

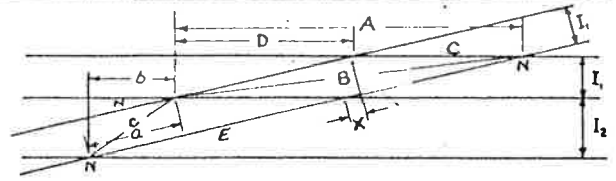
PERMANENT WAY NOTES

PERMANENT WAY MATHEMATICS

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THESE NOTES ARE INTENDED FOR THE GUIDANCE AND ASSISTANCE OF STAFF ENGAGED UPON PERMANENT WAY WORK. THEY DO NOT IN ANY WAY MODIFY, SUPPLEMENT OR AMEND THE INSTRUCTIONS LAID DOWN IN E.D.I., STANDARD DRAWINGS, CIRCULARS ETC., WHICH SHOULD BE REFERRED TO IN ALL CASES.

INTERSECTING PARALLEL STRAIGHT LINES



$$A = 2I_1N$$

$$D = \frac{I_1(N^2 - 1/4)}{N}$$

$$b = \frac{N^2(I_2 - I_1) - 1/4(I_2 + I_1)}{N}$$

$$B = 2I_1\sqrt{N^2 + 1/4}$$

$$E = \frac{I_2(N^2 + 1/4)}{N}$$

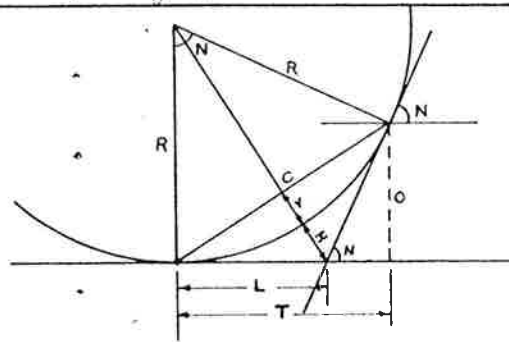
$$c = \sqrt{a^2 + I_1^2} = \sqrt{b^2 + I_2^2}$$

$$C = \frac{I_1(N^2 + 1/4)}{N}$$

$$a = \frac{N^2(I_2 - I_1) + 1/4(I_2 + I_1)}{N}$$

$$x = \frac{G}{2N}$$

TANGENTS & CHORDS



$$\sin N = \frac{T}{R}$$

$$\cos N = 1 - \frac{C^2}{2R^2} = \frac{\sqrt{R^2 - T^2}}{R}$$

$$\tan N = \frac{T}{\sqrt{R^2 - T^2}}$$

$$C = \frac{R}{\sqrt{N^2 + 1/4}}$$

$$= \sqrt{2RO}$$

$$= \sqrt{T^2 + O^2}$$

$$N = \sqrt{\frac{R^2 - 1/4}{C^2}}$$

$$= \frac{R \pm \sqrt{R^2 - T^2}}{2T} \text{ (generally +)}$$

$$= \frac{R}{2L}$$

$$= \frac{T}{2O}$$

$$= \sqrt{\frac{R}{2O} - \frac{1}{4}}$$

$$T = \frac{RN}{N^2 + 1/4}$$

$$= 2ON$$

$$= \sqrt{2RO - O^2}$$

$$= \sqrt{C^2 - O^2}$$

$$O = \frac{R}{2(N^2 + 1/4)}$$

$$= \frac{C^2}{2R}$$

$$= R - \sqrt{R^2 - T^2}$$

$$= \sqrt{C^2 - T^2}$$

$$= \frac{T}{2N}$$

$$R = C\sqrt{N^2 + 1/4}$$

$$= 2O(N^2 + 1/4)$$

$$= 2NL$$

$$= \frac{Nx}{\sqrt{N^2 + 1/4} - N} = \frac{C^2}{2O}$$

$$= \frac{T^2 + O^2}{2O}$$

$$= \frac{T(N^2 + 1/4)}{N}$$

$$L = \frac{R}{2N}$$

$$= \frac{T}{2} + \frac{O^2}{2T}$$

$$x = R \left(\frac{N^2 + 1/4}{N} - 1 \right)$$

$$V = R - 1/2\sqrt{4R^2 - C^2}$$

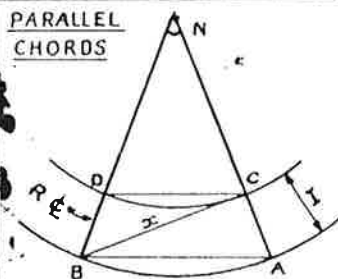
$$= R - ON$$

$$= R \left(1 - \frac{N}{\sqrt{N^2 + 1/4}} \right)$$

$$x + V = L \sqrt{\frac{1}{4(N^2 + 1/4)}}$$

Length of Arc which subtends $N = R\theta$ (For θ see Sheet 1)

PARALLEL CHORDS



$$AB = \sqrt{\frac{(R + 1/2)^2 (x^2 - I^2)}{R^2 - (1/2)^2}}$$

$$N = \sqrt{\frac{R^2 - (1/2)^2}{x^2 - I^2}}$$

$$CD = \sqrt{\frac{(R - 1/2)^2 (x^2 - I^2)}{(R)^2 + (1/2)^2}}$$

$$x = \sqrt{\frac{R^2 + I^2 N^2}{N^2 + 1/4}}$$

$$AB - CD = \frac{I}{\sqrt{N^2 + 1/4}}$$