$$A_1 = \log_e \frac{\nu + 1}{\nu + \tau}$$

$$B_1 = -2\left[\frac{N-1}{N}\delta_{12} + \frac{N-2}{N}\delta_{13} + \frac{N-3}{N}\delta_{14} + \ldots \frac{1}{N}\delta_{1n}\right]$$

$\nu = \dfrac{w}{D}$ where w = axial length of strip

D = distance between adjacent turns

$\tau = \dfrac{t}{D}$ where t = thickness of strip

The factors δ_{12}, δ_{13}, etc., are given in tabular form by Grover for different values of τ and ν.

(8) **Self-inductance in Other Cases.** (*a*) *Coils Wound on Polygonal Formers.* Grover (Ref. (10)), in a Bureau of Standards paper on this subject, gives a method of calculating the inductance of coils of this general form by obtaining, in each case, the "equivalent radius" of the coil, and then treating it as a circular coil having this radius. The formulae for calculation of the equivalent radii are somewhat complex, and reference should be made to the original paper for information on the subject.

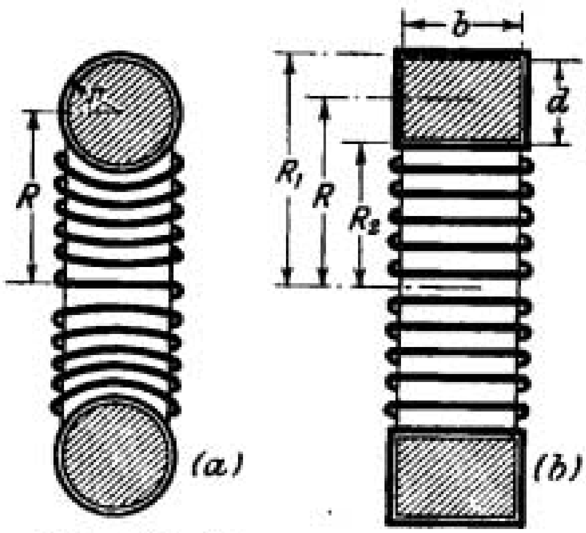

FIG. 100. SELF-INDUCTANCE OF TOROIDAL COILS

(*b*) *Toroidal Coils.* These are coils whose axis and cross-section are either both circular or the former circular and the latter rectangular.

(i) Axis circular, cross-section circular (torus) (Fig. 100 (*a*)).

Russell (*Alternating Currents*, Vol. I, p. 50) shows that the flux inside such a coil, of N turns, when a current of I amp. flows in it, is

$$\phi = \frac{4\pi}{10} NI(R - \sqrt{R^2 - r^2})$$

where R = mean radius of axis of coil in centimetres

r = radius of the cross-section of the coil in centimetres.

Thus, since $L = \dfrac{\phi N}{10^8 I}$ henries

the inductance is given by

$$L = \frac{4\pi}{10^9} N^2(R - \sqrt{R^2 - r^2}) \text{ henries} \quad . \quad . \quad (133)$$

(ii) Axis circular, cross-section rectangular (Fig. 100 (*b*)).