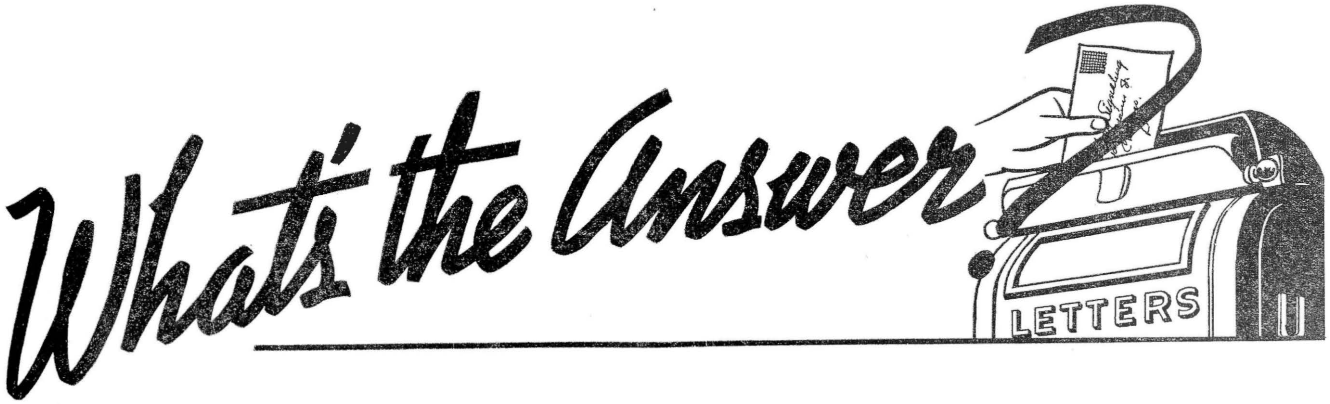

D-C. Test Set For Relays, Slots

"What arrangement of a test set, including meters which may or may not be mounted permanently, have you found to be most practicable for field testing of d-c. apparatus such as relays, slot-coils and electric locks? Do you consider the use of such sets an advantage as compared with the use of individual meters and rheostats?

Built to Meet Practical Requirements

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For field testing of signal apparatus, it has been found most desirable by the writers to have a compact test set composed of all the necessary meters, potentio-meters, and resistances, with a minimum number of switches to operate. It also has been considered that any test should be made with the least amount of distraction with regard to the details for the test circuit to be set up; in fact, the test set should be almost automatic in hook-up, in order that the tester may be more free to concentrate on the test results, thereby accomplishing more and obtaining better results. With the individual meters, the tester is encumbered with greater bulk to handle, each test requires a circuit hook-up requiring additional lost time and thought distraction from the actual test, and accurate calibration of the instruments is more difficult to keep because of the tendency to rough handling which occurs due to the bulk and awkwardness of a great variety of meters. Since a person assigned to testing railway signal apparatus must not only apply his energy to the various tests to be made but also must be endowed with a special sense of alertness for trains that may be affected by his testing, we believe that the compact test set is safer, more desirable, and, in the long run, more economical.

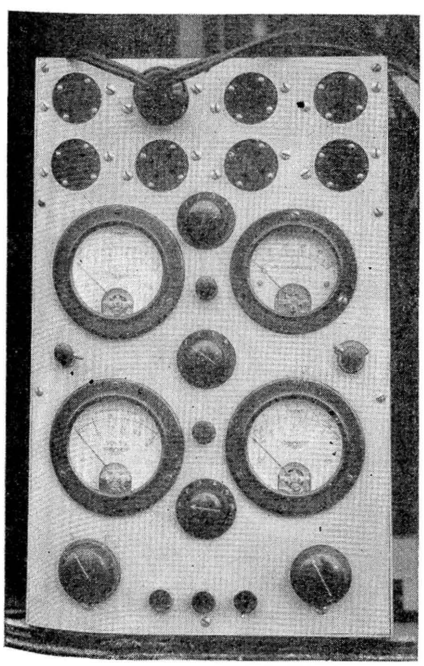

Fig. 1

The writers have used a composite type of test set since 1934, and while it may not fit the particular requirements of all, the special arrangement and procedure can be applied to any desired combination.

The test set is 14⅝ in. long by 9¼ in. wide and 2¼ in. deep, and weighs 9 lb. The body of the case is made of 1/16 in. sheet aluminum, as illustrated in Fig. 1. There are eight four-prong sockets, part of which are double-tier, used to connect the set to equipment to be tested. Four No. 16 AWG flexible wires, each 42 in. long, are connected to a four-prong plug and at the end of each wire is a spring clip for connecting to signal equipment; each wire is marked on the clip +A, —B, +C and —D, respectively. The plug and sockets were used to insure the integrity of the internal circuit desired; any test made with this set requires no more than the four wires shown connected to the plug, while many require less. The markings on the clips are for manipulation chart reference as will be shown on further sketches.

