Railway Signaling

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Electric Plant on N. Y. C. Replaces Two Mechanical Plants

Plant spread over extensive area—Derails, parkway cable and telephone system are features of installation

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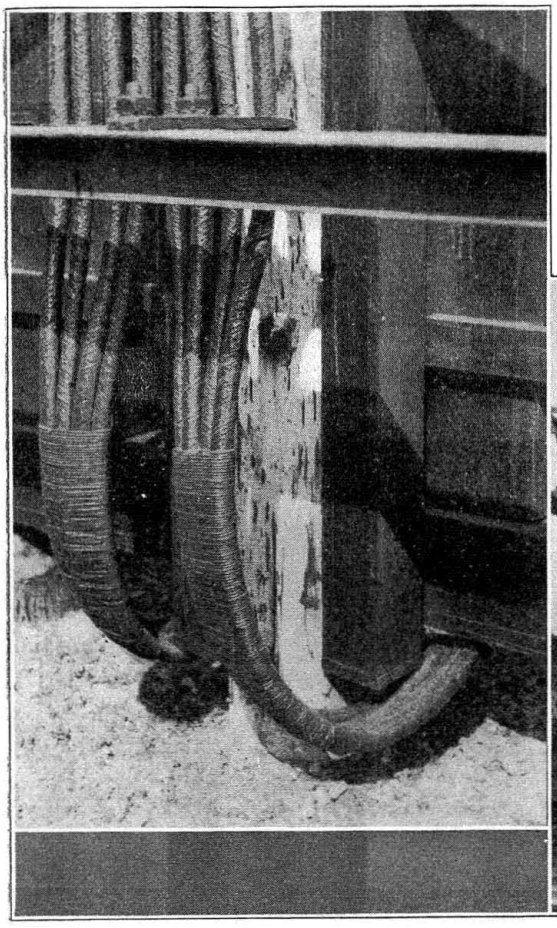
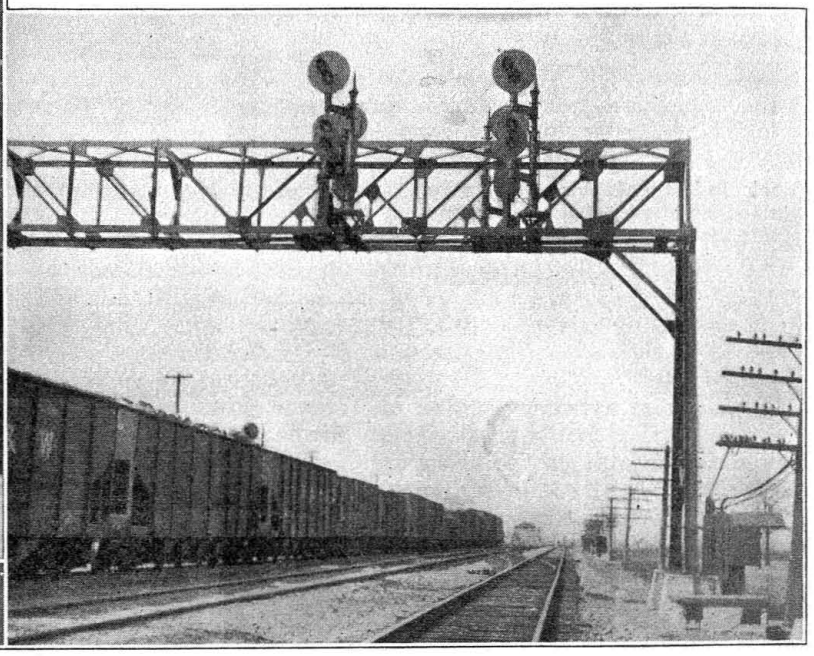




Parkway cable is carried out through the bottom of the relay cases at the bridges and then run up the bridge to the signals

