located, either by careful mechanical inspection or by the test which will be described in the following sentences, the bond should be removed to the repair shop for further examination.

I refer, in this instance, to the possibility of the coil being short-circuited between turns, and since the

Bond	Volts	Amperes
Spec. 502, Fig. 5	2.0	0.16 to 0.25
Dwg. D1599-Sh. 2	8.0	0.44 to 6.66
Spec. 628, Fig. 19	2.0	0.25 to 0.37
Dwg. C8017-Sh. 6	8.0	0.54 to 0.81
Spec. 1076, Pc. 91273	2.0	1.0 to 1.49
Dwg. C8017-Sh. 8	8.0	1.95 to 2.95
Spec. 1286, Pc. 120920	2.0	0.3 to 0.45
Dwg. C8017-Sh. 8	8.0	0.57 to 0.86

bond is composed of two separate windings, which are connected together to form the neutral, it is necessary to separate and insulate from each other, the two leads which form the neutral bond terminal, in order to test the insulation between the turns of the coil. This procedure is not considered feasible in the field. In order to determine if the coil is grounded to the laminated core or to the bond case, it is suggested that a 25-watt lamp be connected in series with a 110-volt, 60-cycle source of power; and the test potential applied, first between the coil and case, and between the coil and core. If the lamp burns at or below full brilliancy and in the case of either of the foregoing tests, the trouble is due either to defective insulation, or the presence of dirt or other foreign material between the coil and the part from which the coil should be insulated. If the lamp remains dark, the trouble can be attributed to damage or defective insulation between the turns of the coil, which condition as described heretofore, can be confirmed after the bond is removed to the repair shop by making use of the test above and connecting the test voltage across the two parts of the winding after the neutral leads have been separated and insulated from each other. In the case of the Spec. 502 bonds, the individual bond terminals may be tested by first disconnecting the coil leads from their respective terminals on the inside of the bond case, and applying the test voltage with the lamp in series between the threaded terminal stud and the bond case. This test can be carried out in the field.

Electric Locking With No Derails

"How can time and route locking be provided in a mechanical interlocking at a crossing of two railroads where no derails are used?"

