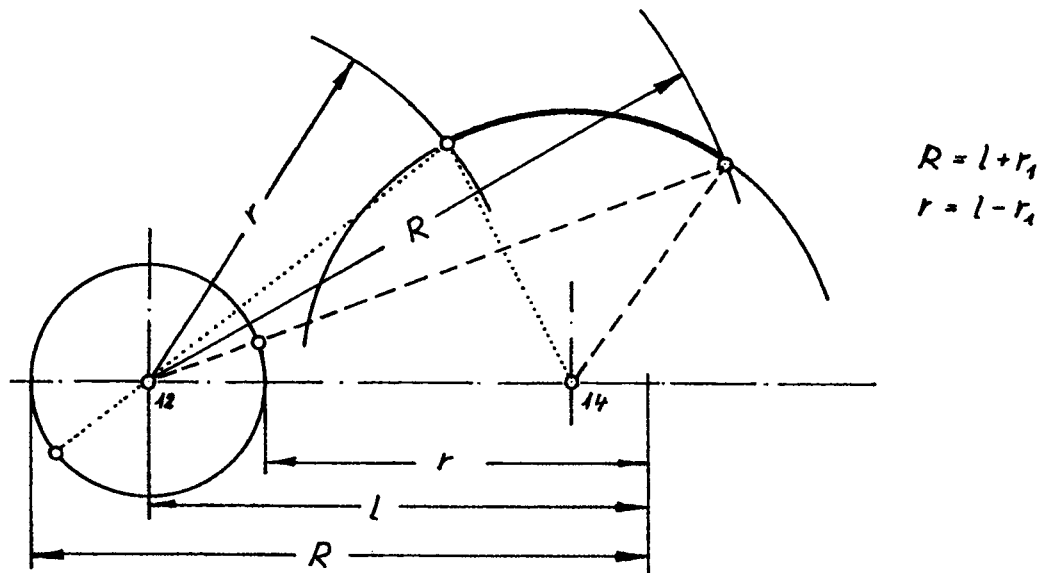


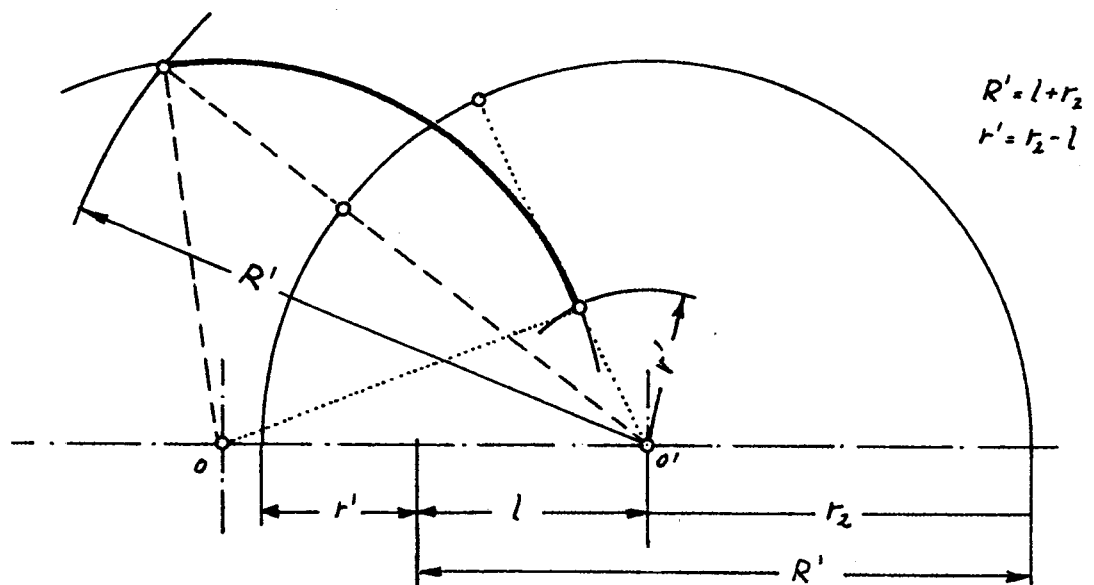
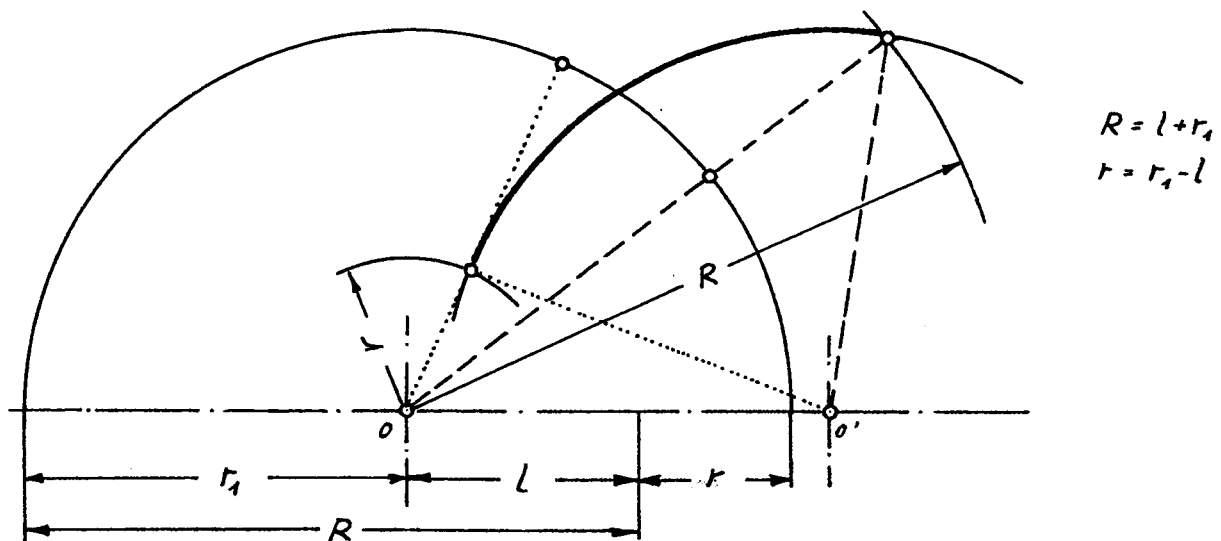
## Beispiele Bewegungsgrenzen

