creasing this ratio as they readily could, preferring, rather foolishly, in the writer's opinion, to secure the slightly enhanced selectivity to be gained from a preponderance of capacity.

However, it will be seen that in the charts provided for simplifying design, everyone has been catered for; the high-capacity enthusiast can use his beloved .0005 mfd. condenser with an inductance of 200 microhenries, at the other extreme, design data is provided for 340 mh. coils for use with .00025 condensers, while a compromise may be effected with either a 280 mh. coil and .00035 condenser, or a 320 m.h. coil and .0003 mfd. condenser.

How Many Turns?

HAVING answered the first of the three questions propounded as an introduction to this paper, it is now necessary to face the second—"How many turns?" The inductance of a single layer solenoid (which is the only type of coil proposed to be dealt with) may be calculated from Nagaoka's formula, usually expressed in the form

$$L = \frac{9.87 \times L \times D^2 \times N^2 \times K}{1000} \text{ microhenries}$$

where L is the length of the winding in centimetres, D the diameter of the coil in centimetres, N the number of turns per centimetre, and K a constant depending on the ratio of diameter to winding length; this constant is obtained from a series of tables.

Mathematicians will appreciate that this formula lends itself to simplification, and it may, in fact, be expressed in the form

$$L = \frac{S \, N^2 \, D}{1000} \text{ microhenries}$$

where S is a shape factor depending on the ratio existing between the length of the winding (i.e., the length of the portion of the coil former covered by the winding), and its diameter; knowing this ratio, the shape factor S may be read off from Chart 1. For example, take a coil which covers 2 inches on an ebonite tube of 4 inches diameter; the ratio length to diameter is then 0.5, and reference to the chart shows the value of S corresponding to this ratio to be 10.2. D is the diameter in centimetres, and N the total number of turns. Since our aim is to find the number of turns to arrive at a given inductance, this formula also requires restating. If it is put in the form

$$N = \sqrt{\frac{1000L}{SD}}$$

it will answer our requirements.

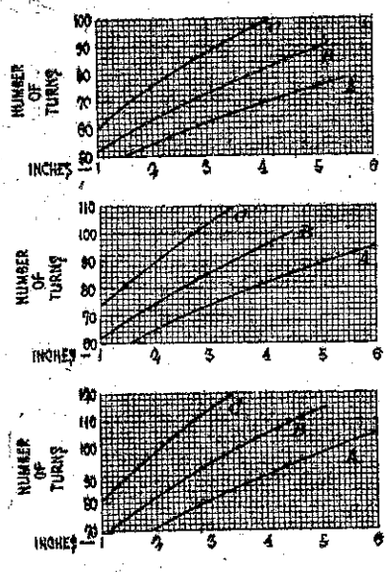
It is recognised that not everyone is prepared to make even these humble excursions into the realm of mathematics. Consequently, while for the sake of completeness, the formulae have been quoted and explained, the data required for winding coils to the four inductances previously quoted as being suitable for covering the broadcast band with various values of variable condensers has been collated in the form of charts which are almost self-explanatory.

Thus, suppose it is desired to wind a 200 microhenry coil on a 3-inch diameter former, the winding to cover 2 inches of the length of the former, reference is made to the appropriate chart, which is in this case No. 2. Along the bottom line of the chart various winding lengths are marked off. A vertical line is drawn upwards from the point marked "2in." until the curve labelled "diameter 3 inches" is encountered. From the point of intersection between the vertical line and the curve, a horizontal line is drawn to the left until it reaches the vertical line marked "turns," which is appropriately subdivided into tens. The number of turns to reach the required inductance is then simply read off. In the instance in question, some 54 turns would be the requisite number.

The point to notice is that the number of turns required to reach a given inductance depends not only on the diameter of the coil, but on the winding length, also; the charts eliminate all calculation if only these two things are known.

As a final word, it may be well to point out that, if the coil is to be close-wound, the gauge of wire (and the covering) must be so chosen that the number of turns which can be accommodated in an inch is such that the total turns will approximately fill the allotted space. Thus, in the example quoted, a type of wire which would wind approximately 27 turns to the inch would be necessary, a wire table disclosing that 22 S.W.G. double cotton-covered fills this requirement.

The next article in this series will deal with the diameter or gauge of wire necessary to produce the most efficient coil of any given dimensions.



Top.—A 200 mh. coil tuned with .0005 mfd. condenser. Centre.—A 280 mh. coil tuned with .00035 mfd. condenser. Lower.—A 340 mh. coil tuned with .00025 mfd. condenser.
"A" denoting a 2-inch former; "B", 2.5; "C", 3.

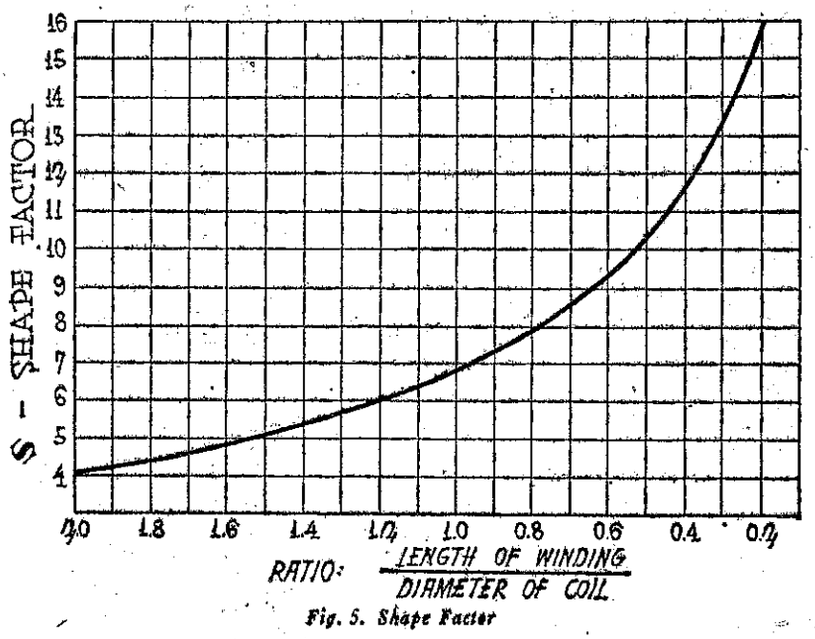


Fig. 5. Shape Factor

Chart 1. Shape Factor.

Curious Incidences

AMONGST the many curious things that have happened whilst listening-in are one or two that are worth mentioning, says Mr. R. Leslie Jones (Wellington). On one occasion three New Zealand stations put the same tune on the air at the same time (not re-broadcast). It was just coincidence.

Recently a friend of mine played on his gramophone "Rosie O'Grady" for me; and a few minutes later I tuned in KDKA (Pittsburg), and the very same tune was broadcast from KDKA.

Another occasion I heard two Australian stations put on a violin solo, and tuned in 1YA (Auckland), and heard the same tune again. On still another occasion, I heard an organ solo from down South, and simultaneously up North an organist in a church was playing the same piece.

When listening-in to Japan one night in the earlier days of radio, I tuned between the "Jap" and 3LO, Melbourne, and heard from Melbourne the "Hallelujah Chorus," and heard the weird native music from the "Jap" station played on the "Samerson" instruments, at the same time; that was when both stations were on 371 metres.

On another occasion I was playing on my piano, and a second later 2FC broadcast the same air.

The world seems but a small area in extent since radio became established. Anyone in the habit of tuning in various stations, can tell from the announcers' voice what station it is; but can anyone pick up the Jap or Russian stations from the announcers' voice