vestigate a report of a dark signal which had caused a delay to a passenger train. After a complete check and inspection of all apparatus involved in the circuit everything was found to be functioning properly.

This particular location was in A.P.B. territory equipped with G.R.S. Type D three-position light signals using 9-volt storage batteries for stand-by power on charge from a Type B, Size 116, 13.5-volt, 0.35-amp. rectifier. The lighting system was approach controlled in connection with a Type W power-off relay, which was controlled through a contact on a stick relay. The stick relay was connected to battery locally, being normally de-energized, energizing on the approach of a train and thus supplying a-c. for the lamps as well as the power-off relay as long as it is functioning.

As the elements of the storage battery were invisible, I placed my voltmeter across the main terminals noting the instrument carefully while I tapped each individual terminal lightly with my pliers until suddenly a deflection was noticed when I tapped a certain terminal. I replaced the battery, and the old battery was sent to the shop where it was opened up for inspection and found to be defective.

It was assumed that the output of the battery during its improper operation was insufficient to energize the stick relay, although the output of the battery during that same operation was sufficient to retain all of the instruments that it controlled in their normal position.

Locating Intermittent Signal Trouble

E. S. LAND
Signal Maintainer, St. Louis-San Francisco, Neosho, Mo.

No doubt every maintainer who reads this, if he has been maintaining any length of time, has experienced at some time or other, the difficulty of locating intermittent signal trouble, which sometimes occurs in underground wires in trunking, and in bootleg connections at signal and battery locations. I have found in my experience that the quickest and most efficient manner of locating this kind of trouble, where there is only one person present, is to use a long pair of meter lead wires. These should be long enough to permit the maintainer to carry the meter around the location with him while shaking bootleg wires or pounding on trunking, with the lead wires connected to the circuit in the signal case. In most cases this kind of trouble will be due to bad connections, or openings in wires inside insulation, or in trunking where it cannot be seen. Ordinarily, when the wire containing the trouble is shaken or jarred it will show a deflection on the meter needle. The object of the long lead wires is to allow the maintainer to watch his meter while shaking or jarring the wires in the circuit. A piece of lamp cord, approximately 30 ft. long, with clips on one end and meter connections on the other, will serve the purpose very nicely. Maintainers will find these long leads will come in handy, and will help to locate this kind of trouble promptly, saving both time and extra work, and perhaps in some cases unnecessary delays to trains.

Instructing Enginemen on Signal Indications

"How are enginemen and trainmen on your railroad instructed in the indications of signal aspects and proper observance of such indications? How often are they examined as to their understanding of signal indications? How is such examination conducted?

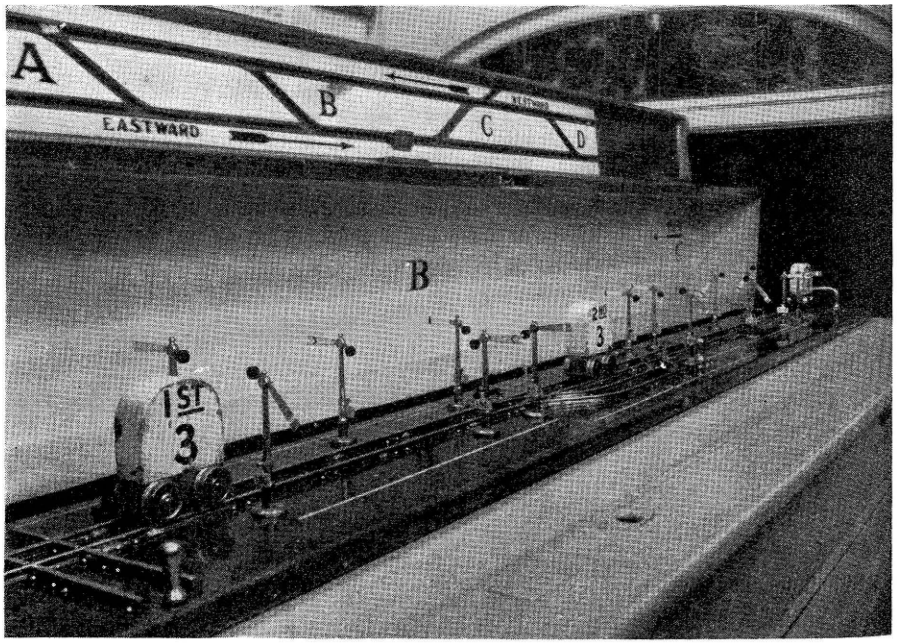
Instruction Car Provided

R. D. MOORE
Signal Engineer, Southern Pacific, San Francisco, Cal.

For the past 30 years the Southern Pacific has operated an "instruction car" for the purpose of instructing employees in the rules pertaining to train operations. The present car is an observation car, remodeled to provide a classroom and living quarters for the instructor and his assistant. Part of the instruction is, of course, on block signal rules and, to facilitate these instructions and to assist in explaining the operation of the block system, a working model is used. It represents about six miles of railroad with sidings and a complete arrangement of automatic block signals. The signals are electrically controlled and as the instructor moves the miniature brass cars along the track circuits, the class can see the signals function just as they do in actual practice.

The instruction car goes to various points on the system and remains until the men in that locality have been instructed. Class periods are of three hours duration. One period, which is attended by men in all branches of operating service, is devoted to a review of general rules, and interlocking and block signal operation. The other period covers air

(Continued on page 362)



A working model of a block system is provided for the instruction of enginemen

brake and train order instruction. Attendance at these classes forms a part of the regular duties of the men. It requires two years to cover the entire system.