### Kurbelschwinge



## Beispiele Bewegungsgrenzen

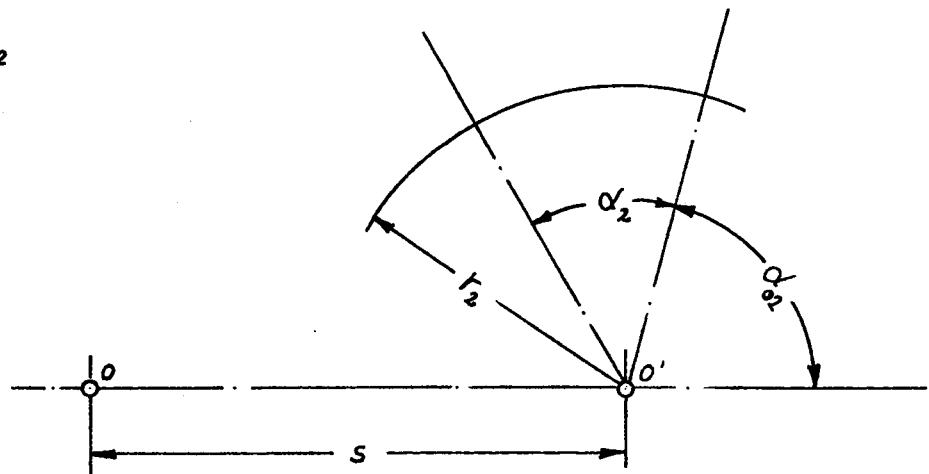
### Doppelschwinge I. Art



# Konstruktion Kurbelschwinge für vorgegebenen Schwenkbereich

Geg.:  $s, r_2, \alpha_2, \alpha_{02}$

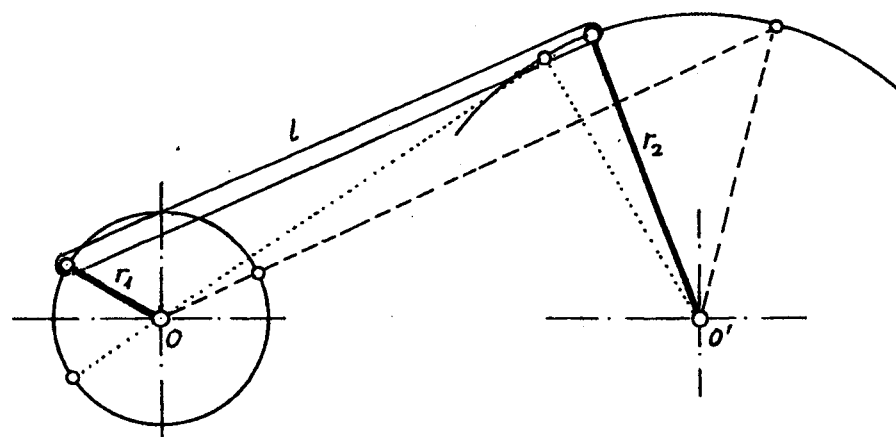
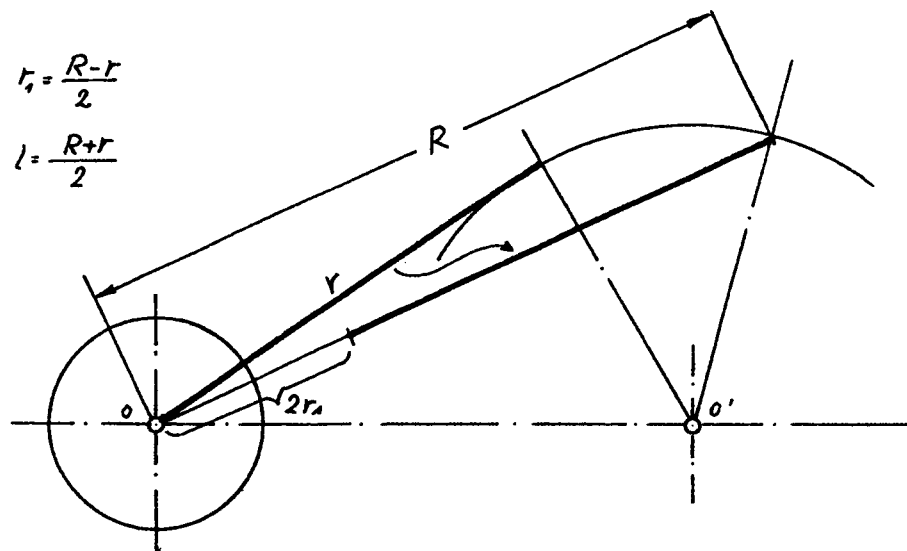
Ges.:  $r_1, l$



$$\begin{aligned} R &= l + r_1 \\ r &= l - r_1 \\ \hline R + r &= 2l \\ R - r &= 2r_1 \end{aligned}$$

