provides for the greatest possible utility of equipment in the small laboratory.

The Type 210 Ratio Arm Box consists of two similar arms, each having 1000 ohms total resistance, tapped at 1-3-10-30-100-300 ohms. The resistances are of the Ayrton-Perry type. This type of resistance, described in another section of this catalog, is practically free from inductance and capacitance effects at audio frequency. The current-carrying capacity is 50 milliamperes and the adjustment accurate to within 0.1%. The dial switches are of the multi-leaf type, assuring low and constant resistance. The cabinet is of walnut with bakelite panel. All metal parts are nickel plated.

Type 210 Ratio Arm Box.................................$28.00

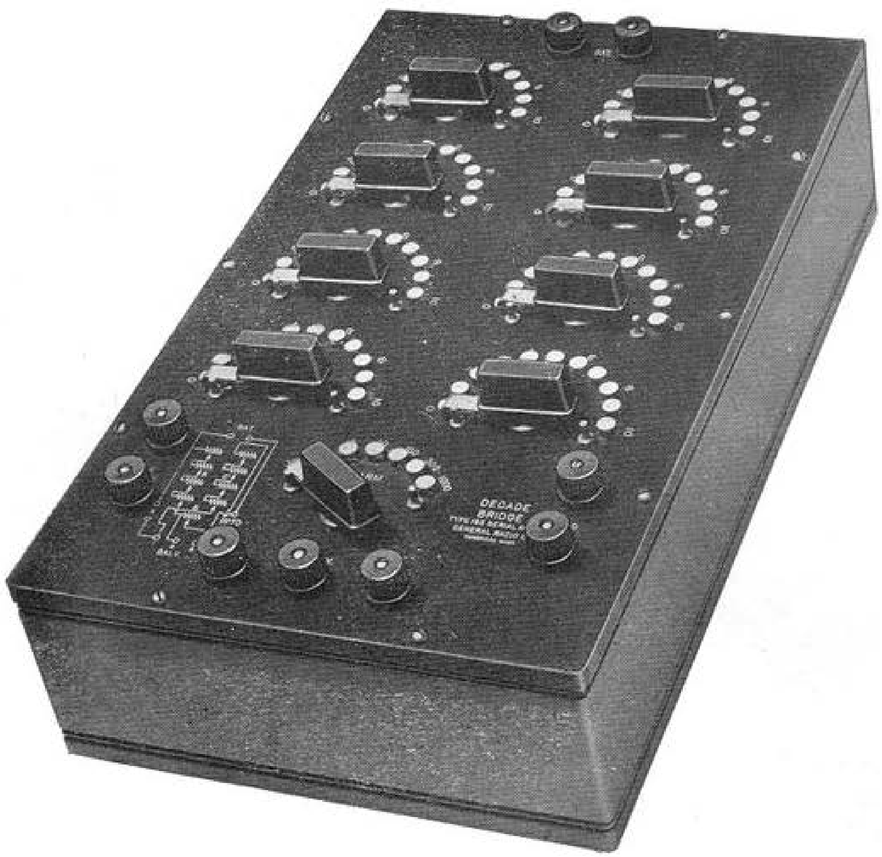
Dimensions 7½″ x 5″ x 4″. Weight 2⅜ lbs.

Code Word: RABID.

TYPE 193 DECADE BRIDGE

The Type 193 Decade Bridge is designed as a utility bridge. It is adapted to general bridge measurements of resistance, inductance and capacitance outside the field of special purpose bridges. The bridge circuit shown on Page 46 consists of three resistance arms, of the non-inductive type.

RESISTANCE MEASUREMENTS. In making measurements of resistances the null indicator is connected between points 1 and 2, and the STD posts connected together. Rc is used as the resistance standard. The

