are in accordance with the plans furnished for the work.

After being placed in service the plant should be tested under actual operation. In testing large interlocking plants on this road we have used a light engine running backward and forward over all possible routes in the plant. One signalman is placed on the engine, who makes inspection of the signal indications and instructs the engineman in regard to the speed of the engine through the plant. Inspectors are placed in the tower to make a complete check as the engine moves over the track circuits and if any bad shunting conditions exist they are taken care of and the test repeated. A test under actual operating conditions is essential as there may be some mistakes in the circuit plan which can be discovered with this test.

Portable Telephone Useful in Testing

B. F. Oler
Assistant Engineer, Pennsylvania
New York, N. Y.

In testing a new interlocking prior to placing it in service, I would not consider the test complete nor reliable unless detailed checking of each branch of all circuits, according to the circuit plan, had been completely carried out, and an operating test of each individual switch and signal function had been made.

Usually the tests are made under traffic. With sufficient help and the use of portable telephones so constructed that they can be used on the interlocking circuit wires, the tests can be made without loss of time and without interference with traffic.

Both Operating and Circuit Tests Essential

H. A. Appleby
Assistant Signal Engineer, A. T. & S. F.
Amarillo, Tex.

An interlocking plant should never be placed in service until a complete set of operating tests for all possible combinations of conditions has been made. This test not only checks construction but also checks errors in design. All construction errors cannot, however, be found by the operating tests and a detailed check of each circuit should be made before it is placed in service, for the same reasons that these circuit tests are repeated periodically after the plant has been placed in service.

My experience has been that the operating tests and circuit checks are equally important, and neither is complete without the other. We insist that both operating tests and circuit checks be made before new or repaired installations are placed in operation.

Complete Operation Test Often Impracticable

W. N. Hartman
Assistant Signal Engineer, Chesapeake & Ohio, Richmond, Va.

The question pre-supposes that complete tests of the interlocking can be made prior to placing it in service, which in actual practice is seldom possible. The majority of new interlocking installations consist of conversions from mechanical to power-operated switches in remote-control or C.T.C. projects where complete operating tests of each individual function before it is placed in service are impracticable.

Even though an entirely new group of switches and crossovers is to be interlocked, the layout is almost invariably located in existing main tracks requiring placing in service under traffic. With this condition, automatic signals or other existing signal facilities are so involved as to necessitate deferring some of the operating tests until the circuit changes incident to the interlocking installation have actually been completed and the facilities, in their entirety, placed in service.

Both methods of testing are essential. The check designated as method (b) detailed checking of all circuits, should be made prior to placing in service, so as to correct all irregularities in the wiring which might result in failure of any of the functions to operate as intended.

The check designated as method (a) operation tests, is necessary in order to detect possible errors in circuit design as well as defects in equipment or auxiliary apparatus which, even though wired in accordance with the circuit plan, would result in interruptions adversely affecting the movement of trains. As many of these checks as operating conditions will permit should be made prior to placing the facilities in service, and the balance completed as soon as practicable thereafter.

Operating tests of each individual function under all abnormal as well as normal operating conditions, are also essential in order to simulate conditions which might be rarely encountered in normal service. This should consist of conducting complete break checks of each individual circuit, having observations made of the various functions affected, to insure that proper protection is provided.

Phantom Indications

"What improvements have been or can be made to reduce the phantom indication on flashing-light type highway crossing signals?"

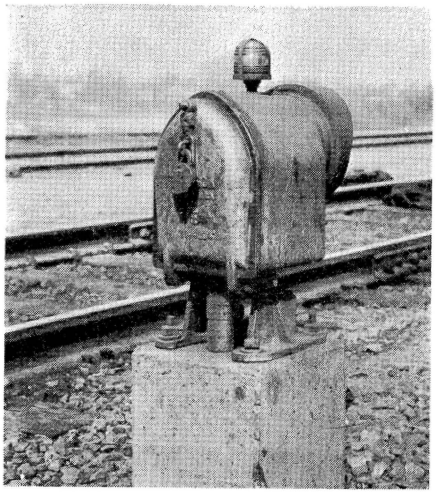
Relatively Unimportant with Flashing-Light Signals

O. S. Field
Engineering Department, General Railway Signal Company, Rochester, N.Y.

It is our belief that the objections to phantom indications from this type of signal are not of great moment. The normal alternately-flashing indication is inherently distinctive from the two stationary lights caused by reflection and from the single fixed light displayed when the signal is operative with the flashing relay not working. From the writer's limited observation, practically every motorist is fully aware of these differences.

It would seem of much greater importance to educate the public to the meaning of the bright alternately flashing lights, than to spend effort on trying to reduce a weak stationary phantom.

We recognize that a small percentage of signals are so located that phantom from the sun occurs during the early morning or late afternoon on clear days. In such instances almost complete elimination of phantom may be secured by the use of doublet lenses in place of the more efficient roundel and reflector.



On the Southern Pacific a small marker lamp on top of each dwarf signal assists in preventing accidents to trainmen