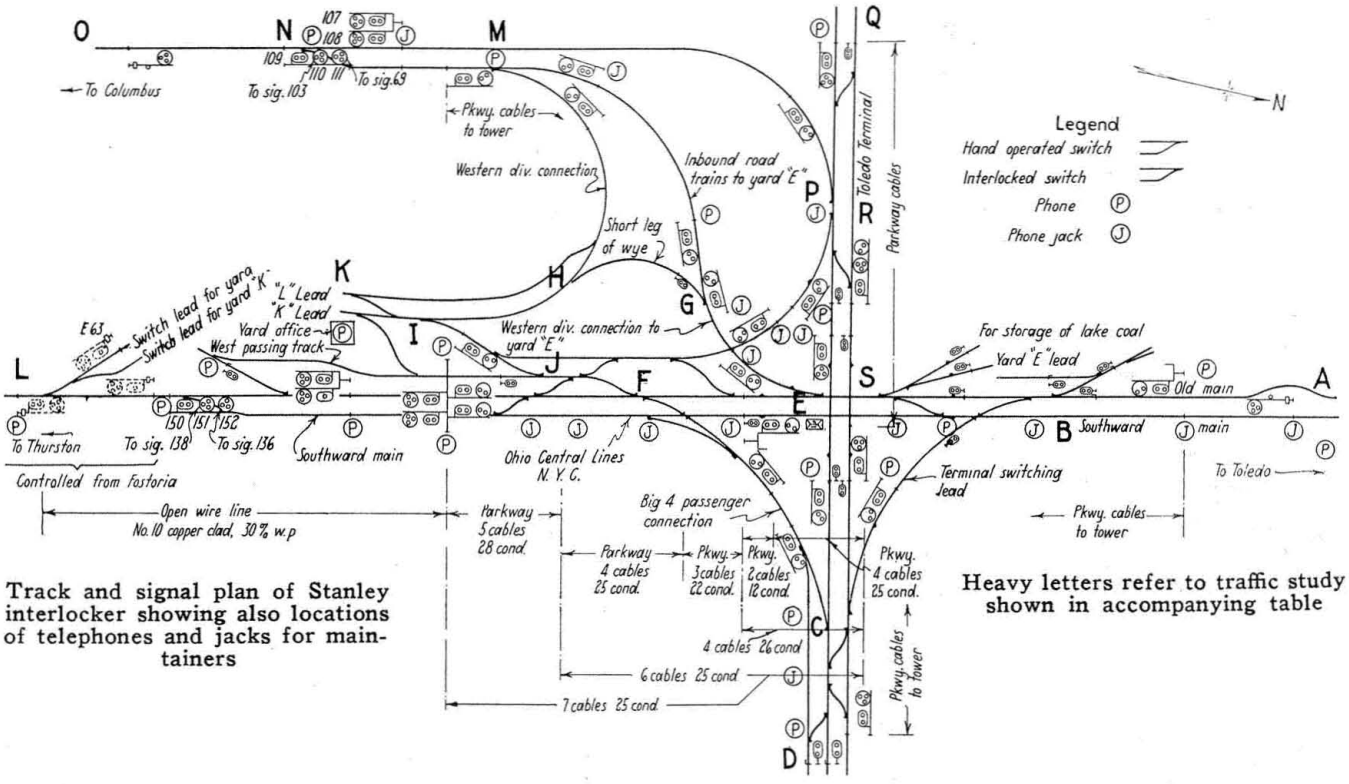
THE Ohio Central Lines of the New York Central has recently placed in service a 152-lever electric interlocking (130 working levers, 22 spare spaces) at the crossing of the Eastern subdivision with the Toledo Terminal railway at Stanley, Ohio, near Toledo. In addition to protecting the crossing, this plant also includes numerous switches and connections, for this is also the junction point of the Western subdivision of the New York Central (Ohio Central Lines) via Columbus, Ohio. New York Central (Ohio Central Lines) and Big Four passenger trains which operate over the Eastern subdivision of the Ohio Central Lines leave their own lines at Stanley to enter on the tracks of the Toledo Terminal railway enroute to Toledo and Detroit, Mich., and these movements require several crossovers and connecting tracks. Large yards and terminal facilities are located both north and south of Stanley, and the several yard lead switches and wye switches are also connected into this plant. This plant replaces two mechanical plants which heretofore controlled crossings and connections between the Eastern subdivision and Toledo Terminal railway at Stanley, and similar crossings and connections between the Western subdivision and the Toledo Terminal railway at Hickox. The track layout was rearranged and enlarged and the Hickox plant eliminated.

