressure. A 4-pole double-throw switch is so connected that the compressors are alternated daily on the 55 to 65-lb. pressure range. Under normal conditions one compressor will raise the pressure from 55 lb. to 65 lb. by pumping 15 min., and about 30 min. will elapse before the pressure will again be reduced to 55 lb. so as to start the compressor again.



The lead cables run in pump log to basement of the tower

The air is distributed over the plant in 2-in. galvanized iron pipe mounted on low concrete foundations, one such main extending down each side of the track layout, cross leads being provided at intervals of about 500 ft. so as to cut around any breaks caused by accidents or derailments. The cross-connections are 2-in. pipe buried about 2 ft. below the rail.



One of the two air compressors

This interlocking was constructed by Pennsylvania forces under the immediate direction of the supervisor and assistant supervisor of telegraph and signals. Plans were furnished from the office of the superintendent of telegraph and signals. This plant, including 35 switches, 6 derails and 47 signals, is maintained by one signalman on each track.

Failure to Check Train Register Causes Collision

THE report of the Bureau of Safety (I. C. C.) in respect to the head-end collision between two freight trains on the Illinois Central near Newton, Ill., on February 16, 1929, attributes the accident to the failure of the conductor properly to check the train register. One employee and also a caretaker in charge of a live poultry car were injured. In the vicinity of the accident, the railroad is a single-track line over which trains are operated by time-table and train orders, no block signals being in use.

Northbound freight train Extra 1762 arrived at Newton at 3:20 p.m., where two cars were picked up and a check was made of the train register. A copy of a train order on Form 19 was received and the train then departed, at 4:00 p.m., and at a point about 2 miles north of Newton it collided with southbound freight train No. 281, while traveling at a speed estimated to have been about 15 m.p.h. Southbound freight train No. 281 left Greenup, 17.9 miles from Newton, at 3:28 p.m., 3 hr. and 30 min. late, and collided with Extra 1762 while traveling at a speed estimated to have been about 15 m.p.h. Operator Richards, on duty at the time of the accident, stated that there was nothing unusual in the procedure of delivering the orders to Extra 1762 before its departure from Newton. There was no mention made of train No. 281 by the dispatcher at the time, and he himself did not know of its location on the division. Upon comparing the register check obtained by Conductor Alsop with the train register for February 15 and 16, it developed that he obtained his entire check for the arrival of trains on the 15th instead of the 16th, with the exception of train No. 231, which he checked immediately upon its arrival at 3:29 p.m.

"This accident was caused by the failure of Conductor Alsop, of Extra 1762, properly to check the train register," said the report. "The evidence clearly indicates that Conductor Alsop failed to obtain a correct register check, owing to the fact that he checked the train register for the previous date by mistake, thus allowing his train to depart before the arrival of train No. 281, an overdue superior train."

Back-Up Movement Through Crossover Causes Collision

IN the report of the Bureau of Safety (I. C. C.) on the head-end collision between two freight trains on the Southern at Landis, N. C., on January 21, 1929, the commission places responsibility upon the train crew for "making a back-up movement through a crossover without proper flag protection." One employee was injured. In the immediate vicinity of the accident, this railroad is a double-track line over which trains are operated by time-table, train orders and an automatic block-signal and train-control system. The accident occurred on the southbound main track at a point about 150 ft. south of the south switch of a crossover.

The crossover is a trailing-point crossover 196.5 ft. in length, connecting the two main tracks. The signals involved, of the color-light type, are southbound signals 3439 and 3451, located 9,637.5 ft. north and 733.5 ft. south, respectively, of the south switch of the crossover. Indications are red, yellow and green, for stop, caution and proceed, respectively. The switches of the crossover operate in conjunction with the automatic block-signal and train-control system. Under the rules, when a train crosses over to, or obstructs the other track, it must first be protected in both directions as prescribed by rule 99, unless otherwise directed, and before entering the main track in automatic block-signal limits a train must, in addition to other precautions, wait two minutes after opening the switches before proceeding.

Northbound third-class freight train No. 62 consisted of 23 cars and a caboose. On arrival at Landis it was brought to a stop on the northbound main track with the caboose just north of the crossover. A back-up movement was then made through the crossover to the southbound main track, in order to perform work and to allow a following first-class train to pass, train No. 12, due at Landis at 7:04 p.m., and the train was still backing up, at a speed estimated to have been between 6 and 8 m.p.h., when its head end was struck by train No. 55.

Southbound second-class freight train No. 55 consisted of 38 cars and a caboose. This train left Salisbury, the last open office, 11.9 miles north of Landis, at 6:15 p.m., 4 hr. and 45 min. late, passed signal 3439, which was displaying a proceed indication, and collided with train No. 62 while traveling at a speed estimated to have been between 15 and 20 m.p.h.

The automatic train-control system is of the intermittent inductive auto-manual type, manufactured by the General Railway Signal Company. The records