Automatic Plant With Derails

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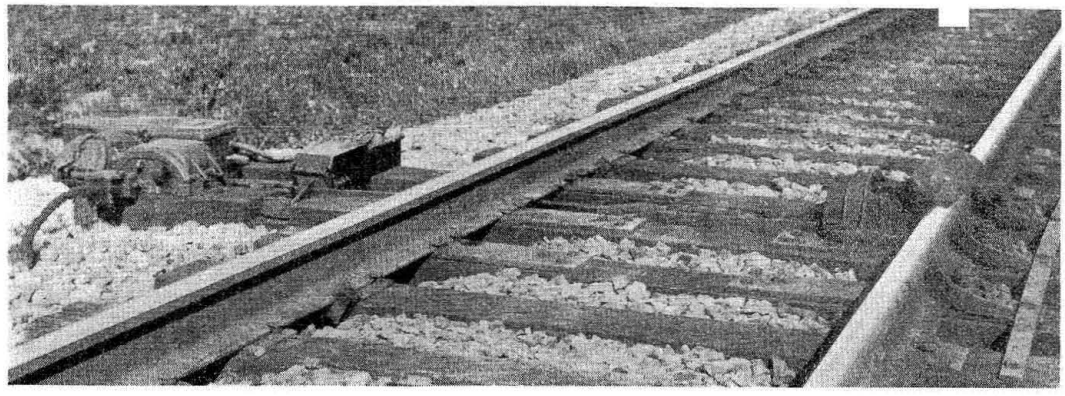


A dual-control for derails and several unique control features developed on job

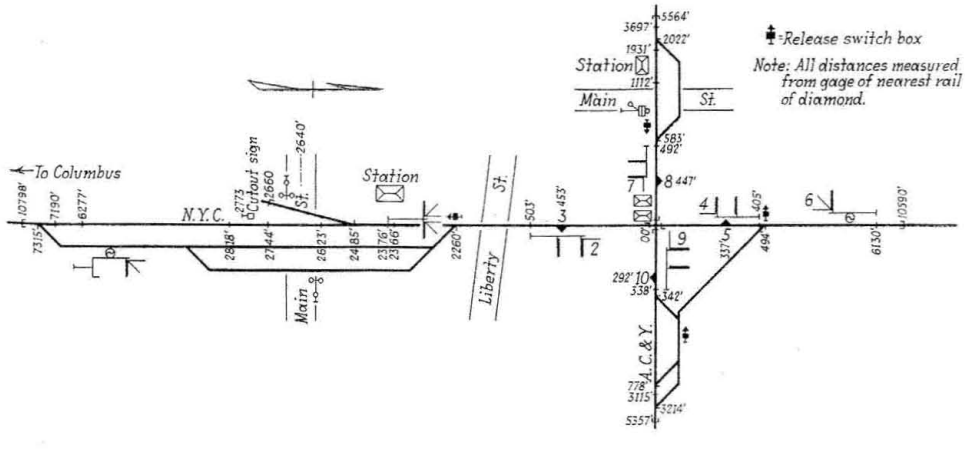
AT ARLINGTON, Ohio, the single-track line of the Ohio division, New York Central, crosses the single-track line of the Akron, Canton & Youngstown. The A. C. & Y. operates two mixed and four freight trains over this crossing daily, while the average traffic on the New York Central includes six passenger trains, two local and 12 through freight trains daily. The lading handled on the A. C. & Y. is general merchandise, while on the N. Y. C., in addition to merchandise, a large percentage of the lading is coal moving north from mines in southern Ohio and West Virginia.

Formerly protection was afforded at this crossing by a mechanically operated target signal which was set normally for N. Y. C. movements. All trains were required to make the safety stop before crossing, the A. C. & Y. trainmen operating the signal for a movement on their line, and then after passing over the crossing, restoring the signal for the N. Y. C. moves. In order to increase efficiency, promote safety and effect economy, the installation of an automatic interlocking, without derails, was contemplated. The Ohio Public Utilities Commission, however, insisted on the use of derails. The interlocking, as installed, and as approved by this commission, has not only home signals on the A. C. & Y. and home and approach signals on the N. Y. C., but also derails of the lift type on both lines.