Use Lock Levers

Curtis Kies
Assistant Signal Engineer, Alton
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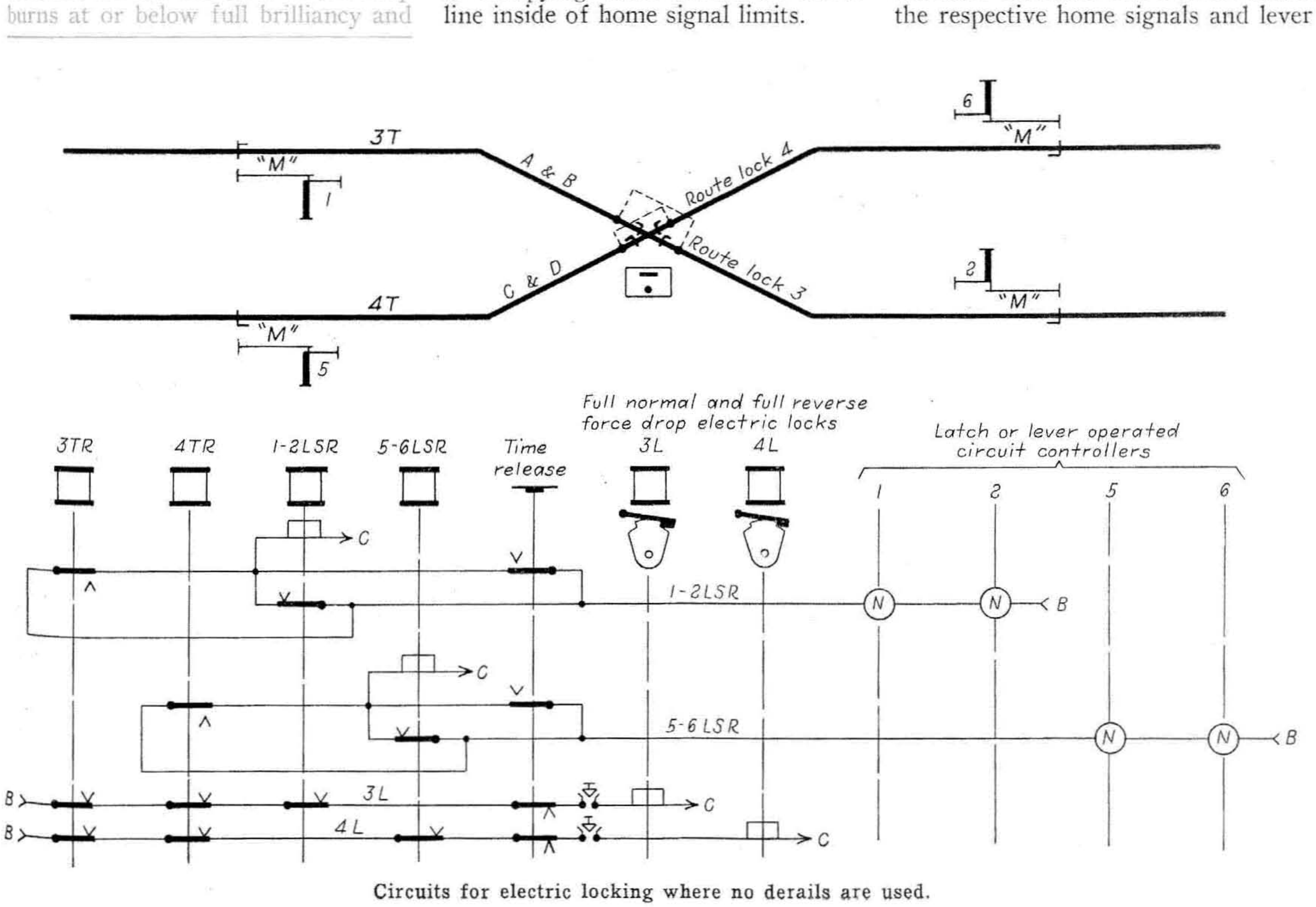
The accompanying diagram shows a circuit arrangement to provide time and route locking at a mechanical interlocking plant where no derails are used. Full track circuit protection is provided for trains moving by signal indication or hand signals, as the route cannot be changed while a train is occupying track circuit on either line inside of home signal limits.

A route lever equipped with a forced-drop electric lever lock, the quadrant of which is cut to lock in the full normal and reverse positions, is used on each of the respective lines, and the lock control circuit is selected through the track relays of the track circuits within home signal limits on both lines, as well as through contacts of the LS relay on each line.

Levers 1 and 2 each control the respective home signals, and lever 3 is the route-lock lever for the A. & B. railroad. Levers 5 and 6 each control the respective home signals and lever



Circuits for electric locking where no derails are used.

4 is the route-lock lever for the C. & D. railroad. For example, with the plant normal, if signal 1 is to be cleared for an approaching train, reverse levers 3 and 1 are reversed. When signal 1 is reversed, a contact in the circuit controller operated by lever 1 will open. This causes lock relay 1-2LSR to be de-energized, thus opening the circuit of the electric lock on lever 3, therefore, the route is locked. Furthermore, as this electric lock is also selected through the track relays 3T and 4T, the route remains locked until the rear end of the train clears the plant.

After clearing the home signal on one line, and it is necessary to change the route, the home signal must be restored to the normal position and the time release must be operated, which will energize 1-2LS relay before the route can be changed to the opposing line. This feature provides a time interval when changing from a route on one road to a route on the other.

Railroad Operation and Railway Signaling

358-Q: *What is the generally accepted definition of "centralized traffic control"?* According to the Signal Section, A. A. R., the term "centralized traffic control" is "A term applied to a system of railroad operation by means of which the movement of trains over routes and through blocks on a designated section of track or tracks is directed by signals controlled from a designated point without requiring the use of train orders and without superiority of trains."