The interlocking is the all-electric type of the General Railway Signal Company. The machine is the Model-2, unit-lever type, and the switch machines are the Model-5A. The high signals are color-light triangular type with 8⅜-in. doublet lenses, and the dwarf signals are color-light vertical type using 5⅜-in. lenses with 10-volt, 18-watt lamps.

The usual 110-volt General Railway Signal control circuits (dynamic indication) are used for switches. Color-light signal control circuits are 12-volt, with battery indication. The battery for signal lighting is located adjacent to each signal, all of which are approach lighted. Route locking and "SS" control are in use throughout. Signal repeater lights are used and are

located at the interlocking lever. For switches and derails, red cross-protection lights are located at the interlocking lever.

The striking feature about this new plant is that the switches and signals are scattered over an extended area; for example, the northward home signal No. 111 on the Western division of the New York Central is 5,200 ft. from the tower and the northward home signal on the Eastern division is 5,600 ft. from the tower.



Track and signal plan of Stanley interlocker showing also locations of telephones and jacks for maintainers

Heavy letters refer to traffic study shown in accompanying table

As a matter of economy in first and annual costs, it was decided that the most satisfactory method of wire distribution was to use parkway cables, except where line wire or aerial cables are shown on the plan. Two terminal inlets were constructed on the outer wall of the tower and the cables extend from the relay racks on the ground floor through these inlets direct to the terminals in the relay cases located in the vicinity of a group of signals, or switches, or to the switch machine unit as the case may be. Parkway cables are also used from the relay cases to the switch machines and signals. At switch locations the cable comes up out of the ground with an easement angle to prevent vibration of the switch machine from breaking the wires in the cable. At the ground line the cable passes through a cast-iron soil pipe, and compound is poured around the cable to seal it in. At the point where the cable enters the switch machine the cable is held in an insulated iron clamp and sealed in with compound. Parkway cables run up the outside of and are clamped to the signal masts.

Parkway Cable Used Almost Exclusively

When installing parkway cable a trench was dug about two feet below the level of the bottom of the rail, a bed of white sand 4 in. thick was thrown in the trench and the cables laid on this bed; and, after the cables were in place, 4 in. of sand was thrown on top before filling the trench with dirt. This method of installing cables has been found to be an effective means of preventing cinders and dirt from coming in contact with the metal covering of the cables, which might cause deterioration of the protection and, ultimately, damage to the insulation. At the ends of parkway cables the formed conductors are taped with friction tape and given a coat of insulating paint, the tape and paint extending down over the end of armor and jute on the cable. This arrangement seals off moisture from entering the lead casing of the parkway cables.

Different cables contain different numbers and sizes of wires, depending on the requirements for each location. Signal control and operating circuits are No. 14 solid copper, and switch control wires are from No. 14 to No. 9, depending on the distance from the tower to the switch. Switches one mile away are operated over No. 9 wires. The maximum number of wires in a cable is 49. The cables are made up of rubber-insulated wire, covered with tape, a layer of jute, two wraps of steel tape and an outside covering of impregnated jute (New York Central electrical department specification). A total of 140,610 lineal feet of parkway cable, 12,800 ft. of aerial cable and 115,500 ft. of weatherproof line wire were used on this plant. All cables were made by the Hazard Wire Works of the Okonite Company and the Rome Wire Company.

