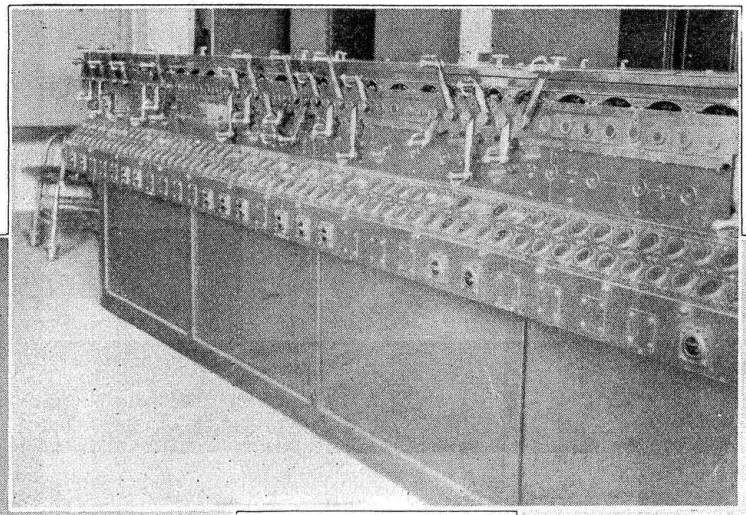
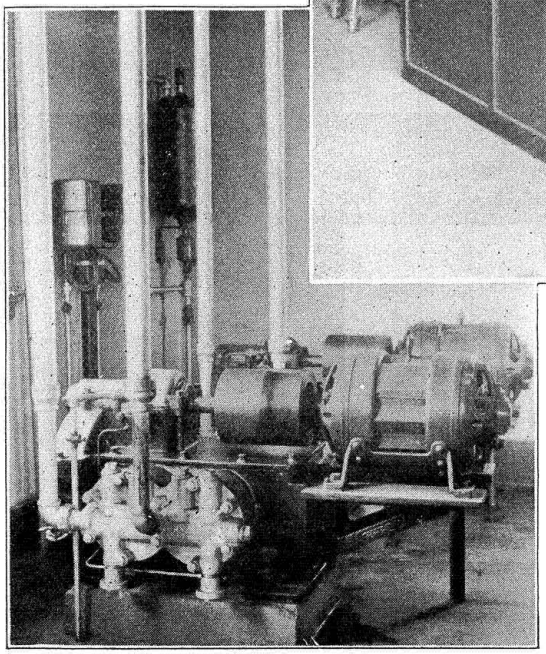
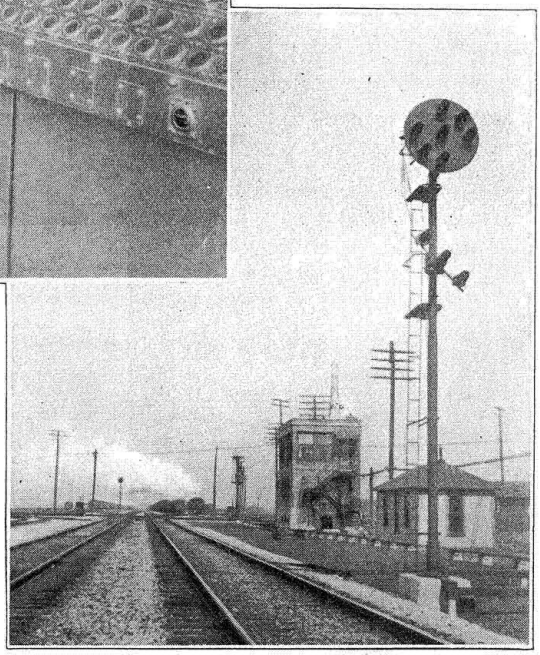
Pennsylvania Installs an Interlocking Without Derails