The Problem

The use of main track derails, along with the location of passing sidings, industrial tracks, interchange tracks and highway crossing protection, all of which are in the approach of interlocking home signals, made the problem of designing the plant more complicated than that involved in a simple grade-crossing layout. All signals are of the color-light type, the aspects being in accord with N. Y. C. standard. Approach signals are in use on the N. Y. C. but on account of slow speed, good view, etc., no approach signals were installed on the A. C. & Y. The home signals are two-position, having a marker unit mounted vertically under the main unit, which designates it as an absolute signal. The approach signals are three position, having a marker unit mounted diagonally under the main unit, which designates it as a "Stop and Proceed" signal. The marker lights indicate red only. The home signals are located from 338 ft. to 503 ft. from the crossing and from 45 ft. to 68 ft. from the derails; the approach signals are from 5,725 ft. to 5,774 ft. from these home signals; and the derails are 292 ft. to 453 ft. from the crossing.

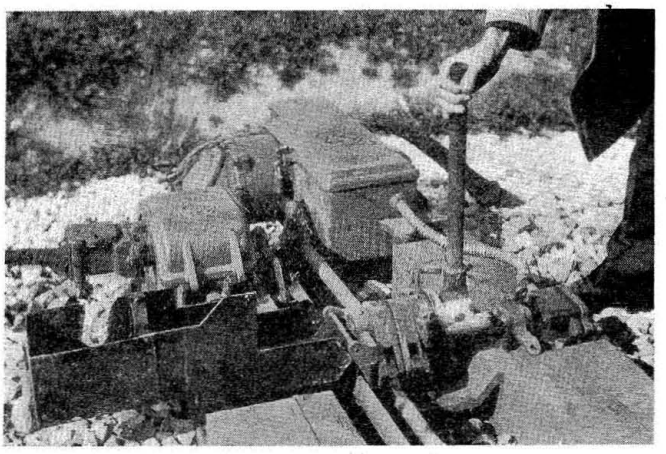
The derails are of the Hayes type and are each operated by a motor-driven machine similar to the skate-placing mechanism as ordinarily used in classification yards. This mechanism is modified somewhat to meet



Track and signal plan of the Arlington automatic interlocking

conditions, and an emergency operating stand, a device designed for this installation, can be used in an emergency to operate the derail by hand. This emergency operating stand, in effect, performs the same function as a dual-control mechanism used with a G. R. S. Model-5B switch machine. The purpose of this new device is, of course, to provide some means for trainmen to operate the derail by hand in case of a failure of the battery supply or control circuits.

This emergency operating stand includes a hand-throw lever so arranged and connected with the derail machine operating rod, that when this lever is operated the control of the derail is transferred from the machine to the hand-throw lever, or from the lever to the machine. The



Derail machine, illustrating dual-control in use

device consists, in brief, of two cranks with concentric bearings, the inner bearing shaft being connected with the outer bearing shaft when the operating handle is in the normal position, i. e., lying down in a line with the axis of the main bearings. When a trainman raises the handle to the position as shown in the illustration, the two cranks are disconnected and the crank, to which the derail operating rod is connected, can be operated only by the handle. The small cast-iron box, as shown on the tie near the trainman's foot, is a circuit controller which is operated by the hand-throw lever when in the normal position. Movement of the hand-throw lever from the normal position opens the circuit for feeding the machine motor, and also the control circuits for all home signals. After the train has passed the trainman operates the hand-throw lever to return the derail to normal position, he then lowers the lever to the horizontal position and places the two split hasps around the handle and locks them in place with a regular switch padlock. The sheet metal cover, shown thrown to the left, is then swung down in place which completes the operation.