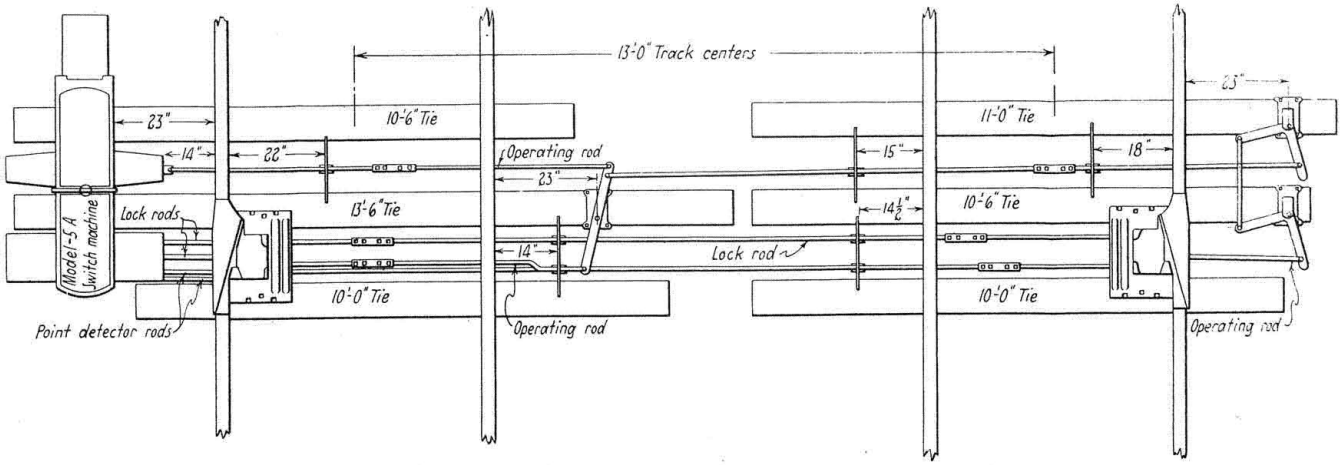
Tandem Derail Operation

Derails are used on each main track, 300 ft. from the crossing and also on each connecting track and yard track leading to a main running track. Model-HP, Size-6, Hayes derails are used in all cases. On the double track the derails for both tracks are the same distance from the crossing, and, in order to reduce the number of switch machines required, these two derails are, in each case, pipe-connected together and operated in tandem by one switch machine.

The main 110-volt power battery consists of 57 cells of Exide Type-EMG7 lead-type storage cells of 120-a.h. capacity. This battery is charged by a special New York Central tungar bulb rectifier on a floating charge of about 2 amp. A 12-volt battery consisting of 6 cells of 250-a.h. battery is provided for control and lock circuits. This battery is charged by a special New

York Central tungar bulb rectifier. Electrolytic ampere-hour meters furnished by the E. A. Lundy Company are provided to indicate the state of charge of these batteries.

A 10-volt battery of five Exide Type-EMG7 storage cells of 120-a.h. capacity is provided at each signal location to furnish power for the signal lamps and also control relay circuits as necessary. This battery is charged by a Union rectifier of suitable capacity so that the battery may be recharged without unusual delay if it should become discharged. One cell of storage battery of 120-a.h. capacity is furnished for each track circuit, a rectifier being used for charging each cell. All storage cells being of the sealed-glass jar type, they are housed in crates without the sand trays.



