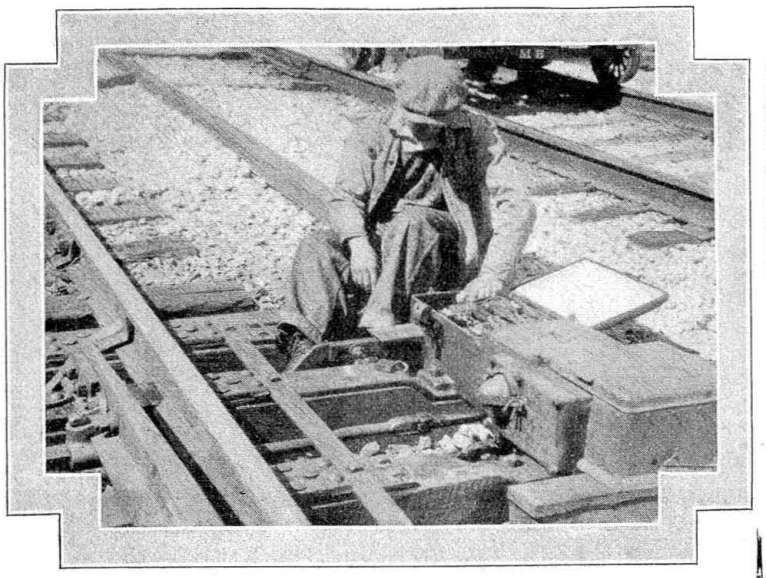


What's the Answer?

An open forum for the discussion of maintenance and construction problems encountered in the signaling field. *Railway Signaling* solicits the co-operation of its readers both in submitting and answering any questions of interest.

TO BE ANSWERED IN A SUBSEQUENT ISSUE

(1) *Which of the following methods of wire distribution do you prefer at interlocking plants —(a) aerial cables on iron posts, (b) individual wires in trunking, (c) underground in conduit or parkway cable? Why?*

(2) *What special maintenance work on signals and interlockers do you recommend in advance of winter weather?*

(3) *Does floodlighting of interlocking track layouts increase safety and facilitate operation? Will such lighting interfere with signals?*

(4) *What safety measures are enforced to protect signalmen from electric shocks? How should breathing be restored artificially in a man who has been knocked unconscious by accidental contact with a high-voltage circuit?*

Should Track Circuit Polarities be Staggered?

"What benefit is derived by transposing the polarity of adjacent track circuits?"

Alternating Polarity of Adjacent Track Circuit Provides Greater Protection Against False-Clear Failures and Helps to Locate Defective Insulated Joints

IT is our practice to distinguish between transposing one track circuit and "staggering" or alternating the polarities of two adjacent track circuits. That is, where only one track circuit is involved we prefer to use the word "transposing." Where the polarities of two track circuits are involved we refer to the practice as "staggering" or alternating when referring to opposite polarities on adjacent rails. Accompanying sketches illustrate the application for both sets of conditions.

In general, with no train on the track circuit, the latter is less liable to fail and cause a signal to assume the "stop" position when an insulated joint breaks down if the rails on each side of the joint are of the *same* polarity. But with this condition there is greater danger of a false-clear failure than would be

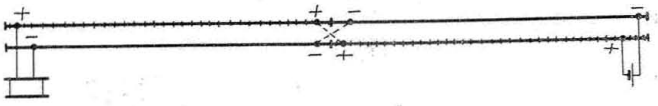


Fig. 1—Transposition made to reduce foreign current troubles to minimum

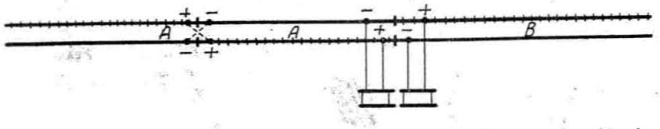


Fig. 2—Transposition made to make polarities of rails in circuit *A* opposite to polarity of adjacent rails in circuit *B*

