had been cleared the conductor asked the operator to ask me if there would be anything following him. There was not much traffic on this branch at night; in fact, this was the only train I could see for the entire night; and I told him "no." The superintendent immediately told me I was working out of my jurisdiction when I did anything like that; that I could not tell at what minute it would be necessary to run something else out there and the conductor was supposed to protect his own train and for me to tell him so. And I did.

When men in the train service on a railroad are not taught and made to flag as per Rule 99 at all times and under all circumstances collisions will continue to pile up regardless of all the fixed signal systems that may be put in use.

<div align="right">J. L. Coss.</div>

TESTING INSULATED JOINTS

To the Editor:

In studying the article by F. L. Dodgson on "Relation of Insulated Joint to Track Circuit," in the April number of the *Railway Signal Engineer,* it seemed to me that a few words might be added separating the theory from the test in order to show clearly just what is necessary to do to make use of the formula. The following
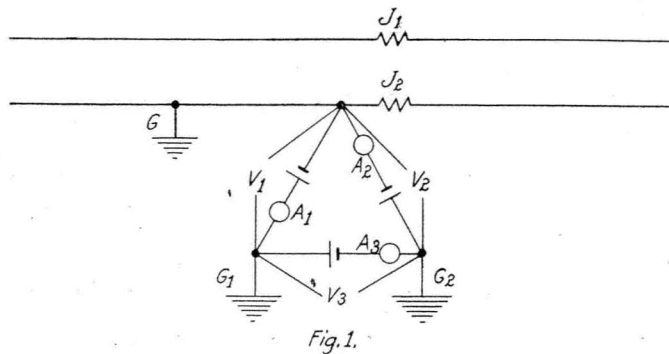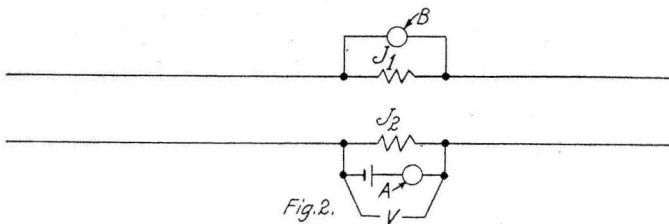

Fig. 1.

Fig. 2.

Figs. 1 and 2 Shows the Methods of Taking Measurements

adds nothing to the article referred to, but merely states the case from another point of view.

The tests divide themselves into two sets. First, the measurement of the resistance to ground of one rail and each of two artificial grounds. Measurements must be made with regular battery and the relays disconnected from both track circuits. One artificial ground is usually available; a second must be installed not nearer than six feet away, or there seems to be no reason why the artificial ground at an adjacent location should not be used, employing a line wire for connections. Fig. 1 shows the measurements to be made, as follows:

Voltage readings V1—V2—V3 (volts).

Current readings A1—A2—A3 (amperes).

From these readings resistances to ground are computed from the following formulæ:

$$G = \frac{\dfrac{V1}{A1} + \dfrac{V2}{A2} + \dfrac{V3}{A3}}{2}$$

$$G^1 = \frac{\dfrac{V1}{A1} - \dfrac{V2}{A2} + \dfrac{V3}{A3}}{2}$$

$$G^2 = \frac{-\dfrac{V1}{A1} + \dfrac{V2}{A2} + \dfrac{V3}{A3}}{2}$$

Second, a set of readings are then made in accordance with Fig. 2. The readings to be taken in this case being:

Voltage reading V.

Current reading A and B.

From these readings, and the previous ones, the resistance of the joint J2 may be computed by substituting in the following formula:

$$J2 = \frac{V}{A - B - \dfrac{V}{\dfrac{V1 - G1 \quad A1}{A1 - B1} + \dfrac{V1 - G1 \quad A1}{B1}}}$$

In all the measurements it is advisable to use the mean between the direct and reverse readings, as suggested by Mr. Dodgson.

There is an objection to this method of testing for regular maintenance use, and that is the necessity of putting two track circuits with their controlled signal apparatus out of commission during the test. However, it is not at all unlikely that tests and study will develop that all the refinements will not be necessary and that a method will be found that can be made quickly and without derangement of the operating circuits.

The formulas which Mr. Dodgson has presented are a very valuable contribution to the art and should stimulate investigation of the insulating properties of insulated joints.

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THE CLASSIC SHADES OF HARVARD

To the Editor:

Permit me to make a brief comment on the communication from John C. Harvard in your May issue. This gentleman divides those who have given thought to the subject of train control, apparently visualized in his mind as a simple automatic stop, into two classes, optimists and pessimists. The former he designates as progressives, to whom he assigns men of my modicum of experience and the United States government, including, of course, the Bureau of Safety of the Interstate Commerce Commission. The other class are termed conservatives, such as are represented by Mr. Felton, who holds, with regard to accomplishment, that it never has been and probably never can be done, and would not be worth a d——n if it could.

Such being the conflicting attitude of minds, your correspondent would return to audible cab signals as a means of enforcing discipline—progress along the line of least resistance. He is in error as to certain statements, and although supported by sundry references to the gospel and science, somewhat in ignorance of certain important facts—very much so as to the auxiliary system of control which has been developed under my direction and auspices; a complete system of audible and visible cab signals combined with auxiliary train control, under the proper restraint of the engineer, which, while protecting him and his train, will permit of every reasonable latitude of judgment in train operation.

Whenever Mr. Harvard can escape from the classic shades of Cambridge and the university I shall be glad to demonstrate this system to him, in the confident expectation that he will prove a convert like unto those