Trainmasters Conduct Classes

W. J. Eck
Assistant to Vice-President, Southern, Washington, D. C.

The practice on the Southern in regard to instructing enginemen and trainmen in the proper observance of signal indications is to conduct annual rule classes on each division. All enginemen and trainmen are required to attend at least one of these classes and receive a certificate for proficiency. These classes are conducted by trainmasters and a considerable portion of the class period is devoted to the discussion and the examination of employees on signal aspects and observance. It is also customary for the signal supervisor to attend these classes and assist the trainmaster in the discussion and examination on rules pertaining to signals.

Selection of Routes at Automatic Interlockings

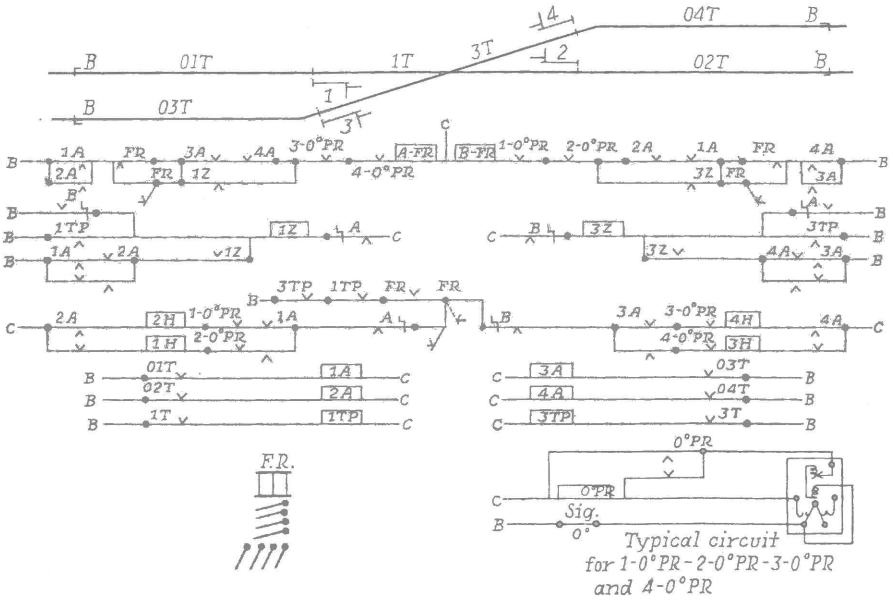
"For the selection of routes as between two roads at an automatic interlocking protecting a crossing, what are the advantages and disadvantages of the two schemes; (1) stick relay control, (2) polar relay control?"

Gives Advantages of Polar Circuits

A. Hunot
Chief Signal Draftsman, Missouri Pacific, St. Louis, Mo.

The accompanying sketch illustrates the circuits for an automatic interlocking using a polar relay for the route controls, and the following is a brief explanation of the advantages and operation: It can be seen that the use of such a control arrangement is simpler and accomplishes the desired result with less apparatus. Initial costs are lower due to fewer relays required for its operation. Power consumption is lower and flexibility of operation is accomplished by a more direct method of circuit arrangement.

The polar relay is controlled so that signals on the opposing railroads are cleared through the polar contacts in opposite positions. The approach circuits of one road energize one coil in the normal polarity while those of the other road energize the other coil in opposite polarity. While, in the stick method of selection, the first signal to clear will prevent any opposing signal from being cleared, the use of the polar relay will, when energized in one polarity, nullify all controls for the opposite polarity, thus preventing completion of circuits for signals on the opposing line.



Example of polar relay control for the selection of routes

Explains Stick Relay Scheme

J. C. Law
Chief Draftsman, Atchison, Topeka & Santa Fe, Topeka, Kan.

The circuits for an automatic interlocking plant using the stick relay scheme of control will have at least two sets of stick relays. One set will consist of one or more relays for each crossing road and will furnish directional selection. The other set will consist of one relay for each crossing road and will furnish preference selection. Directional selection distinguishes between an approaching train and a receding train with reference to the crossing, while preference selection indicates which one of two or more trains occupying approaches on opposing roads will receive a signal to use the crossing. It requires the combined action of both sets of stick relays for the selection of routes and the proper sequence of train operation over the crossing.

The preferable method of obtaining directional selection is to energize a stick relay by the passage of a receding train from the detector or crossing track circuit onto the approach track circuit, and to maintain the stick circuit of the relay as long as the train occupies the approach section. One directional selection relay for each approach section is required for this method.

Preference selection is obtained by each crossing road having a stick relay which, when energized, checks over a back contact of the opposing road's preference relay. A train approaching the crossing will energize and stick up its own road's preference relay if the detector or crossing track circuits are clear, and the opposing road's approach sections are either clear or occupied by receding trains. The passage of a train on one road over the crossing opens the stick cirsuit of its own road's preference relay and sticks up the opposing road's preference relay if there is a train on the opposing road waiting to use the crossing.

Controls can be inserted into the proper branches of the pick-up and stick-up circuits of the stick relays to provide for various operating requirements, such as giving back-up signals on one road and not on the opposing road, or releasing the plant while switching moves are being made on one or more approach sections. The circuits for an automatic interlocking plant, using the stick relay scheme of control, have an adaptability which readily allows for modification to fit special conditions for a particular crossing plant.

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