No Directional Preference

The control arrangement for this automatic interlocking provides no directional preference. Assuming that no other trains are occupying the plant or approach circuits, a train approaching the crossing, automatically starts lining up the route when it enters the clearing circuit. The first move is the operation of the derails to the reverse position, i. e., off the rail, this operation requiring about two seconds. When this operation is completed, and if the signals on the opposing road are at stop and the derails on that road in the normal position, i. e., in the derailing position, then the signal control circuits are established and the indication of home signal for the on-coming train changes to the green, after which, where an approach signal is used, the approach signal displays a green indication, except where a train-order manual-block signal is located between the home and approach signal, in which case the train order signal also must be in the proceed position before the approach signal can display green.

Time locking is not provided; therefore, a route for a train is held as long as the train is on the approach section, unless a release switch is operated by a trainman, or the clockwork release is operated by a trainman of the other road.

Special Releases

On account of the fact that switches for passing sidings, industrial tracks and interchange tracks are located in the approach sections or between the approach and home signals, special release circuits were provided, release switches being located at certain points so as to be convenient for trainmen when making moves. The general design and operation of this system of releases is brought out clearly in the following abstract of the instructions issued to the trainmen.

When a train approaching the crossing does not desire to use the crossing on account of switching, or for other reasons, in order to allow trains of the other road to use the crossing, a trainman must operate the release switch at a point near where the first train stopped.

Release switches on the N. Y. C. are located as follows:

In a box on a post west of the main track opposite the switch at the north end of the passing siding.

In a box on a post on the west side of the main track opposite the switch at the N. Y. C. end of the interchange track.

Release switches on the A. C. & Y. are located as follows:

In a box on a post north of the passing track east of the crossing opposite the switch of the passing track end of the west crossover.

Stenciled on the door of these boxes containing release switches are the words "Release Switch," and each box is locked with a switch padlock. The operation of a release switch should be as follows: Push the lever up and leave it in this position until the train is ready to proceed over the crossing, then pull the lever down, close the door and lock the box.

A N. Y. C. northward train holding the main track at the north end of the passing siding and meeting a southward train will, in order not to cause the southward train to receive a stop indication on the southward interlocking home signal, stop, with the head end of the engine or car south of the first street crossing south of the station opposite the sign reading "Cut Out," located east of the main track. While so stopped the flashing-light signals at this street crossing will not operate.

An A. C. & Y. westward train holding the main track at the west end of the passing track east of the crossing or an eastward train holding the main track at the east end of the house track west of the crossing to meet an opposing train, in order to eliminate a stop indication on the interlocking home signal governing the approaching train to be met, should operate the nearest release switch as follows: Push the lever up and leave it up until the rear end of the train to be met passes opposing the home signal, then pull the lever down, close the door and lock the box.

In order that a train or engine may make a reverse movement through the interlocking by signal indication, after having moved through an interlocking, will, after the rear of train or engine has passed the opposing interlocking home signal, providing no connecting railroad

train or engine is approaching or using crossing, operate the nearest release switch as follows: Push the lever up and leave it up three minutes; then pull the lever down, close the door and lock the box.

Stop-Signal Rules

An interlocking home signal indicating "Stop" may be passed only after complying with the following instructions which are posted in the relay house where the telephone is housed.

A. Note position of the indicator of the opposing railroad; if the disk is vertical it indicates that no train or engine is approaching on that line. If the disk is horizontal it indicates that a train or engine is approaching on the opposing line.