$$r_1 = \frac{R - r}{2}$$

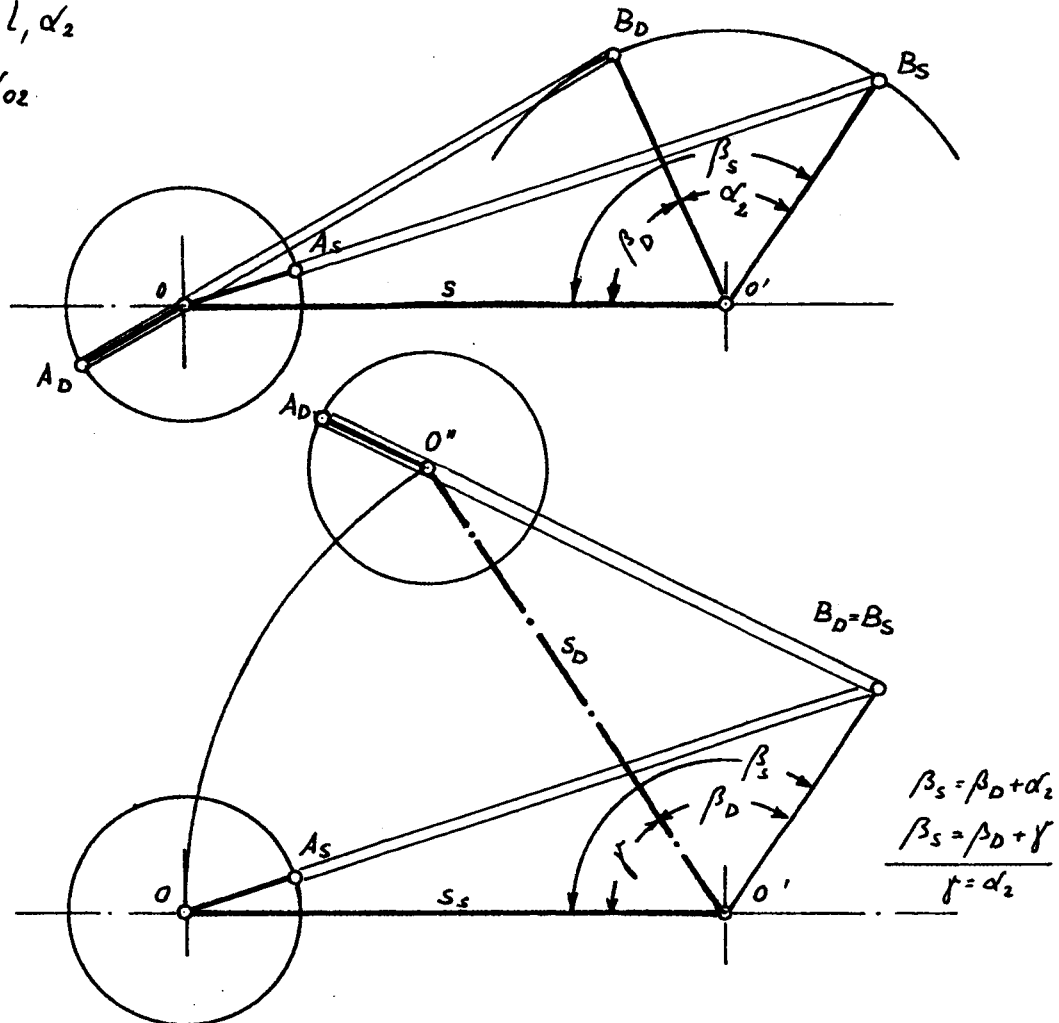
$$l = \frac{R + r}{2}$$



# Konstruktion Kurbelschwinge für vorgegebenen Schwenkbereich

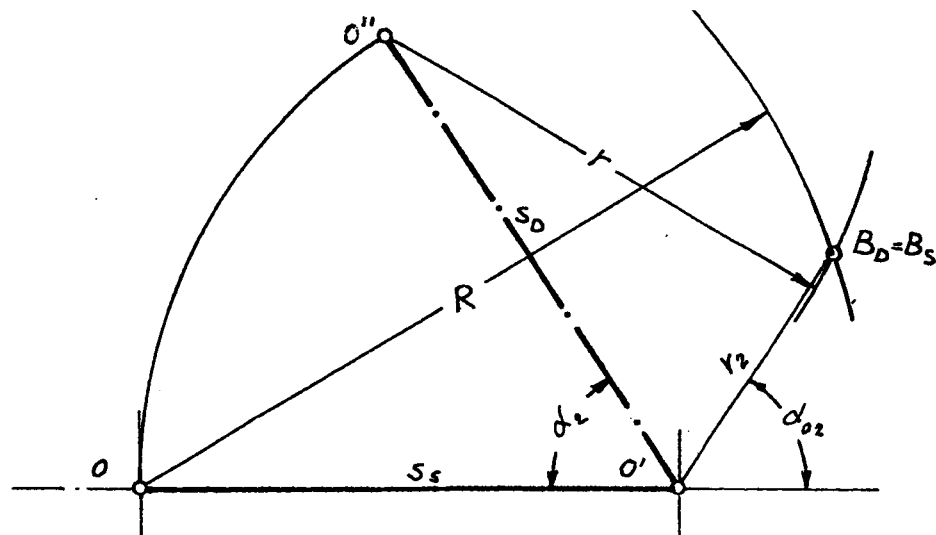
Geg.:  $s, r_1, l, \alpha_2$

Ges.:  $r_2, \alpha_{02}$



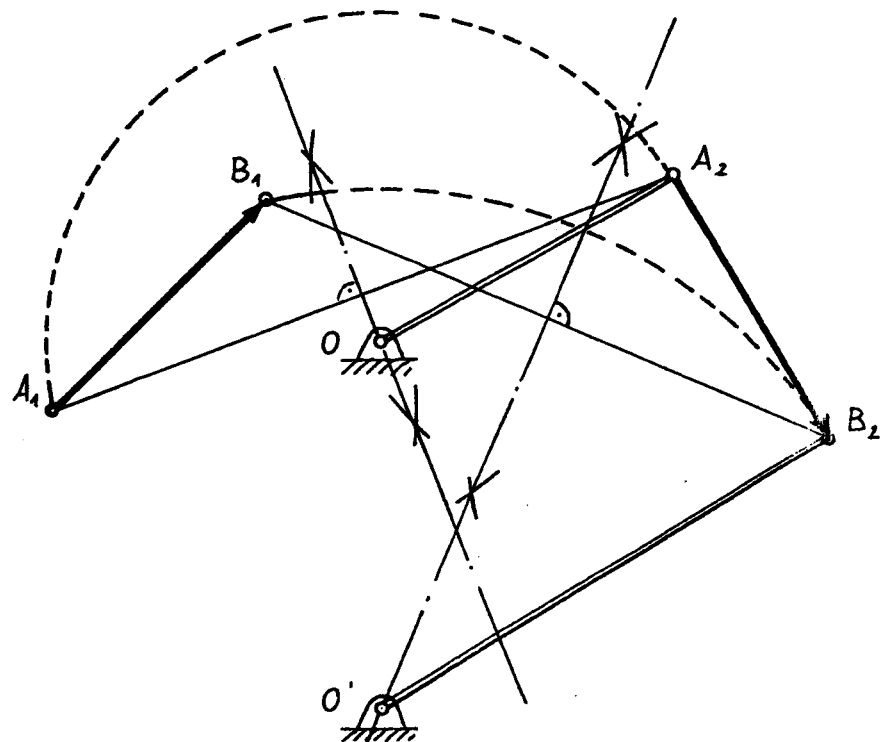
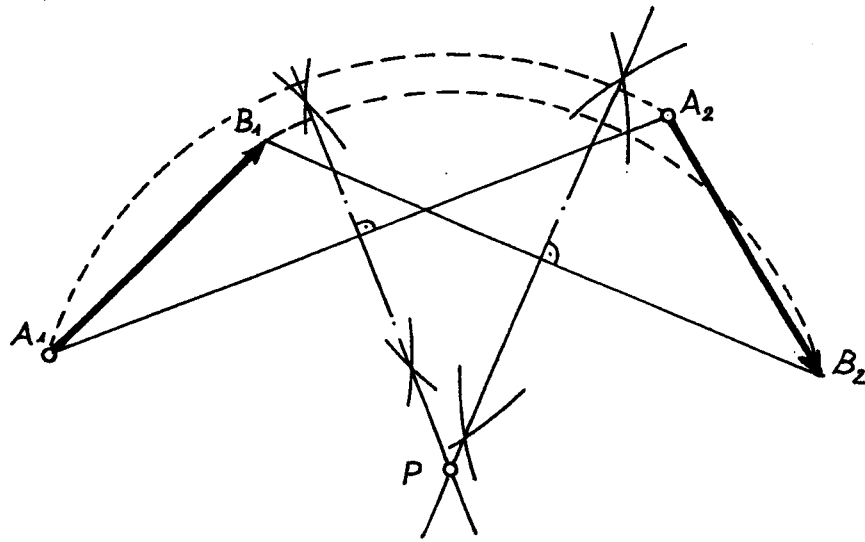
$$R = l + r_1$$