Sketch of the rods for operating two derails by one machine

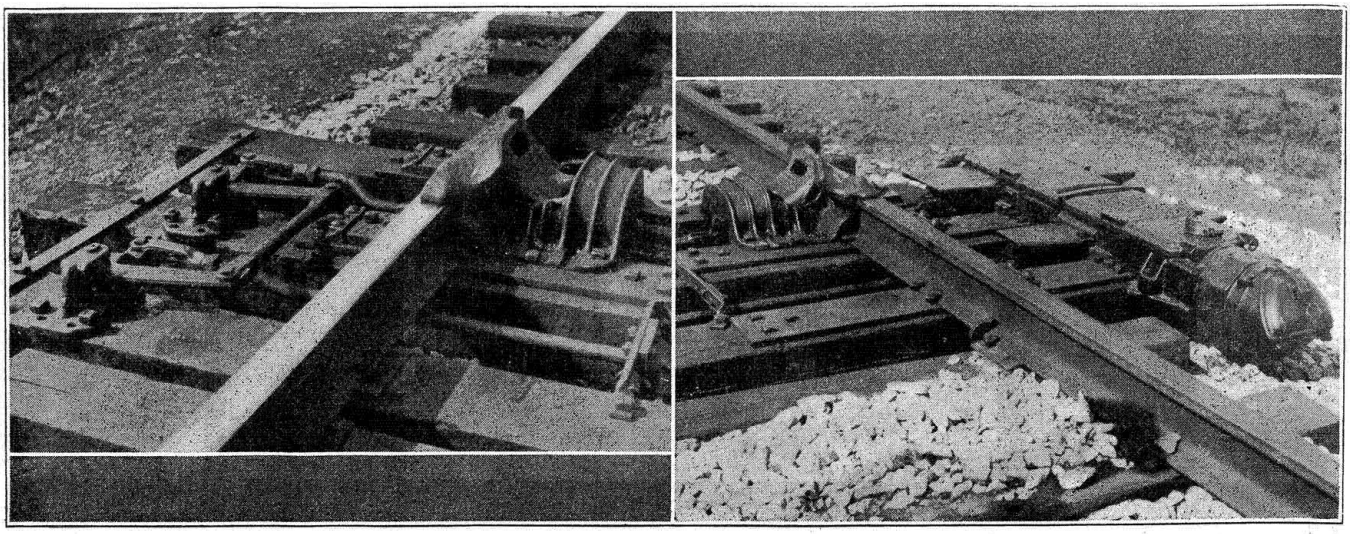
Special Features in Tower

The 110-volt a-c. feed circuit is carried to each relay case location in a separate cable of two No. 8 wires. Power at 110-volt, 220-volt, 60-cycle, single-phase is furnished from the railroad mechanical department substation about ½ mile south of the tower and is delivered at the tower at 2,200 volts, where it is reduced through a 2,200/220-volt step-down transformer. The main battery is of sufficient capacity such that a-c. power may be shut off about three days and the plant continue to operate.

A three story brick-concrete fire-proof tower is used. The relay room in the tower is immediately below the interlocking machine. All the relays are of the wall type and are mounted on wooden frame relay racks of New York Central standard.

In order to facilitate the wiring of the machine, as well as the maintenance and inspection later, a sheet metal pit, 30-in. wide, centering with a slot in the concrete floor and high enough for a man to stand in, extends underneath the full length of the machine. A steel door at one end provides access to the passageway and this door is kept locked, the maintainer being the only person on the job with a key. The pit may be entered from the machine floor or from the relay room below, through the metal doors provided.

An important feature of this installation is the large illuminated track diagram which informs the leverman of the location of all trains, which information is necessary because of the fact that the plant is so scattered. This diagram which was constructed in the signal department shop, at Elkhart, Ind., is 9.5 ft. long and 6 ft. high. The face of the illuminated track diagram is made of asbestos board ⅜ in. thick, over which is glued a white print of the track diagram, which print is colored to show the various track sections. The diagram, has a coat of white varnish which serves not only to prevent fading, but also materially assists in



Derails on double-track are pipe-connected together and operated in tandem by one switch machine