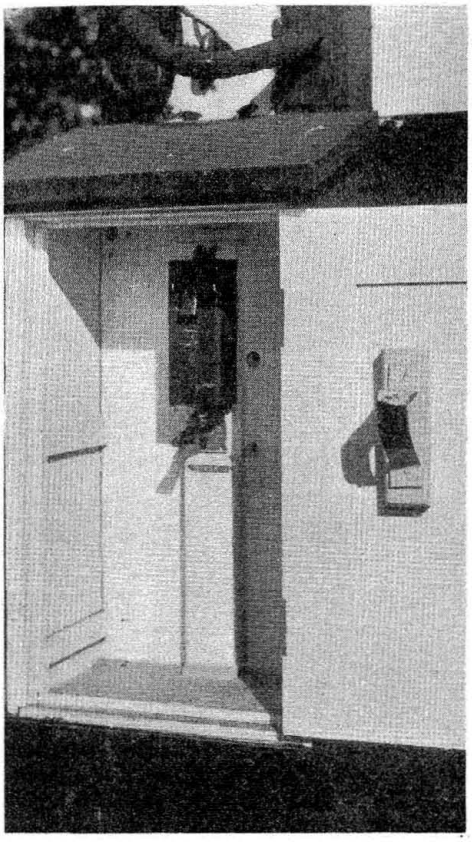
B. If the indicator shows that a train is approaching, ascertain whether the train is going to proceed over the crossing immediately, if not, after making sure that the train has come to stop in the rear of the interlocking home signal, proceed as outlined in Paragraph C and D below; if train or engine is going to proceed over the crossing immediately, wait until the rear end of the train or engine has passed the opposing interlocking home signal, proceed as outlined in Paragraphs C and D the interlocking home signal indicate proceed. If not, proceed as outlined in Paragraphs C and D below.

C. Unlock the cabinet containing the clockwork time release for the railroad desiring to use the crossing; turn the handle of the release to the right as far as possible; hold it in this position 10 seconds; let go of the handle and when the release runs down, that is, stops clicking, which will be about two minutes, wait about one minute and ascertain if the route has been set up and the signal indication changed to proceed; if not, repeat the same operation as above. If the route does not then set up and the signal indicates proceed, arrange to do as follows: Ascertain if the derails on the railroad desiring to use the crossing are entirely off the rail. If not, remove same by operation of hand-throw lever of the emergency operating stand. If the derails are found entirely off the rail, the hand-throw lever should be operated by pushing the lever sideways toward the track until at right angles with the track. The hand-throw lever should be left in the reverse position until the entire engine or train has completed the movement through the interlocker.

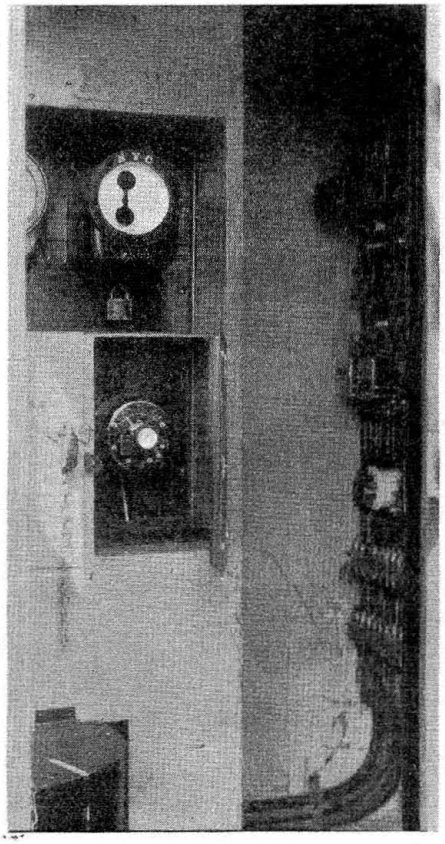
D. After the hand-throw lever of the emergency operating stand has been operated as outlined in Paragraph C, the trainman should return to the crossing and a hand signal should be given to the train to proceed over the crossing.

E. After the train has proceeded over the interlocking by use of the emergency operating stand, the N. Y. C. dispatcher should be advised regarding same.

