Now at the time $T+t$ the distance between the centres of Venus and the Sun, is equal to the sum of their semi-diameters, $=c$, then we have

$$c^2 = \{G-S+a(P-\pi)+vt\}^2 + \{L+b(P-\pi)+gt\}^2 \quad (32).$$
$$=(G-S)^2 + L^2 + 2\{a(G-S)+bL\}(P-\pi) + 2t\{v(G-S)+gL\};$$

neglecting the squares and products of the very small quantities t, a, b and $(P-\pi)$.

But when seen from the centre of the Earth at the time T, we have

$c^2 = (G-S)^2 + L^2$, which substituted in the last equation, gives

$$t = -\frac{a(G-S)+bL}{v(G-S)+gL}.(P-\pi) \quad (33).$$
$$= \delta.(P-\pi), \text{ suppose}$$

Therefore the Greenwich time of the first contact at the place of observation $= T + \delta(P-\pi)$.

If δ' be the corresponding quantity to δ for the time T', then the time of the last contact at the place of observation

$$= T' + \delta'(P-\pi),$$

and if Δ be the whole duration of the transit then

$$\Delta = T' - T + (\delta'-\delta)(P-\pi)$$

Again, if Δ' be the duration observed at *any other* place, and β and β' corresponding values of δ and δ', we have

$$\Delta' = T' - T + (\beta'-\beta)(P-\pi);$$

Therefore $\Delta' - \Delta = \{(\beta'-\beta)-(\delta'-\delta)\}(P-\pi)$

Or, $$P-\pi = \frac{\Delta'-\Delta}{(\beta'-\beta)-(\delta'-\delta)} \quad (34).$$

Now $$\frac{P}{\pi} = \frac{\text{Earth's distance from the Sun}}{\text{Earth's distance from Venus}},$$

Therefore $$\frac{P-\pi}{\pi} = \frac{\text{Venus's distance from the Sun}}{\text{Venus's distance from the Earth}}$$
$$= n, \text{ a known quantity}$$

$$\pi = \frac{1}{n}(P-\pi). \quad (35).$$—(*Hymers's Astron.*)