Four of the flange-type D'Arsonval

To Be Answered in a Later Issue

(1) What kind of a gage do you use, to be placed between a switch point and a stock rail, when testing an interlocked switch or a hand-operated switch for ⅜ in. or ¼ in. opening?

(2) What are the advantages and disadvantages of mounting crossing gate electric lamps on the board forming the track side of the arm as compared with mounting the lamps on the board forming the field side of the arm?

(3) What are the advantages and disadvantages of interconnecting manually-operated train-order signals with automatic block signals so that if the train-order signal is set to indicate that orders are to be picked up the next automatic signal in approach will display the Approach aspect?

If you have a question you would like to have someone answer, or if you can answer any of the questions above, please write to the editor. Answer to any of the questions above will be paid for in cash or by a subscription to Railway Signaling.

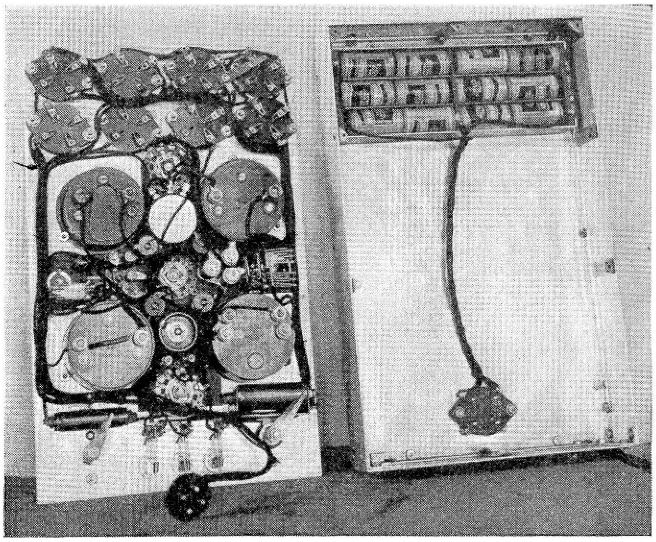

Fig. 2—Interior of test case, showing instrument mounting, wiring and dry cell location.

meters, each 3½ in. in diameter, are used in the set. The upper instrument to the left, in Fig. 1, has an ohmic resistance of 1,000 ohms per volt, and is fitted with a dual scale 0 to 15 volts and 0 to 500,000 ohms. The voltmeter will indicate the following full scale deflections: 0 to 1.5 volts, 0 to 3 volts, 0 to 15 volts and 0 to 150 volts; the scale desired is regulated by the top rotary d-c. volt scale selector, which cuts in additional resistance of the fixed vitrom type with normal tolerance within one per cent. A high ohmmeter, which is also a part of the above instrument, is dependent upon ten small flashlight dry cells for energy, contained within the case, and will correctly indicate up to 500,000 ohms; a zero temperature adjuster for this ohmmeter is shown between the two top meters (small knob).

The top right instrument is a d-c. ammeter having a full scale deflection of 50 milliamperes, the meter scale readings are: 0 to 50 milliamperes, 0 to 500 milliamperes, 0 to 5 amperes and 0 to 50 amperes; the various scale readings are accomplished by proper shunts which are regulated by the rotary scale selector shown at the center of the set, immediately below the two top meters.

The lower left instrument is an a-c. voltmeter with the following scale readings: 0 to 3 volts, 0 to 15 volts, 0 to 30 volts, 0 to 150 volts and 0 to 300 volts; the various scale readings are accomplished by inserting fixed vitrom resistance with normal tolerance within one per cent; the scale selector is shown just below the two lower instruments.

The lower right instrument is an ohmmeter with a dual scale, 0 to 10 ohms, and 0 to 1,000 ohms; this meter is dependent upon two flashlight dry cells contained within the case for energy; the rotary selector switch is located to the right and above the ohmmeter and a zero adjuster for the ohmmeter is located between the two lower meters.

Located in the lower left corner of the set is a 15-ohm resistance wound with Nichrome resistance wire on a slate base. In the lower right corner of the set is a 100-ohm potentiometer. At the bottom center of the set are three push buttons; the left button must be pushed for all voltmeter readings on the instrument at the upper left; the center button is pushed for all a-c. voltmeter readings, indicated on the lower left instrument; and the button at the right is pushed for all ammeter readings, indicated on instrument at the upper right. These buttons are considered necessary to emphasize the check of the scale setting and the writers feel that this feature is responsible for so far never having experienced a meter burn-out.