$$r = l - r_1$$



## Lagenzuordnungen

### 2-Lagen-Zuordnung



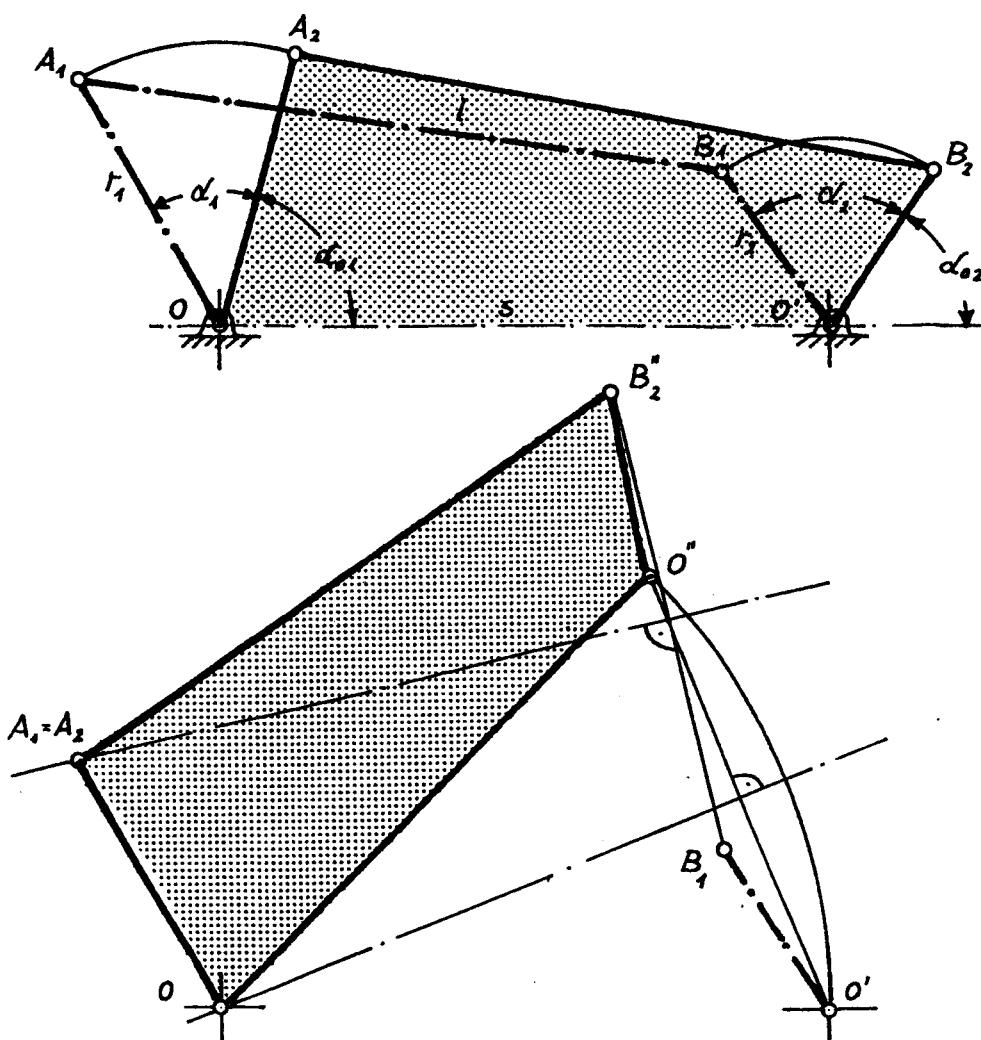
## Beispiele 2-Lagen-Zuordnungen

### 2 zugeordnete Lenkerstellungen

Geg.:  $s, \alpha_1, \alpha_{s1}, \alpha_2, \alpha_{s2}$

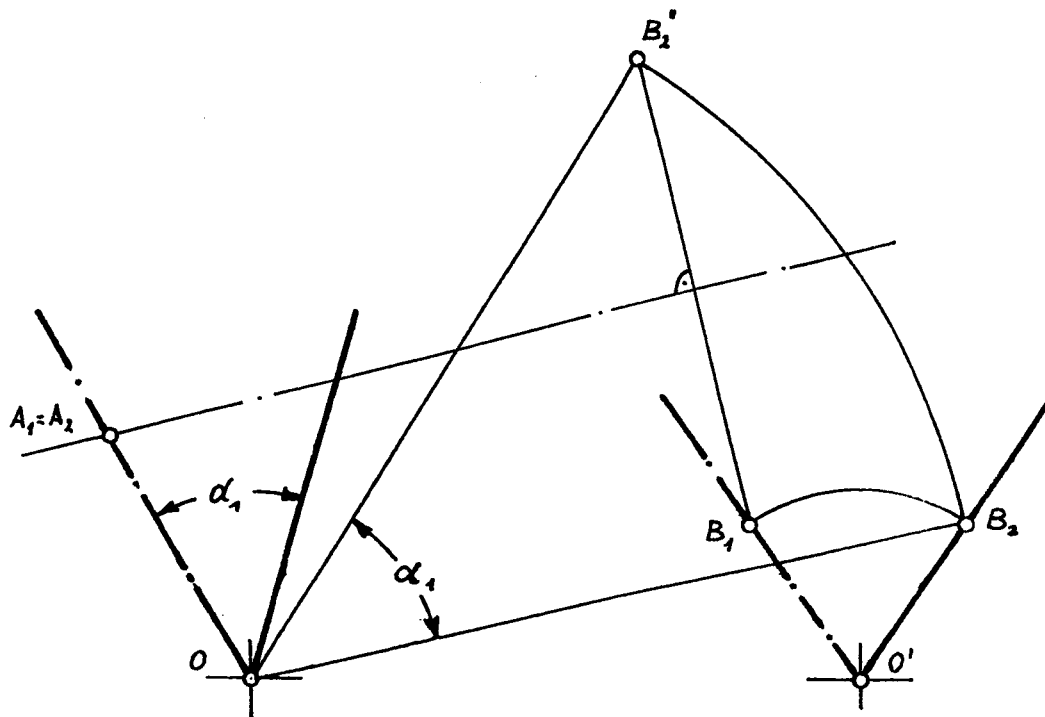
Wählbar:  $r_2$

Ges.:  $r_1, l$



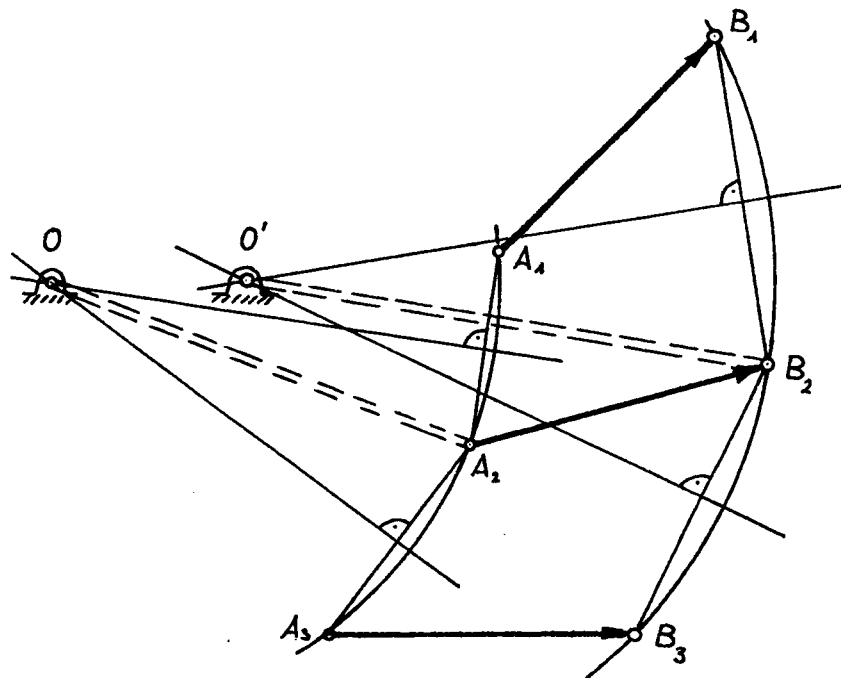
## Beispiele 2-Lagen-Zuordnungen

### 2 zugeordnete Lenkerstellungen



## Lagenzuordnungen

### 3-Lagen-Zuordnung



## Beispiele 3-Lagen-Zuordnungen

### 3 zugeordnete Lenkerstellungen

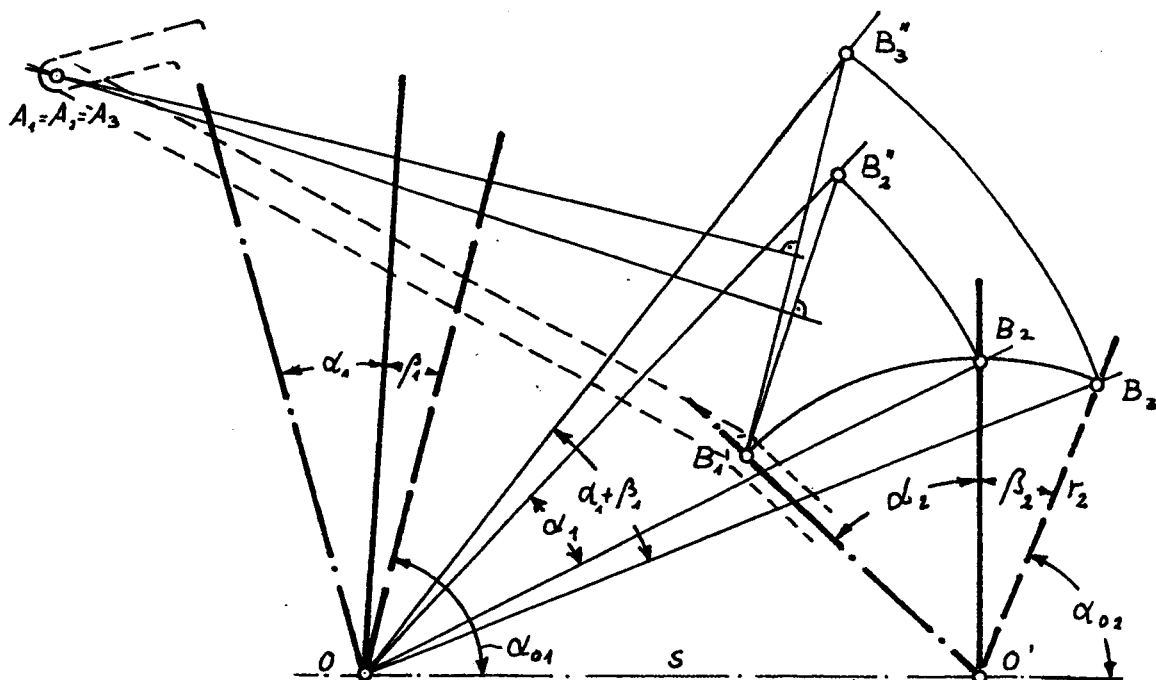
Geg.:  $\alpha_{01}, \alpha_1, \beta_1$   
 $\alpha_{02}, \alpha_2, \beta_2, s$