33-lever electro-pneumatic plant handles crossings

All control wires are carried in overhead cables







Top — Electro-pneumatic machine in tower

Left — Motor-driven air compressors are automatically controlled

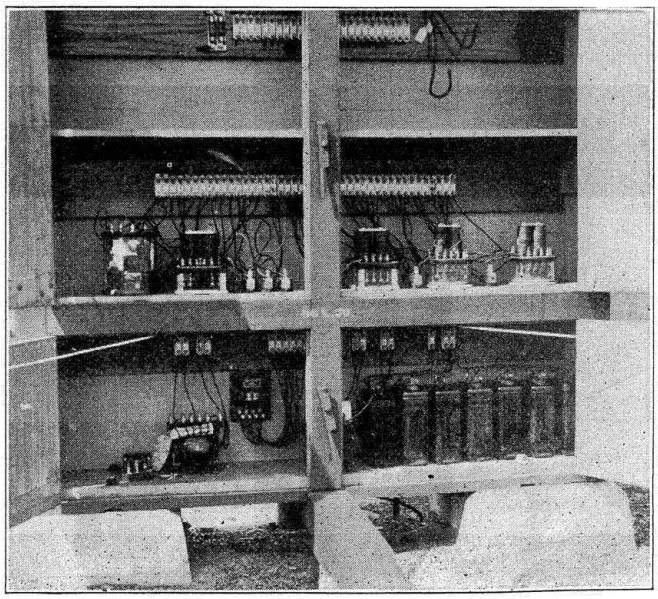
Right — Northbound Pennsylvania home signal

THE most interesting feature about the interlocking plant at Walbridge, Ohio, near Toledo, is the fact that although the main lines of the Pennsylvania, the Hocking Valley, and the Toledo Terminal Railway cross each other at grade, on request to the Public Utilities Commission of Ohio permission was granted to operate without the use of derails in the main tracks. On yard and transfer tracks connecting with main tracks, Hayes derails are used at the clearance. This is a very busy plant, handling from 200 to 300 trains a day.

This layout of crossings had been protected previously by a mechanical plant with 64 working levers constructed in 1902. At the time the terminal line built a second track through this area about a year ago, it was decided to install a new electro-pneumatic plant, manufactured and installed under contract by the Union Switch & Signal Company. The interlocking machine is the Model 14, the switch machanisms are the Model A-1, and the signals of the position-light type. Direct current polarized SS control circuits are used. The plant was installed under the direction of the Pennsylvania which is the senior road and has charge of the maintenance and operation.

Plant Extends Over Large Area

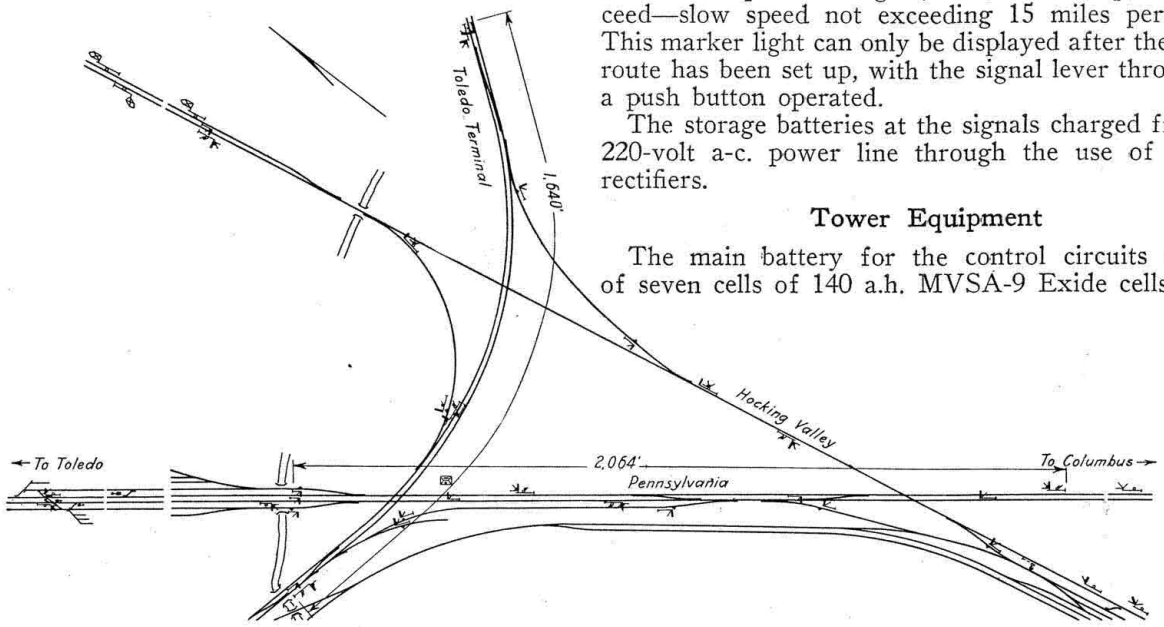
This interlocking is scattered over an extensive area, the distance between the home signals on the Terminal Railway being 1,640 ft. and on the Pennsylvania, 2,064 ft. On account of the fact that the signals and switches were so widely scattered, it was decided that the use of lead-covered cables in underground ducts would be too expensive to be used for the distribution of the wires. It was therefore, decided to use aerial cables supported by standard messenger wire attached to wood poles at a point about 15 ft. above the ground. Where the existing pole line could be used, a stub pole about 15 ft. high was set midway in each span. Three-eighth inch stranded messenger was then strung on these poles,