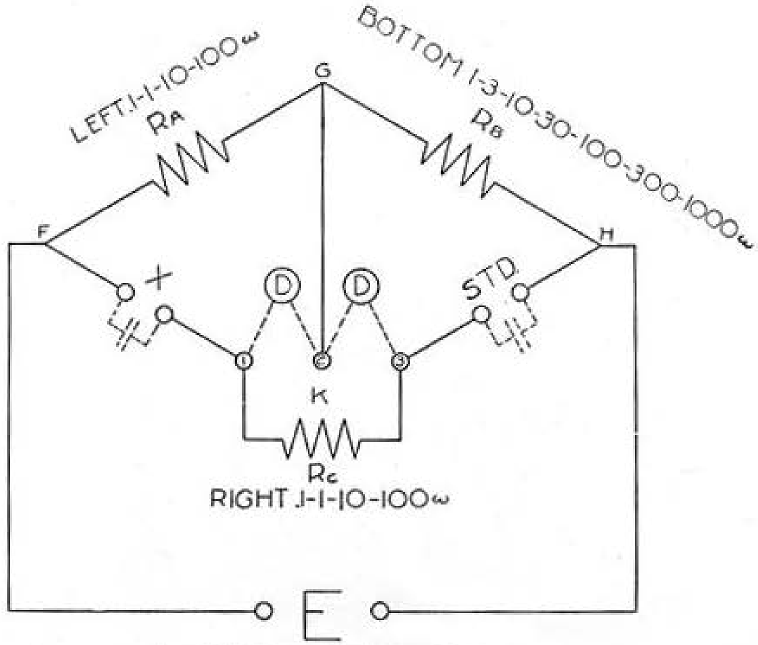


unknown is connected at X and the bridge balanced. The solution of the network gives the equation:—

$$R_X = \frac{R_A\ R_C}{R_B}$$

This method is suitable for the measurement of either direct or alternating-current resistance, a suitable source being connected at E. The accuracy of the bridge for resistance measurements is to within 0.2%, if proper care is exercised by the operator.

INDUCTANCE MEASUREMENTS. In inductance and capacitance measurements, the bridge must be balanced for resistance as well as for reactance. The third resistance arm R_C is used to obtain a resistance balance of the bridge. Since R_C must be connected in the arm having the lower resistance (standard or unknown) and this is not generally known in advance, it is desirable to set the bridge up with a switch so arranged that the null indicator may be readily transferred from 1 to 3, placing R_C in either arm. The bridge is balanced, the condition of zero current in the



null indicator requiring simultaneous balance of both resistance and inductance. The solution of the network gives the equation for the unknown inductance

$$L_X = \frac{R_A L_S}{R_B}$$

The resistance balance gives the relation:—

$$R_X = \frac{R_A (R_S + R_C)}{R_B}$$

if Rc was connected in series with the standard or:—

$$R_X = \frac{R_A R_S}{R_B} - R_C$$

if Rc was connected in the unknown arm.

The accuracy of inductance measurement is to within 0.2% for air core inductances. Owing to the change of inductance with saturation it is impossible to obtain an exact balance with iron core inductances since the degree of saturation changes with every adjustment. The error is consequently greater in this type of measurement. The range for inductance measurement is from about 20 microhenrys to several henrys.

An inductance may be compared with a capacitance by connecting the capacity across R_A. The unknown inductance is connected at the STD posts, the null indicator to 2 and 3, and the X posts connected together. The solution of this network gives the equation

$$L_X = R_B\ R_C\ C$$

The Type 106 Inductance Standards described on Page 36 are satisfactory for use with this bridge.

CAPACITANCE MEASUREMENTS. The Type 193 Decade Bridge is also suitable for the measurement of comparatively large capacitances, where extensive shielding is not required. For capacity measurements the bridge is set up with a switch for transferring R_C from the standard to the unknown arm as before. The unknown condenser is connected at X and a standard capacitance at STD. When there is no current flow through the null indicator the bridge is balanced for both capacitance and resistance. The capacity balance gives the equation:

$$C_X = \frac{R_B\ C_S}{R_A}$$

Since the bridge is in balance for resistance as well as capacitance the resistance equations follow as before.

$$R_X = \frac{R_A\ (R_S + R_C)}{R_B}$$

if R_C was in the standard arm, or

$$R_X = \frac{R_A\ R_S}{R_B} - R_C$$

if R_C was in the unknown arm.

The accuracy of the bridge for capacity measurement is to within 0.2%. The range is from 0.01 microfarad to several microfarads.

GENERAL DESCRIPTION. The elements of the bridge circuit shown on Page 46 are mounted in a walnut cabinet with a hard rubber panel. A dust cover is furnished to protect the bridge when not in use. The resistance units are of the Ayrton-Perry non-reactive type. The current-carrying capacity of the one-tenth ohm units is one ampere; that of the one ohm units, 250 milliamperes; that of the ten ohm units, 100 milliamperes; and that of the one hundred to one thousand ohm units, 50 milliamperes. The cabinet is copper lined to provide shielding. All exposed metal parts are nickel plated.

Type 193 Decade Bridge....................................$115.00

Dimensions 17″ x 10½″ x 5″. Weight 13¼ lbs.

Code Word: BIGOT.