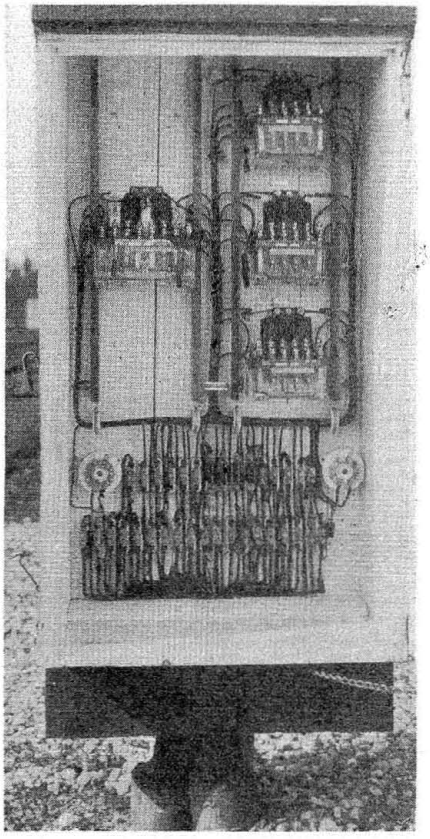
Except for the equipment located at the crossing, all relays, charging apparatus terminals, arresters, and release switches are housed in N. Y. C. standard wood boxes. Two reinforced concrete houses are located at the crossing, one being used exclusively to house relays and terminals, while the other has two rooms, the rear one being used to house the apparatus for charging the battery at the crossing. The outside door of this house opens into a room occupying about two-thirds of the house, this room being used for the approach indicators, clockwork releases and the N. Y. C. telephone, which can be cut in on the dispatchers or the block circuit. This room contains a stove so that this space can be used as a warming room during severe storms when it is necessary for sectionmen to be on hand at the interlocking to keep the derails free from snow. One Winter King heater is used under each derail to keep snow and ice



Bracket on inside of door forces handle of release down in case trainman neglects to do so



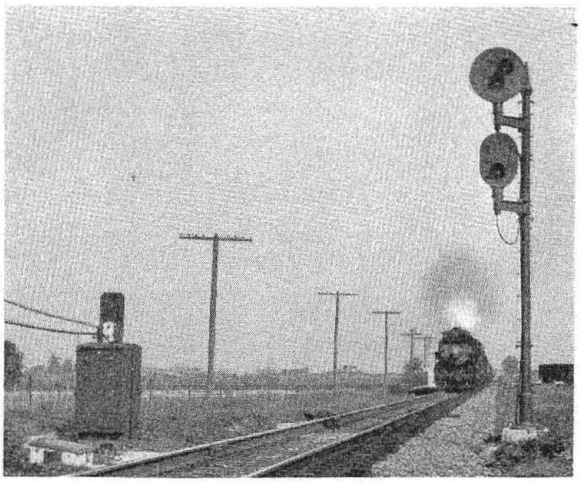
Interior of house at crossing showing indicators and releases



Interior of relay case at home signal on A. C. & Y.

from interfering with operation of the derail during an ordinary storm.

Power at 220-volts a-c. 60-cycle is purchased from the Village of Arlington and is distributed to the various locations where G. R. S. Type-K-2 Class-B 300-v.a. transformers are used to provide the required lower voltages. Copper-oxide rectifiers are used for charging the storage batteries. At the crossing there is a set of 13 Exide EMGO-7 cells used for the operation of the derails. Six cells of 330-a.h. Exide Ironclad MVHL-21 are used for operation of the relays at the crossing, at the home signals, and for lights on the signals in case of a power failure. On five of the approach track circuits and on one special turnout track circuit, Edison Type-M-500 potash battery is used. On each of the remainder of the track circuits there is one cell of Exide EMGO-7 120-a.h. battery.



Home signal on the N. Y. C.

All signals are approach lighted from an eight-volt tap on the transformers; power-off relays are used so that in case of power failure, the signals are lighted from storage batteries. The battery capacity is such, that the entire interlocking, including approach signals, will operate for seven days in case of a power failure. The battery is all housed in concrete battery boxes furnished by the Railroad Accessories Corporation.

