So the number of electrons now entering the anode is $\gamma e^{\alpha d}[e^{\alpha d}-1]$. At this time $\gamma[e^{\alpha d}-1]^2$ positive ions will be incident on the cathode surface and release $\gamma^2(e^{\alpha d}-1)^2$ electrons. These electrons will now produce in space $\gamma^2(e^{\alpha d}-1)^3$ electrons. So the total number of electrons now present is

$$\gamma^2(e^{\alpha d}-1)^2+\gamma^2(e^{\alpha d}-1)^3$$

and these electrons will now enter the anode. The process will continue in this way and the total current is proportional to

$$e^{\alpha d}+\gamma(e^{\alpha d}-1)e^{\alpha d}+\gamma^2(e^{\alpha d}-1)^2e^{\alpha d}+\dots \text{ upto infinity}$$

$$=e^{\alpha d}[1+Z+Z^2+Z^3+\dots \text{ upto infinity}]$$

where $Z=\gamma[e^{\alpha d}-1]$

$$=\frac{e^{\alpha d}}{1-Z}=\frac{e^{\alpha d}}{1-\gamma(e^{\alpha d}-1)}$$

Hence

$$\frac{i}{i_0}=\frac{n}{n_0}=\frac{e^{\alpha d}}{1-\gamma(e^{\alpha d}-1)}$$

γ has been introduced by Townsend as a measure of secondary ionization and is known as Townsend's second coefficient

The experimental results are in somewhat good agreement with Townsend's theory specially for a limited (E/p) values.