Located between the meters and on the left side of the set is a rotary polarity switch used in connection with the various hookups contained within the set. The internal arrangement and wiring of test set is illustrated in Fig. 2. Figure 3 shows the test set as used in the field and depicts the ease with which tests can be made. A set of manipulation Fig. 4 to 16 inclusive should accompany the test set for reference purposes; for a new man never having used the set, each sketch is complete as to instrument scale, socket, leads, polarity, potentiometer, resistances or push button to be used for the particular test outlined.

Example 1—

Suppose a voltmeter reading is desired, in accordance with Fig. 5. No. 1 socket is to be used; therefore, insert the plug into this socket. Since leads D and C are to be used, of which lead C is plus and D is minus polarity, they are clipped to the signal apparatus to be tested. The desired scale is then picked from the list shown on Fig. 5, setting the scale selector for that scale and push-button at the left is depressed.

Example 2—

Suppose it is desired to check the PU and DA characteristics of a line relay, in accordance with Fig. 11. The plug is inserted into socket No. 4. The two relay coil wires are disconnected, leads C and D attached in their place, leads A to plus energy and B to minus energy. The 50 milliampere scale is shown to be used, also the 100 ohm potentiometer; therefore, the right push-button is depressed, the potentiometer is operated and the ampere readings are noted.

However, should voltage readings be desired, as in Fig. 12 which shows the same set-up except for the use of the 15-volt scale, the left push-button is depressed; this voltage test can be made alone or simultaneously with the ammeter test. The reverse character-

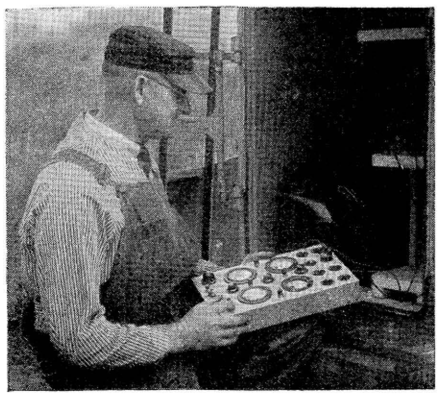

Fig. 3—The set is convenient to handle

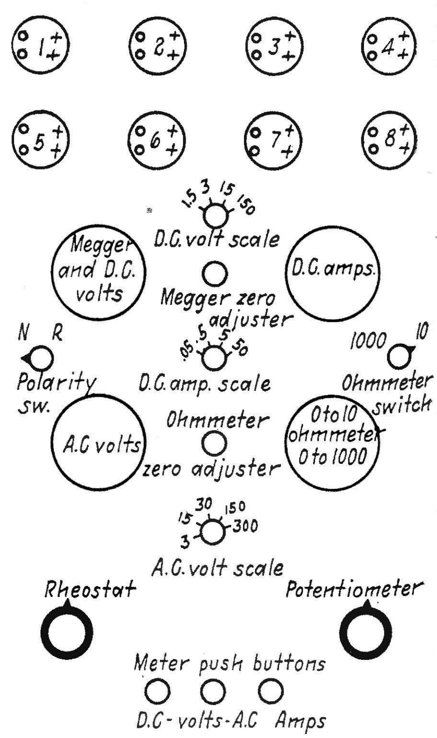

Fig. 4

Diagrammatic layout of panel

istic readings can be obtained by reversing the polarity switch.

From the given examples, the reader will note that the usual local test hook-up is used, while interconnection between meters, potentiometer, and switch is accomplished automatically when the plug is inserted into the socket, and only one piece of testing apparatus need be carried about.