Wählbar.:  $r_2$

Ges.:  $A_1, (r_1, l)$

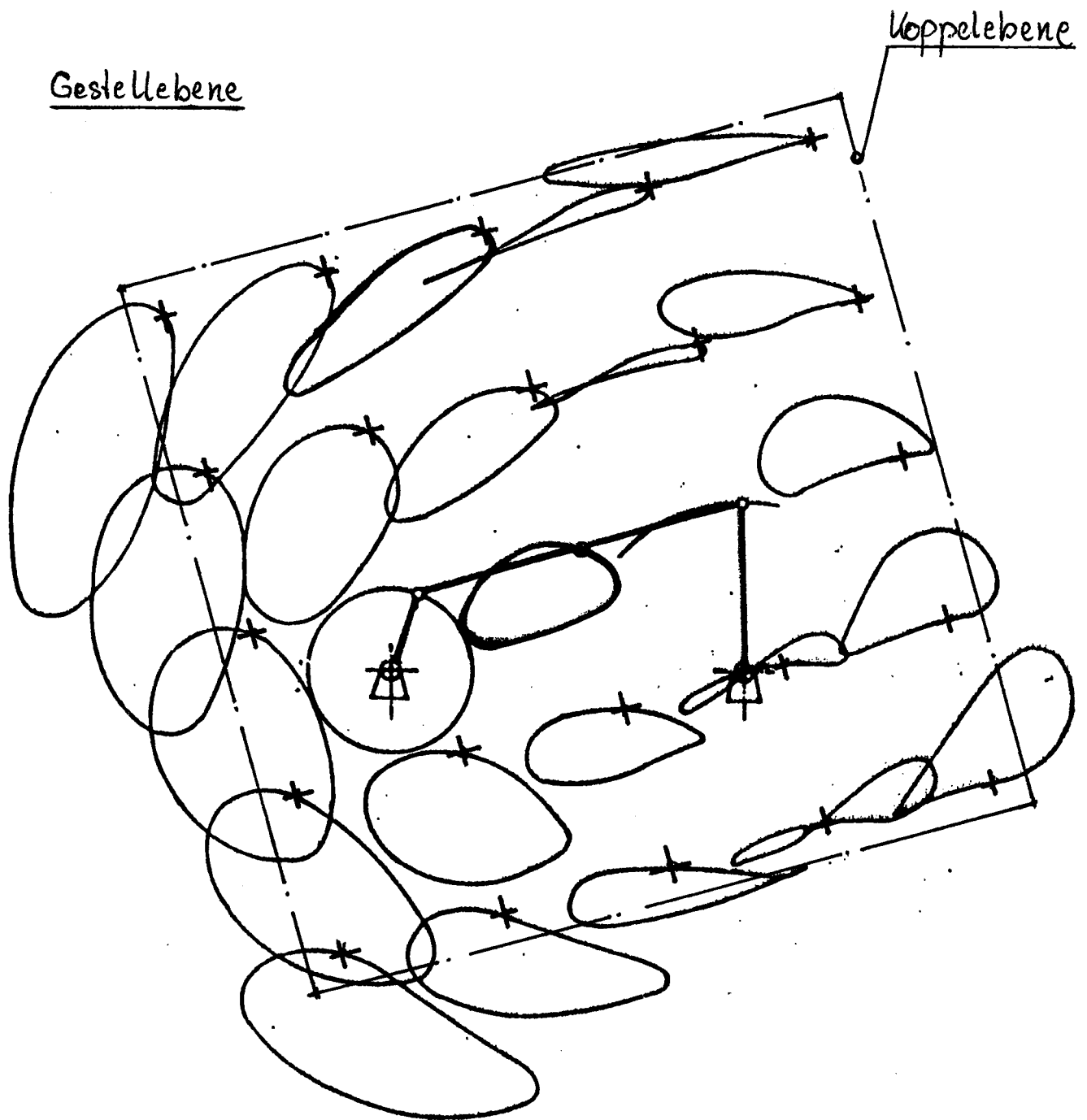
$$r_1 = \overline{A_1 O}$$

$$l = \overline{A_1 B_1}$$



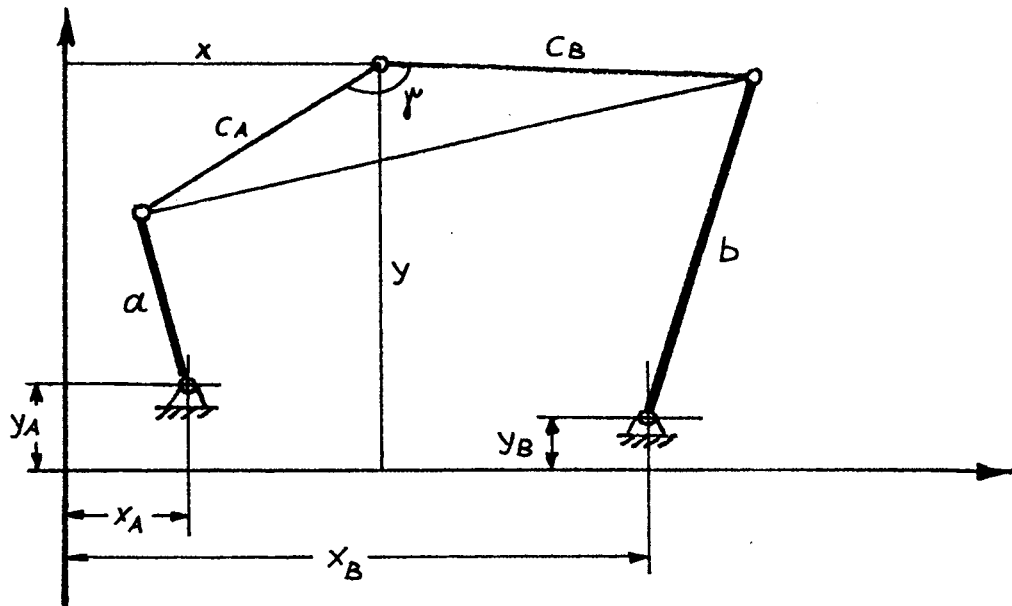
## Koppelkurven

### Beispiel Kurbelschwinge



## Mathematische Darstellung der Koppelkurven

(algebraische Kurve 6. Ordnung)



$$[(e-g)^2 - l - h]^2 = 4lh$$

$$e = \frac{u}{2v} \quad u = 2MF \quad v = M^2 + N^2 \quad M = K \cos \gamma + L \sin \gamma$$

