closed at its mouth, the total volume of water supplied up to the time the influx is stopped, is: (neglecting the comparatively insignificant correction for friction, etc.)

$$Q = v = \left\{ \tfrac{1}{2} \sqrt[4]{.474573\ldots} \sqrt[2]{2g}\, b \right\} \left\{ h^{\frac{5}{2}} \frac{2T}{5H} + H^{\frac{3}{2}} t_s \right\} + \left[\frac{0.54\, r\, b\, T}{H} \right] \left[\frac{h^2}{2} - \frac{h^3}{6H} \right] \quad (1)$$

This formula is applicable only so long as h does not exceed the numerical value of the positive root of the equation:

$$h^{\frac{5}{2}} \left[\frac{T}{H^{\frac{1}{2}}} \sqrt[4]{.474573\ldots} \sqrt[2]{2g} \right] + h \left[\frac{.54\, r\, T}{H} \right] = Lc \quad (2)$$

2nd. When the duration and velocity of the tidal influx are barely sufficient for it to reach the head of the reservoir during the time of slack water, and to raise the equilibrium water level of the reservoir a height w above its surface-elevation prior to the ingress of the tide; the numerical value of w is determined by equation:

$$\left\{ \tfrac{3}{2} t_s \left(H - w \right)^{\frac{1}{2}} + \frac{T}{H} \left(H - w \right)^{\frac{3}{2}} \right\} \left\{ \tfrac{1}{2} \sqrt[4]{.474573\ldots} \sqrt[2]{2g} \right\} + \quad (3)$$

$$+ \left(H - w \right) \left[\frac{0.54\, r t_s}{H} \right] + \left(H - w \right)^2 \left[\frac{0.54\, r\, T}{H^2} \right] = Lc$$

and the volume of stationary water in the reservoir above the elevation just mentioned, is:

$$v_2 = a\, w \quad (4)$$

The additional volume v_3 of flowing water stored up in the reservoir when the gates are closed at the turn of the tide is:

$$v_3 = b\, c \left\{ \tfrac{2}{5} \left(H - w \right)^{\frac{5}{2}} \left(\frac{T}{H^{\frac{1}{2}}} \sqrt[4]{.474573\ldots} \sqrt[2]{2g} \right) + \left(H - w \right)^3 \left(\frac{0.54\, r\, T}{3H^2} \right) \right\}; \quad (5)$$

and the total volume of water supplied up to the time that the influx is stopped is:

$$Q = v_2 + v_3 \quad (6)$$

3rd. When the inward tidal current reaches the head of the reservoir before the time of slack water—

The height z of the water in equilibrium, which has accumulated in the reservoir prior to the occurrence of slack water in Cumberland Basin, is determined by equation:

$$\left(H - z \right)^{\frac{3}{2}} \left[\frac{T}{H^{\frac{1}{2}}} \sqrt[4]{.474573\ldots} \sqrt[2]{2g} \right] + \left(H - z \right)^2 \left[\frac{0.54\, r T}{H^2} \right] = Lc\ ; \quad (7)$$

and the volume of stationary water in the reservoir above its surface elevation, prior to the influx of the tide, is:

$$v_1 = a\, z \quad (8)$$

The height u of a similar sheet of water accumulated in the reservoir during the time of slack water is determined by equation:

$$\left\{ \tfrac{3}{2} t_s \left(H - z - u \right)^{\frac{1}{2}} + \frac{T}{H} \left(H - z - u \right)^{\frac{3}{2}} \right\} \left\{ \tfrac{1}{2} \sqrt[4]{.474573\ldots} \sqrt[2]{2g} \right\} + \quad (9)$$

$$+ \left\{ H - z - u \right\} \left\{ \frac{0{,}54\, r t_s}{H} \right\} + \left\{ H - z - u \right\}^2 \left\{ \frac{0.54\, r\, T}{H^2} \right\} = Lc\ ;$$

and the corresponding volume of stationary water in the reservoir is:

$$v_2 = a\, u \quad (10)$$