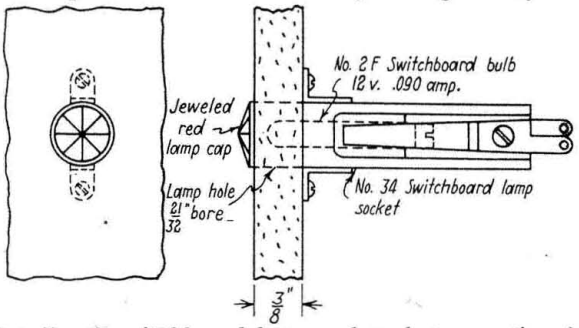
keeping it clean. Western Electric No. 34 switchboard type lamp sockets are used in the diagram and are mounted on the back of the asbestos board. Jeweled lamp caps, Western Electric Type-4B, are inserted in the holes flush with the face of the asbestos board, Western Electric No. 2F switchboard lamp bulbs are

View looking from tower along Belt Line with derails in foreground

used, operating at 12-volts, 0.09 amp. The frame of the diagram is made of angle iron, the sides and ends of sheet metal, the front being asbestos board.

Telephone System

As shown on pg. 320, pole box telephones for the use of trainmen and maintainers are located at various important points throughout the limits of the plant as designated by the letter *P*. These telephones are all connected to what might be known as a "party line," terminating in a loud-speaker on the operating floor of the tower. At points marked *J*, Crouse-Hinds weather-proof telephone jacks for maintainer's use are located on the bottom of relay boxes. The SC weather-proof telephone jacks are also connected to the plant telephone line above described. Each maintainer is supplied with a portable telephone for communicating with the tower when at a location not provided with a regular telephone. He plugs into one of these jacks and talks to his helper or to the towerman by calling him by name,



Details of switchboard lamp and socket mounting for illuminated track diagram

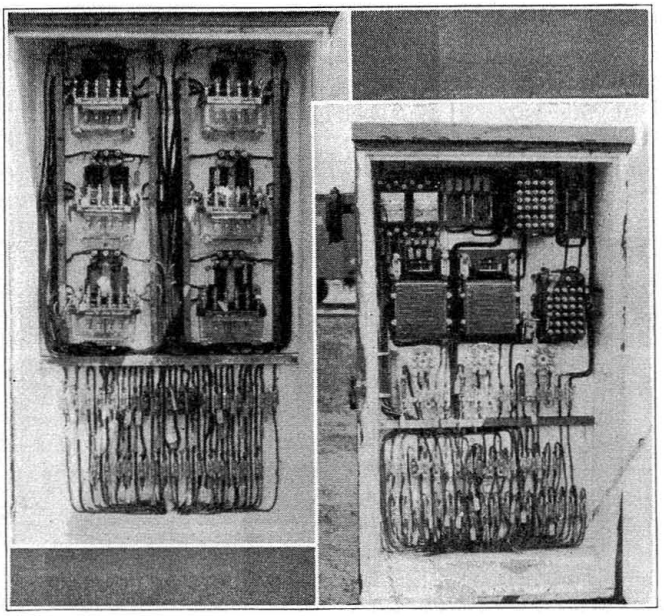
no ringing being necessary as the loud-speaker answers the purpose.

Pole-box telephones are mounted on the same posts with relay boxes, where possible. Where a relay post mounting is not available, a separate concrete post is used for the telephone pole box. Spare conductors in No. 14 gage signal cables are used for the telephone lines and connections. The conductors and signal cables are those known as "straight" (not twisted) pairs. Outside the territory in which conductors are available, fic chart (pg. 323) shows approximately the make-up, of aerial wires on a signal cross-arm. Lightning arresters on these telephone cable circuits are used only where aerial lines connect to parkway cable.

Owing to the length of the interlocking machine, the operator or towerman carries a head set which he may plug into a telephone jack at any of the several locations along the front of the interlocking machine, at which points switchboard type transmitters are suspended.