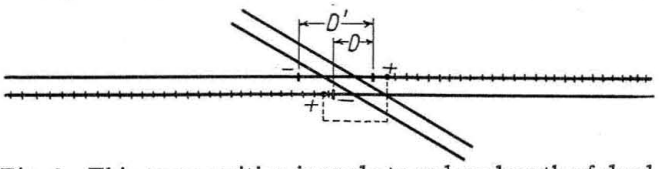


Fig. 3—This transposition is made to reduce length of dead section—With the transposition the dead section is length *D* and without transposition dead section would be length D^1

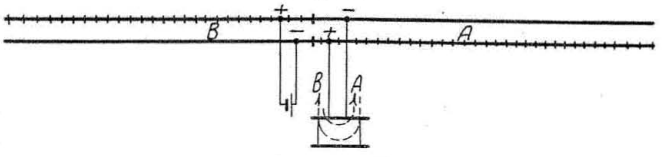


Fig. 4—Polarities of adjacent rails are alternated in order to lessen the chances of relay *A* being energized from battery *B* when circuit *A* is occupied should either one or both insulated joints break down

the case if the rails were of *opposite* polarity. For this reason we believe that the polarities of all adjacent track circuits should be alternated. Greater protection is thus afforded against false clear failures and defective insulated joints are also more easily located. This is illustrated in Fig. 4, which shows that the flow of leakage current *B* would be opposite to the normal flow and consequently the relay current would be less than if current from *A* and *B* were flowing in the same direction.

Nashville, Tenn. GEO. S. PFLASTERER,
Signal Engineer, Nashville, Chattanooga & St. Louis.

Better Protection Against Incorrect Energization of Track Relays Is Obtained When Adjacent Circuits Are Staggered

TRANSPOSING or staggering the polarities of adjoining track circuits protects, to some extent, against the incorrect energization of a track relay by the battery or transformer of an adjoining track section in the event of a failure of the insulated rail joints to insulate properly one track circuit from the other. The benefits of staggering the polarities of adjoining track circuits are:

1. In case of failure of the insulated rail joints, the voltage impressed on the adjacent track relay will, under some conditions, be lower than that normally supplied by its own track battery or transformer alone. On the other hand, if the polarities were not staggered, the voltage impressed on the track relay would always be higher than that supplied by its own track battery or transformer.

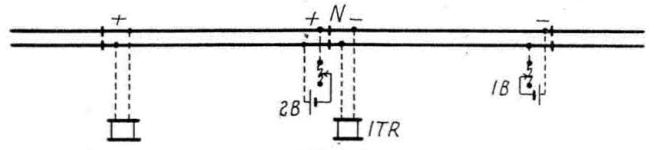


Fig. 1

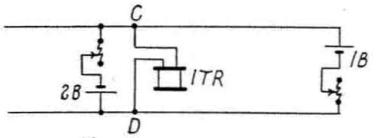


Fig. 1a

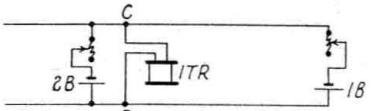


Fig. 1b

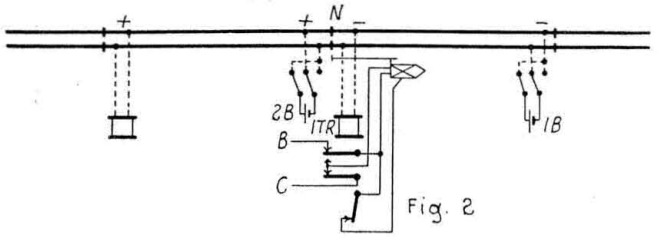


Fig. 2

Fig. 1.—Adjacent track circuits with staggered polarities—(1a) Showing zero voltage impressed on track relay under balanced conditions—(1b) showing voltage impressed on relay with similar polarities on adjacent circuits

Fig. 2—Effect of transposed polarity on polarized track circuits if insulated joints break down

2. Any voltage impressed on a track relay by the battery of an adjoining track circuit will be of polarity opposite to that of the voltage normally impressed on the relay by its own track battery or transformer and hence the reverse pick up rather than the direct pick up will determine the response of the relay.

