Darwin, Horace

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Horace Darwin

The object is to make 2 points one on each side of a lens move in such a way as always to remain at conjugate foci — PR P'R' are the poles of 2 cells, alike in all respects. The poles R & R' are connected by a bar with a slot in it (see picture over) through which the pivot at O passes — also PRR'P' are constrained to keep in a straight line

$PO = p$ (r) $P'O = r'$ } $RR' = L$

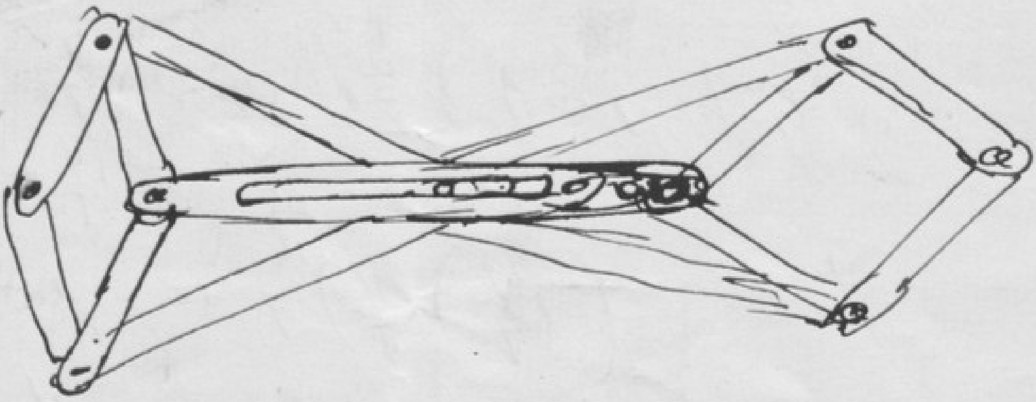
$RO = r$ (p) $R'O = p'$ } there is clearly a typical error here - r' & p' should be transposed

$r = \frac{k}{p}$ $r' = \frac{k}{p'}$ where k is a constant

$$L = r + r' = k\left(\frac{1}{p} + \frac{1}{p'}\right)$$

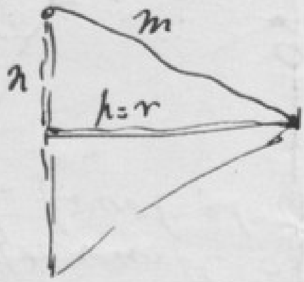
$$\frac{1}{p} + \frac{1}{p'} = \frac{L}{k}$$

Hence if $\frac{k}{L}$ is the focal length of the lens p & p' are conjugate foci.



$k = p\,r$

$\frac{k}{l}$ = focal length of lens



$k = p^2$

$= \sqrt{m^2 - n^2}$

$l = \frac{\sqrt{m^2 - n^2}}{\text{focal length of lens.}}$

(the length of the connecting link RR')

M.J