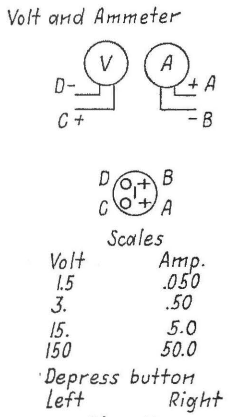

Fig. 5

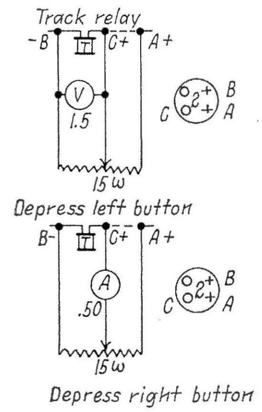

Fig. 6

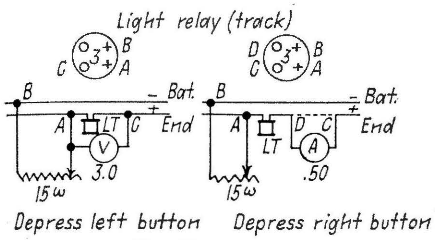

Fig. 7

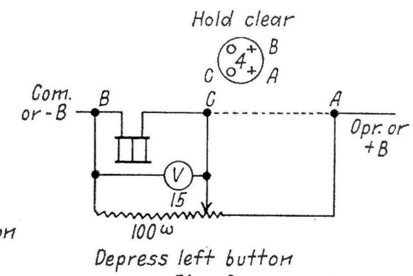

Fig. 8

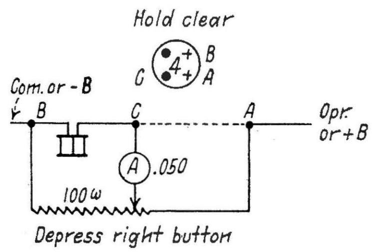

Fig. 9

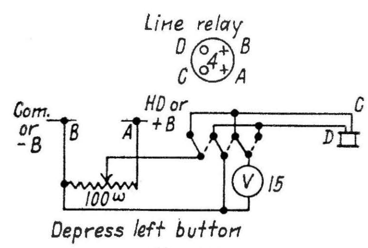

Fig. 10

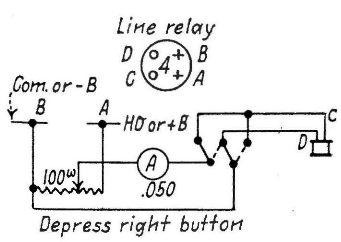

Fig. 11

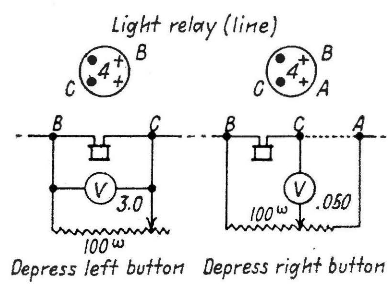

Fig. 12

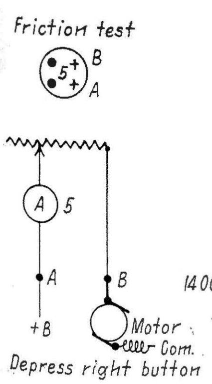

Fig. 13

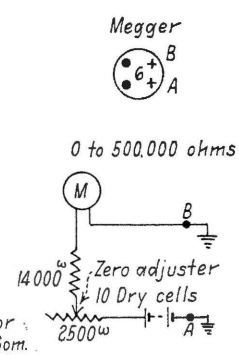

Fig. 14

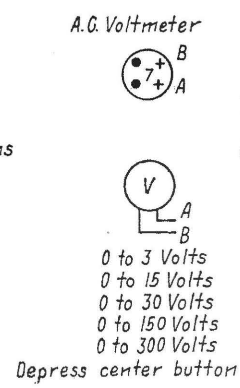

Fig. 15

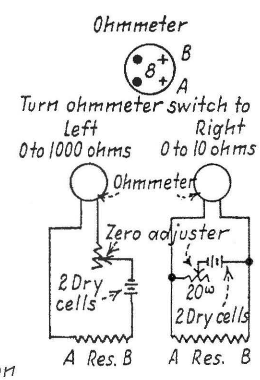

Fig. 16

Manipulation sketches give instructions for operation

Railroad Operation and Railway Signaling

This series has been prepared to present both the background of signaling and an analysis of signaling systems. The general field of railway signaling will be described, an attempt being made to clarify its interconnection with railroad operation.

252-Q: *What different combinations of equipment are used at interlockings for the control and operation of switches and signals?* A: Where a great number of switches and signals are situated in one locality, as in terminals, yards and other points of routing, it is sometimes desirable to have all functions controlled from a central location. For this reason, towers are built at the principal points of activity where such concentration would be advisable. The towers house the levers for operating the most important of all the switches, signals, and other functions in that vicinity. Where such towers are located in block territory, they also serve as block stations.

The levers are usually grouped together in a common frame, the assemblage being designated as a "machine." The levers may be designed to control and operate the switches, signals and other functions mechanically, electrically, pneumatically, or by some combination of these means. A great variety of combinations are available. However, there are four major recognized classifications into which all machines are placed which may be listed as follows:

1. The mechanical machine: A machine designed to operate the units mechanically (although some of the units may be controlled and operated electrically).