Interior of instrument case at one of the home signals

using brackets on the stub poles and short crossarms on the main poles. Cable ring or carriers were used to support the cables.

The control wires in these cables are No. 14 and No. 9 solid copper with 5/64 in. Kerite insulation, the entire cable being wrapped with tape and covered with braid. The main cables include as high as 129 wires made up of 37 conductors, and No. 9 wire used in separate cables



Plan showing the extent of plant—Three crossings but no derails

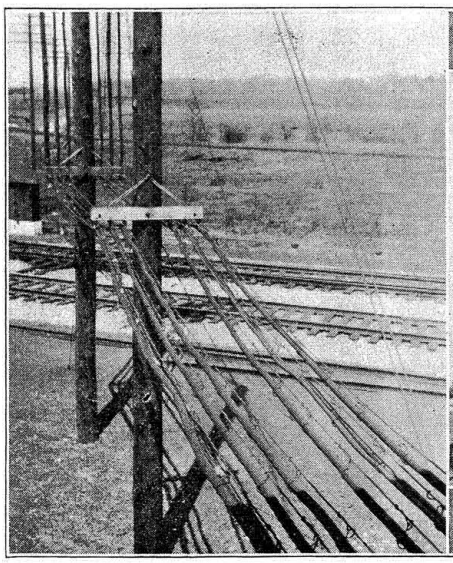
for d-c. busses. The 220-volt a-c. circuit for distribution over the plant is carried in weatherproof line wire, No. 6 or 10 as required. The cables are brought down on a messenger to enter the rear of the wood relay cases through large insulating porcelain tubes. The wires terminate on porcelain-based terminals mounted in the case. From the relay cases to the switches or signals, the single conductor insulated wires are run in wood trunking. The line cables extend into the tower and are terminated on porcelain based terminals in the enclosed cabinets. All relays in the tower are housed in sheet-metal cabinets with glass doors. All track circuits operate on 25 cycle a-c., with Model TV 30 and SLV 13 vane-type relays. The high and dwarf signals are of the position-light type and are normally lighted from the commercial a-c. power. When there is an interruption in the power, the signals are lighted from storage battery by means of a power-off relay. In order to keep trains moving when there is an interruption of the track circuit, a marker light displayed 7 ft. below the top row of lights, indicates—"stop, then proceed—slow speed not exceeding 15 miles per hour." This marker light can only be displayed after the proper route has been set up, with the signal lever thrown and a push button operated.

The storage batteries at the signals charged from the 220-volt a-c. power line through the use of Balkite rectifiers.