$$N = L \cos \gamma - L \sin \gamma \quad F = C^2 + D^2 - b^2 + c^2$$

$$K = 2Cc_B \quad L = 2Dc_B \quad C = x - x_B \quad D = y - y_B$$

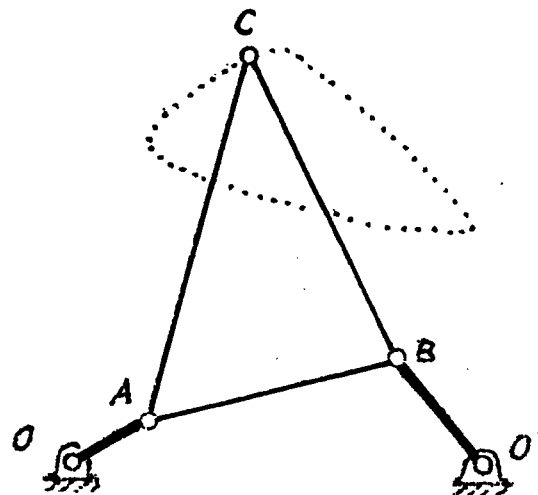
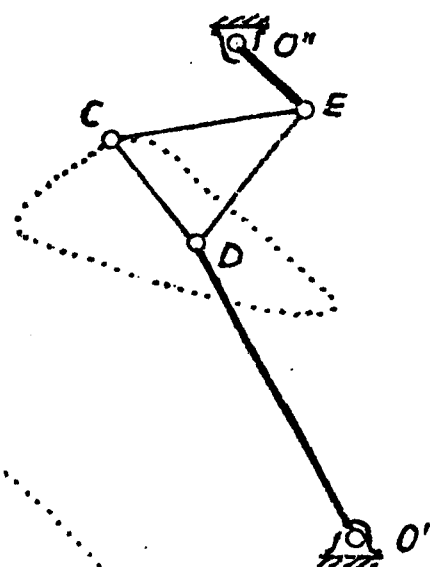
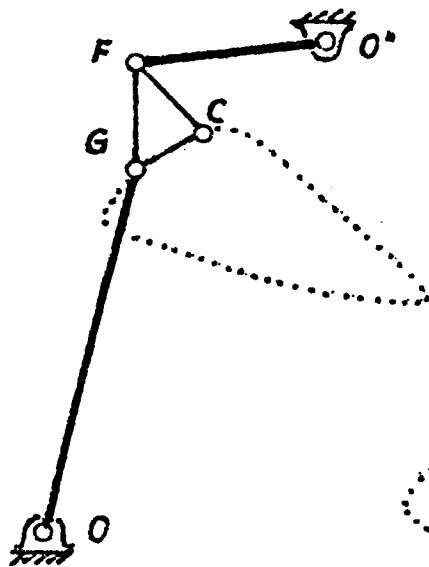
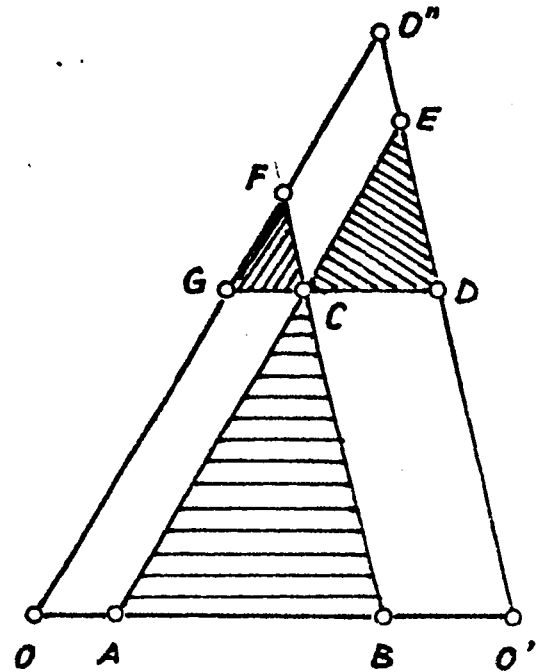
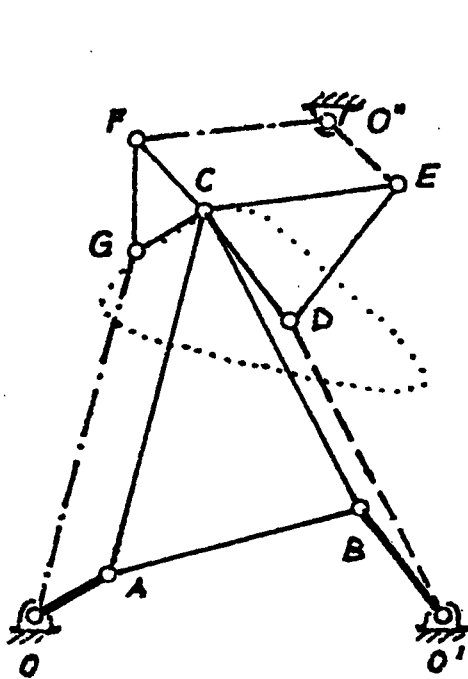
$$g = r/2p \quad r = 2GE \quad p = G^2 + H^2 \quad G = 2Ac_A \quad H = 2Bc_A$$