Open line wires on the pole line extend to signal locations, where field-made aerial cables are run from the line to instrument cases. Single-conductor Trenchlay cable is used for track connections, No. 6 for relay leads and No. 10 for battery leads. The connections from the bootlegs to the rail are duplex stranded rail bonds. Parkway cable is used between instrument cases and the signal heads, this cable being run up outside the mast in order to facilitate inspection and maintenance. Except at rail connections, where bootlegs are used, the cable is protected protected at the ground lines by being sealed with asphaltum in an 18-in. piece of cast-iron soil pipe.

The rail on the N. Y. C. is 127 lb. and that on the A. C. & Y. 70 lb. The bonds are American Steel & Wire Company Type DS-1 stranded steel with copper center. These bonds are held in place by P. & M. Company bond wire protectors. The relays,. signals, derail machines, transformers, rectifiers, etc., were furnished by the General Railway Signal Company. Practically all the relays are Type-K and the signal units are Type G and D. The release switches are the Railroad Supply Company No. 3055. The lightning arresters are the Railroad Accessories Corporation Everett Raco Everohm type, being used in connection with Copperweld ground rods.

The design and construction of this interlocking was performed by the signal department of the New York Central under the direction of F. B. Wiegand, signal engineer, the construction being supervised in the field by O. Falkenstein, signal supervisor.

Fuses and Fuses

Chicago, February 15.

To the Editor:

I am writing you our answer to the article on fuses in signal circuits, by W. F. Follett, in the November issue of Railway Signaling, in which Mr. Follett advocated the minimum use of fuses in signal circuits. The article was very interesting to us. While it undoubtedly is the result of Mr. Follett's experience with fuses, we do not believe it tells the whole story. Like almost anything else, there are fuses and fuses. There are fuses designed to have the maximum time lag, and there are others in which this factor is almost zero. Fuses can be made for operation on any current value from 1/100 amp. to several hundred amperes. We believe that the trouble experienced with fuses in signal circuits lies in the selection or design of the fuse used rather than in the principle of fusing.

Of course, there are undoubtedly many places in railway signal work where fuses are of no advantage and had better be eliminated. On the other hand, where fuses could effect a real saving in the protection of meters, instruments, and relays, they should be used. Let us review briefly the factors involved in such protection. First, let it be remembered that a fuse is a protective device and that an unnecessarily delicate size should not be used. Always the maximum size which will insure protection should be used.

In the case of fuses used for the protection of instruments, it is important that the use of lead, tin, zinc, or other alloys should be avoided, in order to eliminate the possibility of their crystallizing and breaking under repeated heating and cooling or vibration. Another undesirable feature of these metals is that on gradual overloads the element is liable to melt completely, yet not sever. Only metals or alloys having high conductivity can be used. High conductivity means a smaller wire to carry the same load; a smaller wire means less mass to volatilize under a short circuit; all of which means a quicker acting fuse. We must also use only such metals as are very resistant to corrosion and oxidation; platinum, gold, silver, nickel, or their alloys are best. Most of the wire for fuse links in our fuses is less than 0.001 in. diameter. Even .0001 inch of oxidation film on a .001 in. diameter wire would reduce the cross section area by 36 per cent.

Again, instrument protection is usually a time proposition; in other words, the fuse must blow much faster than the needle of the instrument can make its lightning leap. It might seem unreasonable to expect a 1/32 amp. (31 mil.) fuse to protect a 0-1 mil. meter. Nevertheless, the protection is real because the fuse blows so much faster than the meter burns out. The oscillograph shows us that this fuse, under a 110 volt d-c. short, blows in 0.001 sec. Under these conditions, the meter needle flips across the scale in about 0.003 sec. and actually burns out in 0.173 sec. How fast is 0.001 sec.? Well, roughly, if you represent the width of this page as one second, it is the size of the period at the end of this sentence.

E. V. Sundt,
General Manager, Littelfuse Laboratories.