3. With polarized track circuits the energy supplied by the battery or transformer of an adjoining track circuit will tend to reverse the position of the polar contacts of the relay.

As stated under (1) above, the voltage impressed on a track relay adjacent to defective insulated joints is reduced by transposition of polarity of adjoining track circuits. In fact, the nearer equal the conditions are in the two track circuits the lower will be the resulting voltage impressed on the track relays. With the track sections as shown in Fig. 1 and with a failure of the insulated joints at *N*, the circuits will be as shown in Fig. 1a. If the voltage of battery *1B* were equal to that of battery *2B* and if the total resistance of the circuit from point *C* to point *D* through battery *1B* were equal to that of the circuit from *C* to *D* through battery *2B* the potential at *C* would be the same as at *D* and hence no voltage at all would be impressed on relay *1TR*.

If the polarities of the adjoining track circuits were not staggered, the circuits would be as shown in Fig. 1b. With this arrangement, batteries *1B* and *2B* would act in multiple with each other to send current through *1TR* and hence the voltage impressed on *1TR* would be greater than if battery *1B* were acting alone.

With polarized track circuits having their normal polarity transposed as shown in Fig. 2, track battery *2B* would, if the insulated joints at *N* should fail, tend to reverse the position of the polar contacts of relay *1TR* as stated under benefit (3) above, thus causing the signal to indicate caution.

Swissvale, Pa. L. E. SPRAY,
Circuit Engineer, Union Switch & Signal Co.

Benefits to be Derived from Transposing the Polarity of Adjacent Track Circuits are Questionable

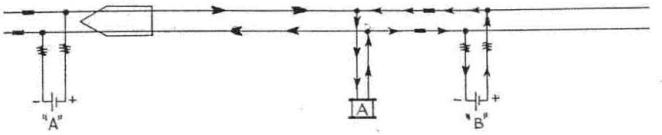
THE purpose of transposing the polarity of adjacent track circuits is to overcome to a certain extent the possibility of a battery of one track circuit holding up or picking up the relay of an adjacent circuit in case of leaky or broken down insulated joints. The sketch shows the condition above mentioned where current from battery *B* is leaking through the joints and holding relay *A* energized with a train on that circuit.

The theory is that the current from battery *A*, which leaks by the train, offers opposition to that part of the current from battery *B* which is leaking through the joints and tending to flow up through the train shunt, thereby causing a higher voltage at the point where relay *A* is connected to the rail. This opposing current allows less current flow from battery *B* which in turn causes less voltage drop in the leaky joints and resistance units in the leads of battery *B*.

The argument for overcoming this condition (to a certain extent) is to reverse the polarity of battery *A* so that the current from this battery which is leaking by the train shunt will reduce the voltage at relay *A* caused by battery *B*, an amount equal to its own voltage (battery *A*) at the point where the relay is connected to the rails. Due to the increased current flow, the voltage drop in the resistance units in the leads of battery *B* and the leaky joints will be greater, further reducing this foreign voltage. Therefore, the only time any benefit would be derived from transposing the polarity of adjacent track circuits

would be when the train shunt is poor and battery *A* current tends to flow by the train, thus reducing the voltage at relay *A*. Poor train shunting is a very undesirable condition in any event and should be remedied but not by transposing the track circuit polarities.

I do not know of any improper operation due to this cause but I do know of a few cases where a



Track circuits with same polarities at adjacent rails to illustrate foreign current action on relay *A*

train approaching a signal shunted the track relay on the other side of the joints due to leaky or broken down joints and thereby tripped the signal in the face of the train. It seems remote that any improper operation that might result from leaky or broken down joints, would be overcome by transposing the polarity of adjacent track circuits. Hence, the benefit derived from transposing the polarity of adjacent track circuits, at the expense of simplicity and uniformity, is questionable.

Albany, N. Y. F. X. REES,
Circuit Enginer, New York Central

Transposed Polarities Enable Maintainer to Check Condition of Insulated Joints More Easily

AMONG the benefits derived by transposing the polarity of adjacent track circuits, the most important is the check on broken down insulated joints at the signal location. The transposed polarity gives a maintainer an easy check on the condition of the insulation in the joints. By placing a jumper around the insulated joints (first one, then the other) it is possible for him to detect broken down insulation, because if both joints show a leakage or breakdown the signal will display a restrictive indication.

