The Rotary Engine: Design and Function

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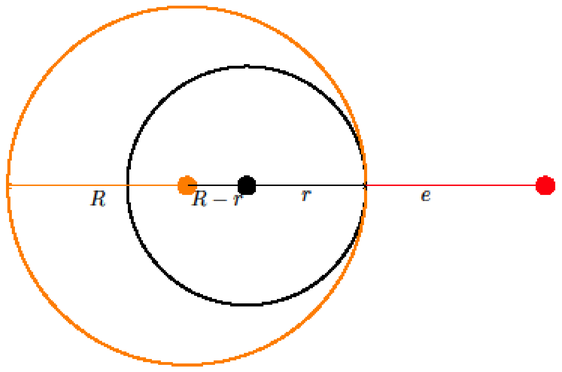
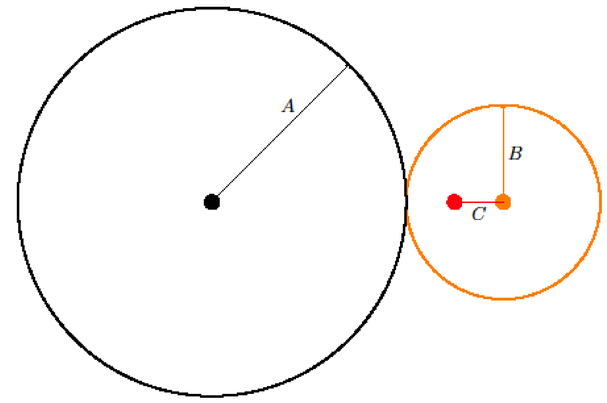
Ring Gear Method



Semi-minor axis configuration for ring gear method

$$\frac{r}{R} = \frac{a-1}{a},\ a \in \mathbb{N}$$

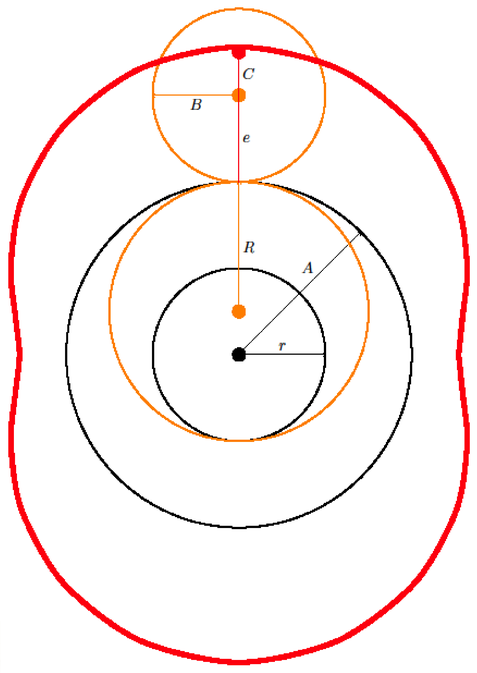
Two Gear Method



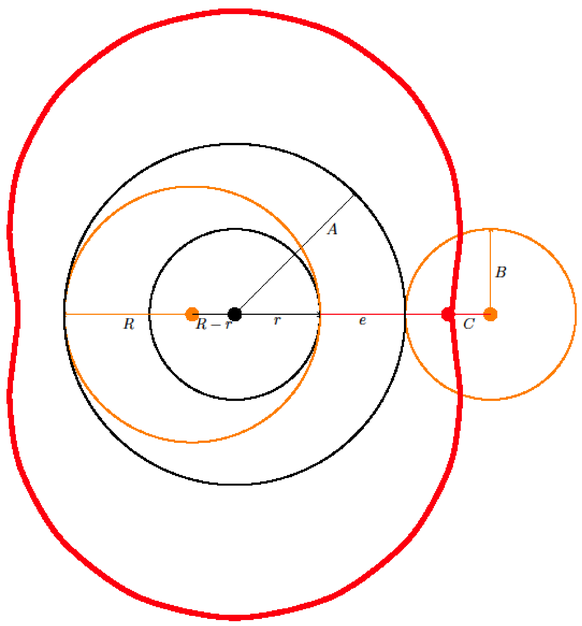
Semi-minor axis configuration for two gear method

$$\frac{B}{A} = \frac{1}{a-1}, a \in \mathbb{N}$$

Both Methods



Semi-major axis:
$2R - r + e = A + B + C$



Semi-minor axis:
$r + e = A + B - C$

Both methods construct the same trochoid with parametric equation:

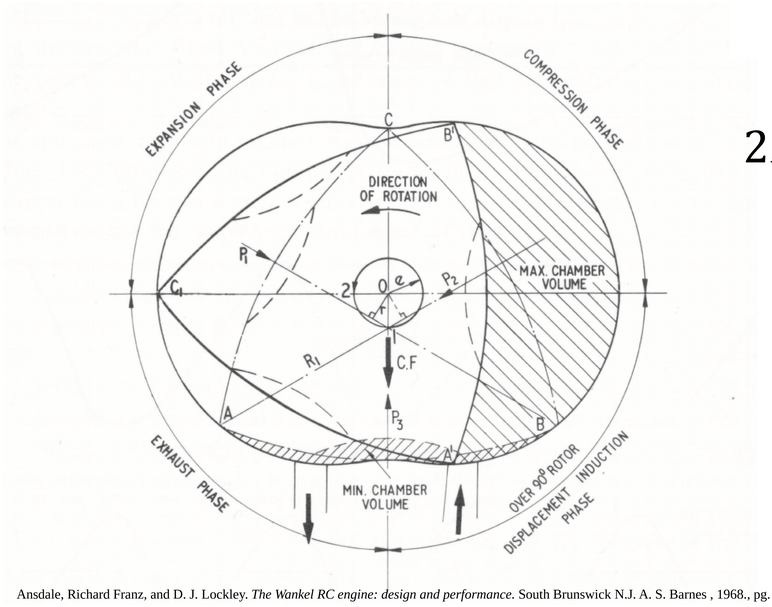
$$\begin{cases} x = \mathrm{R}\cos\alpha - e\cos 3\alpha \\ y = R\sin\alpha - e\sin 3\alpha \end{cases}$$

given that:

$$A = r\left(1 + \frac{e}{R}\right)$$

$$B = \left(1 - \frac{r}{R}\right)\left(1 + \frac{e}{R}\right)$$

$$C = R - r$$



Ansdale, Richard Franz, and D. J. Lockley. *The Wankel RC engine: design and performance.* South Brunswick N.J. A. S. Barnes , 1968., pg. 41

$$A_{max} = (R^2 + 3e^2)\frac{\pi}{3} - \frac{\sqrt{3}R^2}{4} + \frac{3\sqrt{3}}{2}eR$$

$$A_{min} = (R^2 + 3e^2)\frac{\pi}{3} - \frac{\sqrt{3}R^2}{4} - \frac{3\sqrt{3}}{2}eR$$

$$V_s = 3\sqrt{3}R_1Be$$
$$R_1 = (R + a)$$

The trochoidal shape of the chamber can be constructed through multiple methods. By analyzing the construction methods, one can better understand the properties of the rotary engine. The displacement volume , V_s, can be determined by calculating the maximum and minimum combustion areas, A_{max}, A_{min}

Works Cited

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Wankel, Felix. *Rotary piston machines; classification of design principles for engines, pumps and compressors.* London, Iliffe, 1965.