Method of Operation

The entire plant is handled by three operators, one on each trick and three maintainers. There were formerly at the two plants, and during the period when the new plant was under construction, six operators, nine switch tenders, and one maintainer. The traffic table (p. 323) shows approximately the make-up, number of trains and engine movements per day. Northward freight trains from the Eastern subdivision ordinarily head in at the Bucyrus end of the new yard marked *K*, and southward trains to this division depart the same way. Northward freight trains from the



The relays and rectifiers at signals and switches are housed in wooden cases

Western subdivision enter the new yard marked *K* from points *H* and *N*, thus arriving in this yard headed south. Western subdivision freight trains headed southward, depart by the same route.

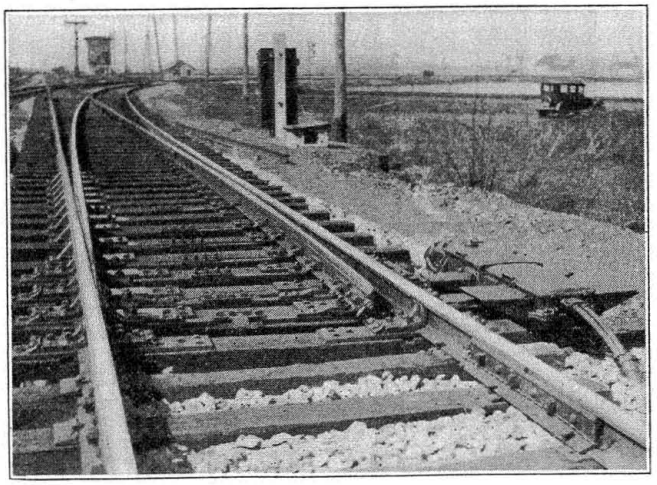
"Puller" runs from the yard marked *K* to the various connections, operate over the Toledo Terminal railway tracks marked *Q* and *D* reaching these tracks through the various connections shown. The movement of lake coal to the docks is in the direction marked *A*, either direct from the Eastern or Western subdivisions or from the new yard marked *K*.

From 10 to 12 passenger trains per day to and from Toledo and Detroit operate through the route marked *D, C, F* and *L*, whereas 6 passenger trains per day operate through the route marked *D, C, R, P* and *N*. All train movements in the plant other than those above described are yard cuts and light engines. Light engine movements are generally from the yard marked *K* to enginehouse *A*. Engines are turned as required from time to time on the short wye marked *GHM*.

No train orders are used for trains on the Eastern subdivision as this is the territory on which regular train orders and manual block were eliminated owing to the substitution of the centralized dispatching system, which was placed in service July 25, 1927. On the Western subdivision, manual block and written train orders are in use. The northward manual block ends at Signal No. 111 and the southward block begins at Signals No. 107 and No. 108. The operator at the yard office keeps the manual block sheet and notifies the towermen at Stanley what block indication to display at Signals No. 107 and No. 108. The towerman in turn reports to the operator when northward trains clear the block, reading this information off the illuminated diagram. The towerman operators are required to handle a few train orders for passenger trains moving past the tower enroute to the Western subdivision (Columbus line), and other than this, they have very little wire work. The Toledo Terminal railway operates right-hand running on double track and train orders are practically eliminated.

TABLE A—ECONOMIC ASPECTS OF NEW STANLEY INTERLOCKER

	Credit	Debit	
A—First cost			$211,000
B—Annual operation (as compared to former arrangement)			
1. Increased maintenance and repair, labor and material, including long term renewals		$10,897	
2. Savings made			
(a) Train-hours saved (101 freight trains daily, three minutes delay saved per train, at $14 per hour	$25,650		
(b) Engine-hours saved (65 light engines daily, one minute delay saved per engine, at $10 per hour	2,920		
(c) Wages saved account eliminating three operators and nine switch tenders	21,751		
(d) Reduction in passenger train delays (16 trains daily)			
Total	$50,321	$10,897	
3. Annual saving	$39,424		
C—Return on investment (not including fixed charges), per cent			18.7