Should both insulated joints break down at the signal, it will give a stop indication if a two-position track relay is employed and with three-position polarized circuits, the signal will show a caution indication. This feature in itself has proved the necessity of providing transposed polarity of circuits at all automatic signal locations.

St. Augustine, Fla. W. A. HOFFMAN,
Signal Engineer, Florida East. Coast

How Many Signal Aspects and Indications?

"What is the distinction between signal aspects and signal indications? How many are needed for efficient operation?"

Lackawanna Employs Six High and Two Dwarf Signal Aspects for Interlocking and Automatic Signal Indications—Cab Signaling Requires Fewer Aspects and Indications Than Wayside Signaling

THE distinction between signal aspect and signal indication is best shown by the following definitions of these terms:

Signal Aspect—The appearance of a signal conveying the indication as received from the direction of an approaching train.

Signal Indication—The information or command conveyed by the aspect of a visual signal.

We are primarily concerned with the safe, and secondarily with the expeditious, handling of trains. To this end (1) Signal aspects and indications should be limited to the minimum necessary for conveying the required information; (2) An aspect should have but one indication; (3) Both aspects and indications should be developed along a line of logical reasoning so as to be easily comprehended by enginemen and trainmen, and easy to fix clearly and indelibly in their minds.

Color-light signals have been used for any extensive installations on the Lackawanna since 1920. Six high and two dwarf signal aspects serve for both interlocking and automatic signal indications, as indicated by the accompanying chart. There is one apparent inconsistency in that, aspect 2 without number plate means

Form S. E. 2
12-23

THE DELAWARE, LACKAWANNA AND WESTERN RAILROAD COMPANY

COLOR LIGHT SIGNALS

NAMES, ASPECTS AND INDICATIONS

FIG.	COLOR GIVEN BY	INTERLOCKING HIGH SIGNALS NAME	INTERLOCKING HIGH SIGNALS INDICATION	AUTOMATIC BLOCK SIGNALS NAME	AUTOMATIC BLOCK SIGNALS INDICATION
					Legend Red Yellow Green
1.	One Red Light	Stop Signal	Stop		
2.	Red Light over Yellow Light	Slow Speed Signal	Proceed at Slow Speed Prepared to Stop	Stop and Proceed Signal	Stop and proceed (under limitation given in Book of rules)
3.	One Yellow Light	Approach Signal	Approach next signal prepared to stop	Approach Signal	Approach next signal prepared to stop
4.	Yellow Light over Green Light	Approach Restricting Signal	Approach next signal at restricted speed	Approach Restricting Signal	Approach next signal at restricted speed
5.	Red Light over Green Light	Clear Restricting Signal	Proceed at restricted speed		
6	One Green Light	Clear Signal	Proceed	Clear Signal	Proceed
		SLOW SPEED SIGNALS			
7	One Red Light	Stop Signal	Stop	NOTE:— An automatic block signal is distinguished from an interlocking signal by a number plate.	
8.	One Yellow Light	Slow Speed Signal	Proceed at slow speed prepared to stop		

Chart giving names, aspects and indications of color-light signals on D. L. & W.

"Proceed at slow speed prepared to stop;" and with number plate means "Stop and proceed" (under limitation given in book of rules). There is no hazard to traffic due to misinterpretation of this indication, in fact, it is expected that eventually the automatic and interlocking indications will agree and be "Proceed at slow speed prepared to stop." On new installations aspect figure 1 with number plate will have the automatic signal indication as shown for figure 2.

An entirely new factor must now be considered as it has a material bearing on signal aspects and indications—cab signals are being adopted very generally in connection with automatic train control of the continuous type. It is desirable that these agree both in indication and aspect with wayside signals, except the interlocking stop and slow speed signals which need not be reproduced in the cab. When speed control is automatically enforced, the cab signal indication must necessarily be confined to action required on the part of the engineman as soon as received.

A slight rearrangement of D. L. & W. standard