ionized hydrogen is always almost exactly proportional to the ratio of free acid to salt, and is equal, in very close approximation, to the product of this ratio by the ionization constant of the acid. That is to say, representing free acid by HA and salt by BA,

$$(\overset{+}{\mathrm{H}}) = k \times \frac{\mathrm{HA}}{\mathrm{BA}}$$

whence, if $k = (\overset{+}{\mathrm{H}})$

$$\frac{\mathrm{HA}}{\mathrm{BA}} = 1$$

From this relationship, therefore, follows the conclusion, fully established by experiment, that whenever in such a solution the excess of acid, HA, is chemically equivalent to the quantity of salt, BA, the hydrogen ion concentration is almost exactly equal to the ionization constant of the acid. But the ionization constant of carbonic acid (first hydrogen atom) is 0.0000003. Hence in a solution containing exactly equivalent quantities of free carbonic acid and, for example, sodium bicarbonate, the hydrogen ion concentration must be 0.0000003 N. Further, since

$$\frac{\mathrm{HA}}{\mathrm{BA}} = \frac{(\overset{+}{\mathrm{H}})}{k}$$