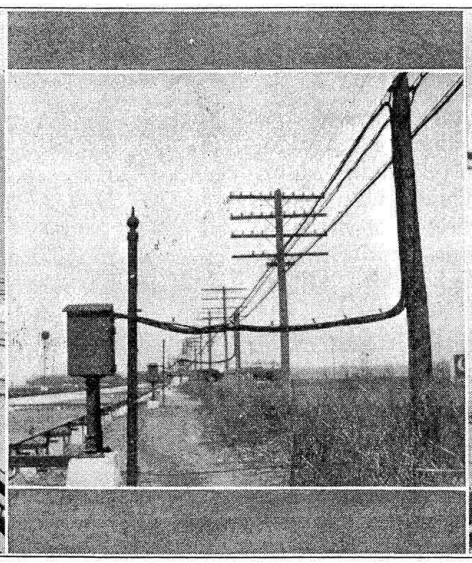
Tower Equipment

The main battery for the control circuits consists of seven cells of 140 a.h. MVSA-9 Exide cells. This battery is charged by Union rectifier requiring a constant floating charge of 2 amp.

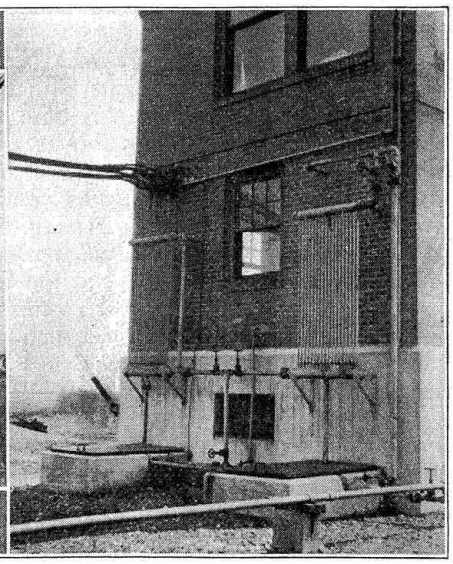
Two motor-driven air compressors, each of 52 cu. ft. per minute capacity, are provided. Each machine is used on alternate days to supply the air for operating the electro-pneumatic switches. The machines are controlled automatically to hold the air pressure between 65 and 75 lbs. A 6,600-volt, 25-cycle, 3-phase power line carries power to the plant where it is transformed to 220 volts for operating the air compressors, lighting the signals, and charging the batteries. In case of



Cable lead from the tower going north

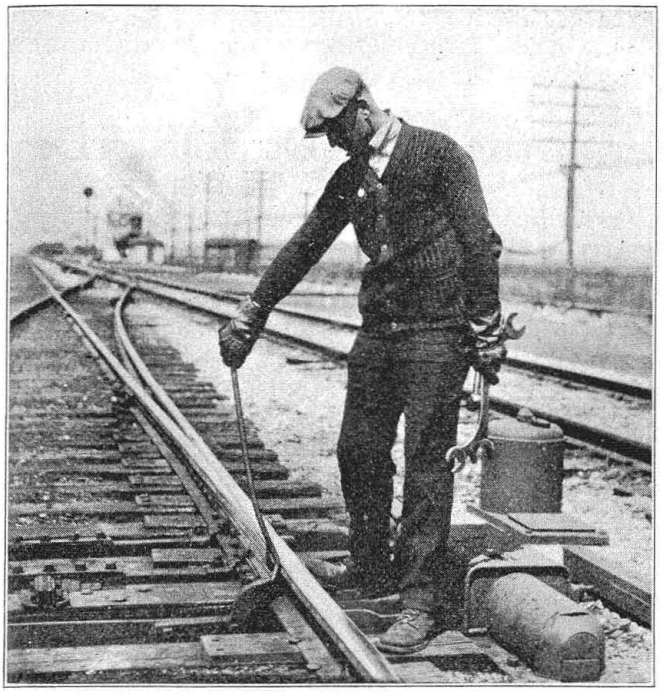


Cable drop from line to box



Aerial cable lead carried through wall of tower

power failure air can be supplied by a locomotive, a special connection being provided for this purpose. Air for operating the electro-pneumatic switches is supplied through a two-inch iron pipe line, supported on concrete



R. J. Walimire, maintainer, testing the adjustment of a switch

foundations about 10 ft. apart. The cross runs to the switches are 0.75-in. galvanized pipe.