$$E = A^2 + B^2 - a^2 + c_A^2 \quad A = x - y_A \quad B = y - x_A$$

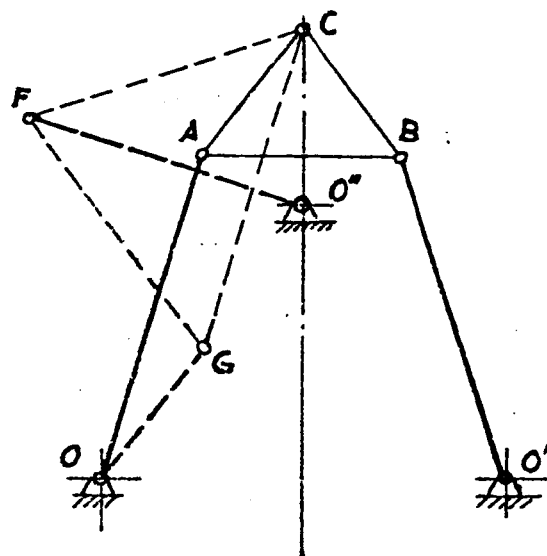
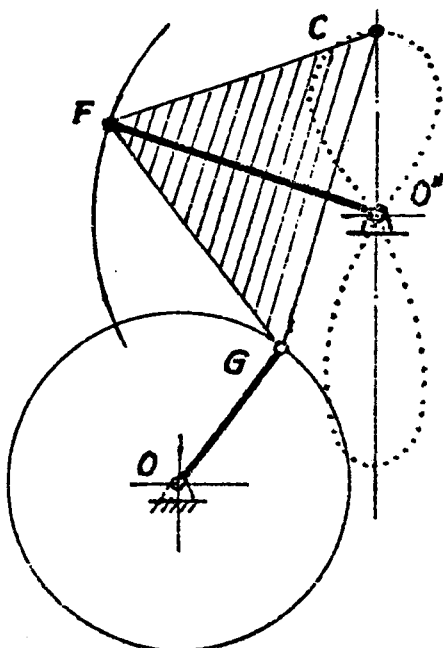
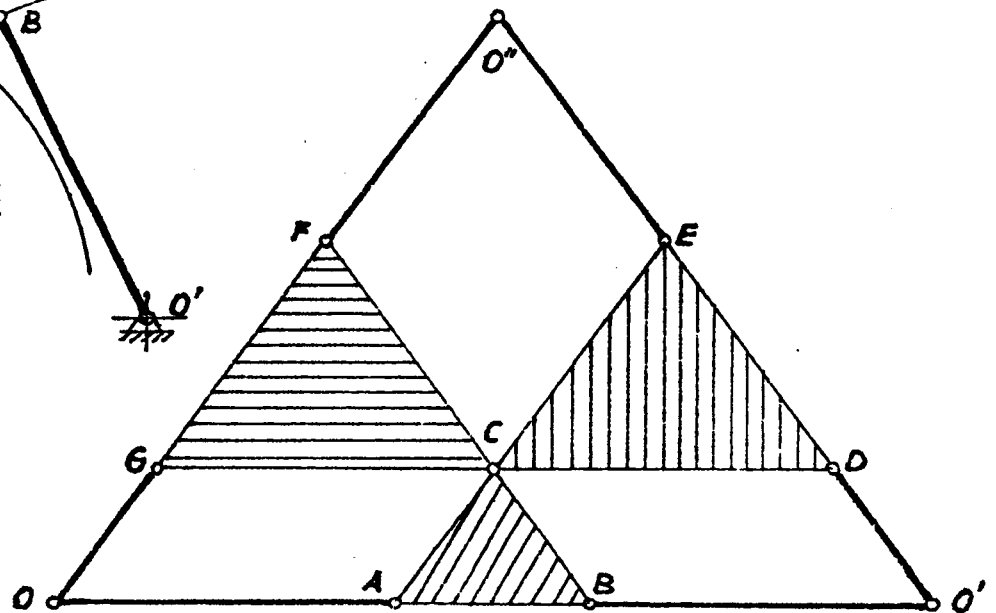
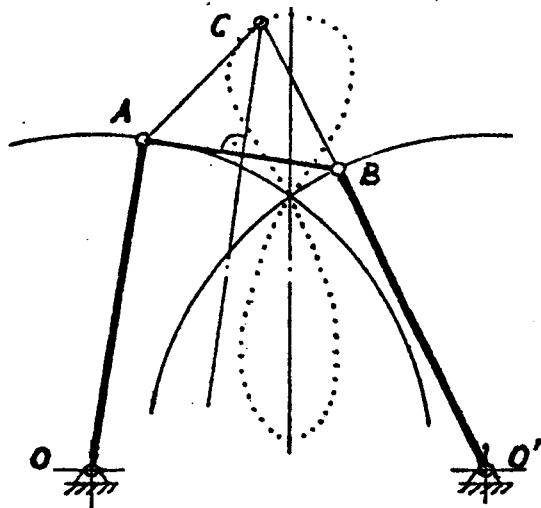
$$l = \frac{t}{v} + \frac{u^2}{4v^2} \quad t = N^2 - F^2 \quad h = \frac{s}{p^2} + \frac{r^2}{4p^2} \quad s = H^2 - E^2$$