It is to be noted that by this definition "centralized traffic control" is a "system of railroad operation."

359-Q: *Are all the different types of signaling systems essentially systems of railroad operation?* A: Yes. We have reviewed the time-interval and space-interval methods of railroad operation, and have noted that each system of signaling is primarily a system for establishing space-intervals between trains.

360-Q: *Is it desirable to review the various elements utilized in controlling trains to appreciate fully the scope and meaning of centralized traffic control?* A: Yes. Summarizing briefly, we have noted: That regular trains are operated in accordance with a time-table and schedule; that the time-table establishes superiority of trains (known as "time-table superiority") on the basis of "class" and "direction," in order to set up a basic and uniform order of precedence for trains meeting and passing on the road; that first-class trains have precedence over second-class trains, and second-class trains have precedence over third-class trains, etc.; that, on a track over which trains are operated in both directions, a train of superior direction has precedence over another train of the same class traveling in the opposite, or inferior, direction; that train orders are issued to eliminate possible confusion when schedules are disrupted, and to authorize the departure and subsequent operation of extra trains, work extras, and additional sections of regularly scheduled trains; that superiority conferred by train order is known as "right," and that such superiority takes precedence over class or direction; that space intervals between trains, and authorization and control of train movements over routes and through blocks, are established by means of various types of signaling systems, such as manual block, automatic block, controlled manual block, cab signaling, and interlocking signaling; and, finally, that with each system of signaling, certain special rules are required in order that trains may be operated safely and expedited in accordance with the peculiarities of control established by each signal system.

361-Q: *How do these elements enter in centralized traffic control?* A: *Centralized traffic control* is merely the centralization, at one point, of the control of train movements over sections of the road, such *train movements* being authorized and *directed by signal indication, without* requiring the establishment of *time-table superiority*, and *without* requiring *train orders for normal operation.*

With centralized traffic control the schedule included in the employee's time-table becomes merely a reference guide establishing departure times for trains at their origination point and at intermediate station stops, and arrival times at final destinations. On sections of track under centralized traffic control, train superiority established by time-table (in other words, time-table superiority—which classifies trains and establishes precedence for individual trains out on the road by "class" and "direction") is not required. Neither are the rules in the Standard Code establishing specified time clearance between trains during certain operations (Rules 86 and S89 and similar rules of the Standard Code adopted November, 1938) required. Finally, the type of train superiority known as "right", conferred by train order, and train orders themselves are not required for normal operation, the train order system being utilized only in case of failure of the master control system—the signal system.

All train movements are controlled and directed at crossover points, turnouts, crossings, and at all points where diverting switches are involved, by signal indication under the control of a centrally located operator. All rules necessary for the protection of trains operating under the particular type or types of signal systems in service must be retained.

362-Q: *What are the basic Standard Code rules governing train operation under centralized traffic control?* A: In the Standard Code, revised November, 1938, we find Rule 251, reading, "On portions of the railroad, and on designated tracks so specified on the time-table, trains will run with reference to other trains in the same direction by block signals whose indications will supersede the superiority of trains." It will be noted that this rule is restricted to "trains—in the same direction."

Rule 261, governing following and opposing movements of trains, reads as follows: "On portions of the railroad, and on designated tracks so specified on the time-table, trains will be governed by block signals whose indications will supersede the superiority of trains for both opposing and following movements on the same track."

363-Q: *What confusion should be avoided in the strict interpretation and observation of these rules?* A: In both Rules 251 and 261 we find the phrase, "by block signals whose indications will supersede the superiority of trains." Now, Rules S71, D71, S72, D72 and 73, which establish train superiority, are grouped in the Standard Code under the general title, "Superiority of Trains." Thus, Rules 251 and 261 might be interpreted as stating that signal indications supersede *all* types of train superiority. If this were so, and strict observance of this interpretation were followed, the failure of block signal systems or centralized traffic control systems covered by Rules 251 or 261 would result in a complete tie-up of