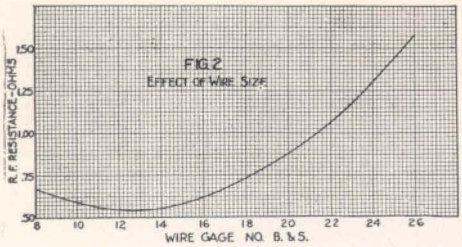


there is an optimum size of wire which is not critical, but should be approached for minimum resistance. Curves taken similarly at other frequencies indicate that there is an optimum size for each wavelength band, and that the lower the frequency, the smaller the wire.

The use of collodion, shellac, or other good binders had no appreciable effect.

In order to test the effect of coil form a coil form was wound in the usual manner, and a strip of bond paper cemented to the circumference of the wire with collodion. When dry, it was possible to slip out the form without disturbing the wire. Measurements on this coil gave the following:

Resistance of coil with form .8 ohms
Resistance of coil without form .6 ohms
Gain 25%
Inductance .... 7.5 microhenries

But it is efficiency in which we are interested, and a reduction of resistance is not indicative of the true gain. It is power factor which is to be considered.

Reactance $= 2\pi fL = 6.28 \times 7.5 \times 10^{6} \times 7.5 \times 10^{-6} = 353$ ohms.

$$\text{Power factor} = \frac{R}{X} = \frac{.8}{353} =$$

.23% with form.

$$\text{Power factor} = \frac{.6}{353} = .17\%$$

without form.

From this it is evident that the power factors differ by about .06%—a very doubtful gain when elimination of the form means a less rugged coil, more difficult to construct. The change of distributed capacity was too small to measure.

Some rather surprising results were obtained by placing metal in the field of the coil. The same coil was used in all the tests, having a resistance of .7 ohms, and an inductance of 7.5 microhenries. P.F. was .2%.

A strip of .010″ x 1½″ copper 4″ long was placed along the axis and inside of the coil. Power factor rose to .23%, an increase of .03%.

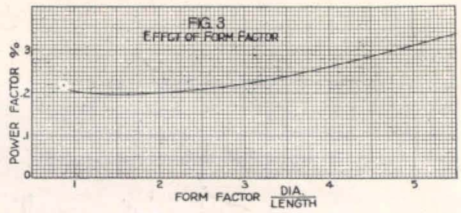
A sheet of ¼″ aluminum placed successively nearer the side of the coil had no readable effect until it actually touched the insulation, when the power factor became .21%. When placed flat against the end of the coil, the change was very slight.

A strip of .010″ x 1½″ copper was placed around the circumference of the coil, with about ½″ air space. When the loop was not closed to make a short-circuited turn, the power factor was .22%, but when closed it became .26%.

As an extreme case, a copper can was made to enclose the coil entirely, leaving about ½″ air space all around. The power factor went up to .27% in this case.

Power factor is mentioned in all of these tests rather than resistance, as a true indication of the change. In most instances, the inductance of the coil was reduced somewhat, accompanied by an increase of radio frequency resistance.

Six different coils were wound to practically the same inductance, on



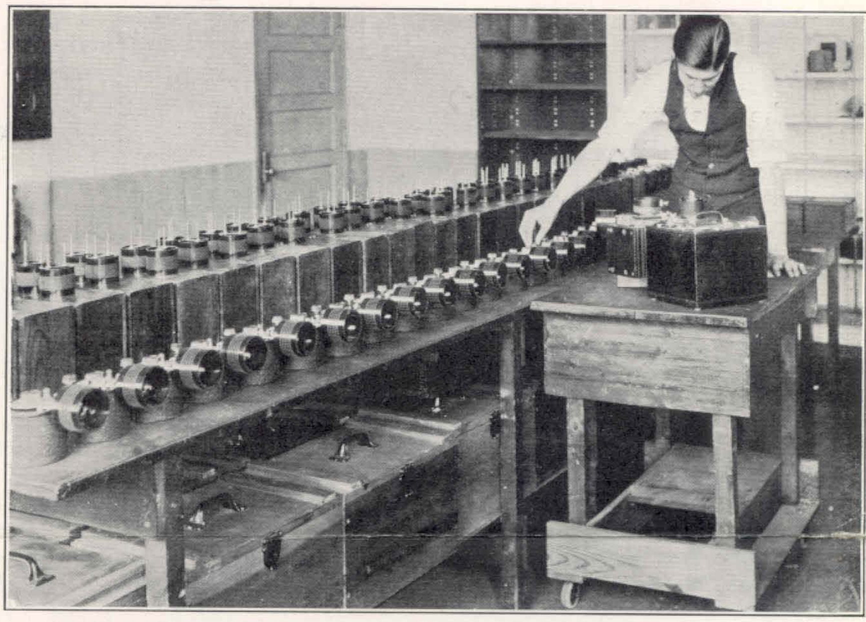
the same diameter form, but with different winding lengths, and consequently some variations in the number of turns. Inductances averaged 7 microhenries. The curve of Fig. 3 shows the results.

The object of these experiments was not to prove that bad coils are good, nor to discourage the construction of really low loss coils, but to find the causes of inefficiency, and what practical means could be taken to avoid them.

It is very evident that most of the losses come from the conductor itself, and while form and nearby metal objects do contribute, their effect is relatively small, and if

(Continued on page 3)

Mass Wavemeter Calibration



We are continually hearing of the use of modern efficiency methods in the production of everything from fans to flivvers. Above is illustrated an example of their application to the laboratory. Since each Type 358 Wavemeter has an individual calibration chart, the calibration of these units becomes somewhat of a problem due to large numbers manufactured as a consequence of the popularity of this wavemeter. Much time is saved by the method shown above. A number of wavemeters are set up in a long row. A radio frequency oscillator and a standard wavemeter are placed on a truck somewhat resembling a tea wagon, and the oscillator set to the proper frequency for the first calibration point, this being checked by the standard wavemeter. The table is wheeled into position so that the oscillator is coupled to the first wavemeter in line and the wavemeter condenser rotated until resonance is indicated. The dial reading for this frequency is marked down, and the truck wheeled down the line, repeating the process for each wavemeter. The oscillator is kept exactly at the proper frequency by constant reference to the standard wavemeter. The oscillator is set to another frequency, and each of the wavemeters in turn adjusted to resonance. In this manner the data for a number of calibration charts is gathered with a minimum of manipulation of apparatus. When data has been obtained in this manner for points on each coil, it is plotted and the charts mounted and boxed with the meters for shipment.