The plant is maintained by two men on a day and night assignment, covering eight-hour periods between 7 a.m. to 11 p.m.

I. C. C. Report of Rear-End Collision at Danville, Ky.

ON April 10, 1928, there was a rear-end collision between a passenger train and a light engine on the Southern at Danville, Ky., resulting in the death of 1 employee, and the injury of 17 passengers, 3 employees, 2 Pullman porters, and 1 dining car employee. An abstract of the report of the Bureau of Safety of the Interstate Commerce Commission covering this accident follows:

This accident occurred on a double-track line over which trains are operated by time-table, train orders and an automatic block-signal and automatic train-control system. The accident occurred within yard limits at Danville, at the south end of what is known as the north yard, on the lead track at yard track 2. The lead track branches off the northbound main track toward the northeast, while yard tracks 1, 2, 3, and 4, numbered from west to east, extend northward from the lead track. Yard track 2 connects with the lead track at a point 297.4 ft. from the switch connecting the lead track with the northbound main track, this being the main-track switch involved in this accident. At a point 18 ft. south of this main-track switch there is another switch, the north switch of a crossover, which connects the two main tracks.

The signals involved are northbound signals 1172 and 1176, located 557 and 2,430 ft., respectively, south of the lead-track switch. Signal 1172, operates in the stop and caution positions only. Signal 1176 is of the three-position, upper-quadrant, semaphore type. The automatic train-control device is of the intermittent inductive type, known as the auto-manual automatic stop.

At the time of the accident light engine 1307, headed north, stood on the lead track. Work extra 6272, consisting of engine 6272, headed north, stood on the southbound main track, opposite signal 1172, the engine being about 100 ft. south of the south crossover switch and the caboose about 100 ft. south of the signal. The weather was clear at the time of the accident, which occurred at about 5:15 p. m.

Northbound passenger train No. 42 passed signal 1176, which was displaying a clear indication, passed signal 1172, the indication of which is in question, entered the main-track switch leading to the south end of the north yard, this switch having just previously been opened by Brakeman Paul of work extra 6272, and struck the rear end of the tender of light engine 1307 while traveling at a speed variously estimated to have been from 20 to 40 miles per hour. With the exception of the rear truck of the combination car, none of the equipment of train No. 42 was derailed. The employee killed was a hostler helper on engine 1307.

Summary of the Evidence

The engineman of train No. 42 stated that approaching Danville he received a clear indication at signal 1176 and as he approached signal 1172 it was in caution position; these indications were also called by the fireman. Approaching signal 1172 he made the air-brake application and when the engine was about one car-length from signal 1172 he released the brakes, the speed having been reduced to about 30 or 35 miles per hour; he operated the acknowledging lever to acknowledge the caution signal indication and forestall the operation of the automatic stop. The first knowledge of anything wrong which he had was when he felt the engine swerve as it entered the open switch; he immediately applied the air brakes in emergency but thought the speed had not been further reduced at least to any extent, prior to the accident. The engineman at first said that his engine was about four or five car-lengths south of signal 1172 when he remembered looking at it the last time; he said that the signal indication could have changed to stop if the switch was opened between the time he last saw the signal and the time the engine passed it, but the time was very short and he was of the opinion that the main-track switch was not opened until after his engine passed signal 1172. Engineman Bradley later said that signal 1172 displayed a caution indication when he started to move the forestalling lever down while the engine passed over the track inductor.

The head brakeman of work extra 6272 stated that when his train left Danville he remained there with instructions to flag all trains until the return of his train. When he saw the work train returning to Danville, Brakeman Paul called the yardmaster by telephone and received instructions to put the work train on the coal track in the north yard; nothing was said about train No. 42 and he did not tell the yardmaster his train was on the southbound track. He immediately left the telephone booth and walked about 50 ft. to the switch connecting the northbound main track with the lead track and opened it, then he walked to the north switch of the crossover, 18 ft. south, and opened that switch, after which he started toward the south switch of the crossover, intending to open that switch. After reaching a point about 30 ft. south of the north switch of the crossover he saw train No. 42 approaching,