The use of parkway cable results in the elimination of trunking

In addition to the information the towerman receives from the plant telephone line as to the movement of trains and from the illuminated diagram, the approach of eastward trains on the Toledo Terminal line is made known by an automatic train annunciator. The movement of westward trains on the Toledo Terminal is indicated from the next tower about 1¼ miles eastward. Southward trains on the New York Central from the line to the dock and engine terminal are announced by the switch tender about ½ mile north. Northward trains on the Eastern subdivision are announced by the central dispatcher at Fostoria and northward trains on the Western subdivision are announced by the next manual block station south, all notification being by telephone. An effort was made to eliminate all unnecessary wire and message work at this tower so that the towerman would be free to operate the plant, otherwise it would have required more operators.

The Toledo Terminal railway permits operations on its tracks with crews of many of the connecting railroads. The crews of a number of these other roads operate through this interlocking plant at Stanley, and at times use routes other than the main routes of the Stanley plant. In order to take care of this condition in connection with the new interlocking plant, arrangements were made before placing plant in service, to distribute colored etchings of a type similar to the plan shown on pg. 320. These were issued to all roads in sufficient quantities so that copies could be given to each member of every train crew involved. After this distribution, schools were conducted and men examined and instructed to make certain that they understood the operation. This plan was found to be worth while, because the plant went into service as smoothly as contemplated, and has since operated almost 100 per cent as far as signal obedience by train crews is concerned. The plant was installed by railroad forces under the general direction of F. B. Wiegand, signal engineer, Cleveland, Ohio, and under the immediate supervision of O. Falkenstein, supervisor of signals, Ohio Central Lines. Telegraph department work, also line work for the signal department, was installed under the direction of R. F. Finley, superintendent of telegraph.

TRAFFIC DATA RELATING TO MOVEMENTS THROUGH STANLEY INTERLOCKER

Freight		
D to *A* (via *C* and *B*)	1 train,	24 cars
A to *D* (via *B* and *C*)	1 train,	24 cars
D to *Q* (via *C. S. R.* and *P*)	10 trains,	285 cars
Q to *D* (via *P. R. S.* and *C*)	16 trains,	499 cars
L to *A* (via *J. F. E. S.* and *B*)	2 trains,	128 cars
K to *Q* (via *C. F. J.* and *I*)	3 trains,	180 cars
Q to *K* (via *P. R. F. J.* and *I*)	3 trains,	176 cars
D to *K* (via *C. F. J.* and *I*)	12 trains,	518 cars
K to *D* (via *I. J. F.* and *C*)	12 trains,	568 cars
O to *A* (via *N. M. G. E. S.* and *B*)	2 trains,	102 cars
O to *K* (via *N. M. H.* and *I*)	4 trains,	255 cars
K to *O* (via *I. H. M.* and *N*)	10 trains,	586 cars
Total	76	
Passenger		
D to *O* (via *C. S. R. P.* and *N*)	3 trains,	14 cars
O to *D* (via *N. P. R. S.* and *C*)	3 trains,	13 cars
D to *L* (via *C. F.* and *J*)	5 trains,	36 cars
L to *D* (via *J. F.* and *C*)	5 trains,	36 cars
Total	16	
Yard Engines		
Toledo Term. Engs. *K* to *D* (via *I. J. F.* and *C*)	8 trains,	104 cars
N. Y. C. Engs. *D* to *K* (via *C. F. J.* and *I*)	8 trains,	138 cars
K to *A*	5 trains,	325 cars
A to *K*	trains,	325 cars
Total	25	
Light Engines		
A to *K*	23	
K to *A*	24	
D to *K* (via *C. F. J.* and *I*)	8	
K to *D* (via *I. J. F.* and *C*)	8	
Total	63	