$$y = f[(a, b, c_A, c_B, x_A, x_B, y_A, y_B, \gamma) x]$$

# Mehrfache Erzeugung von Koppelkurven

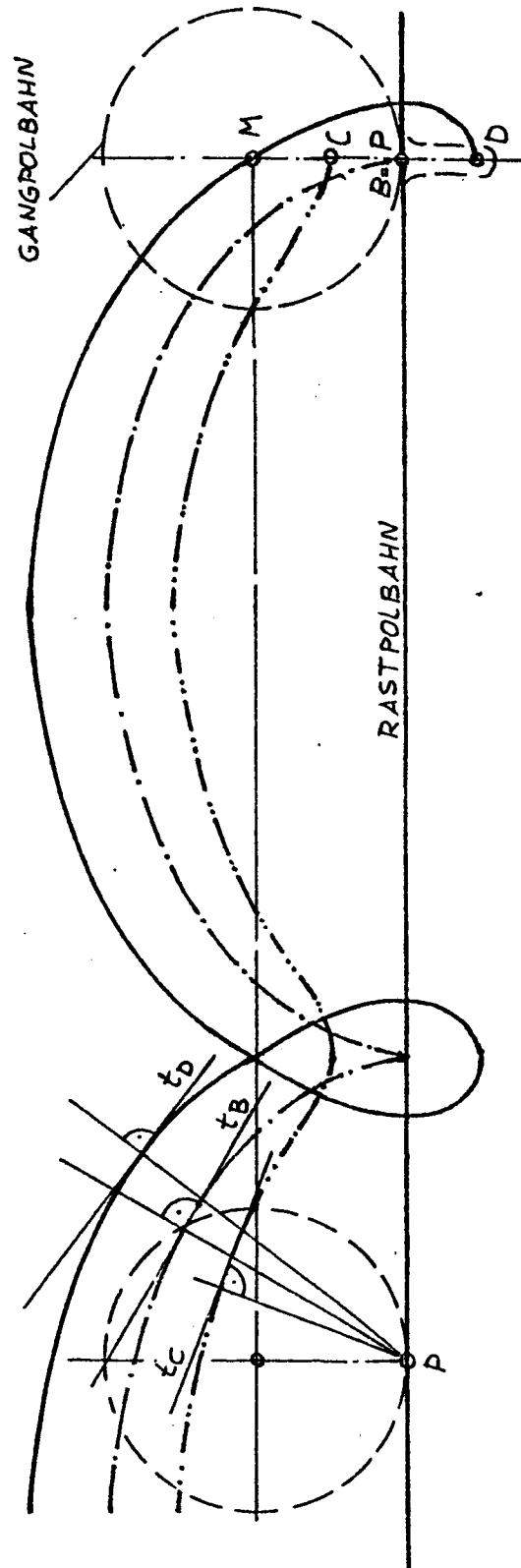


## Mehrfache Erzeugung von Koppelkurven



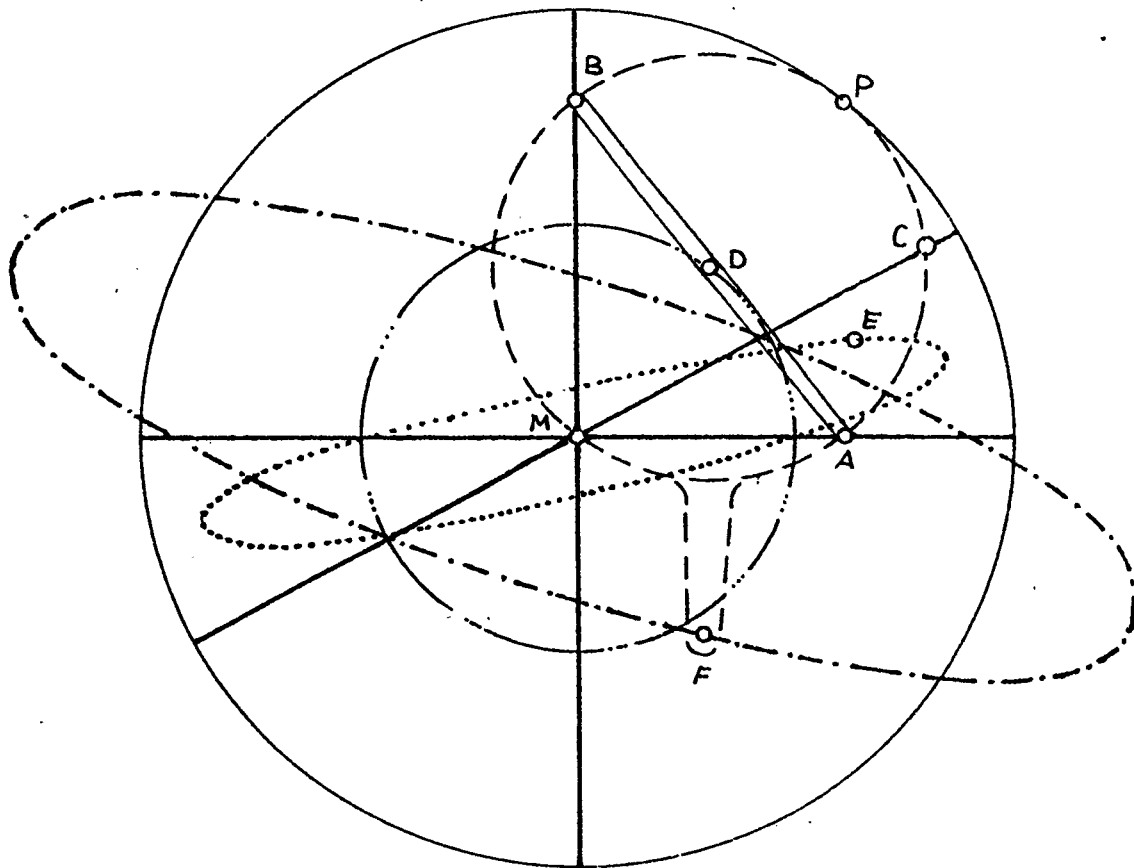
# Beispiele für Koppelkurven

## Abrollbewegung eines Rades



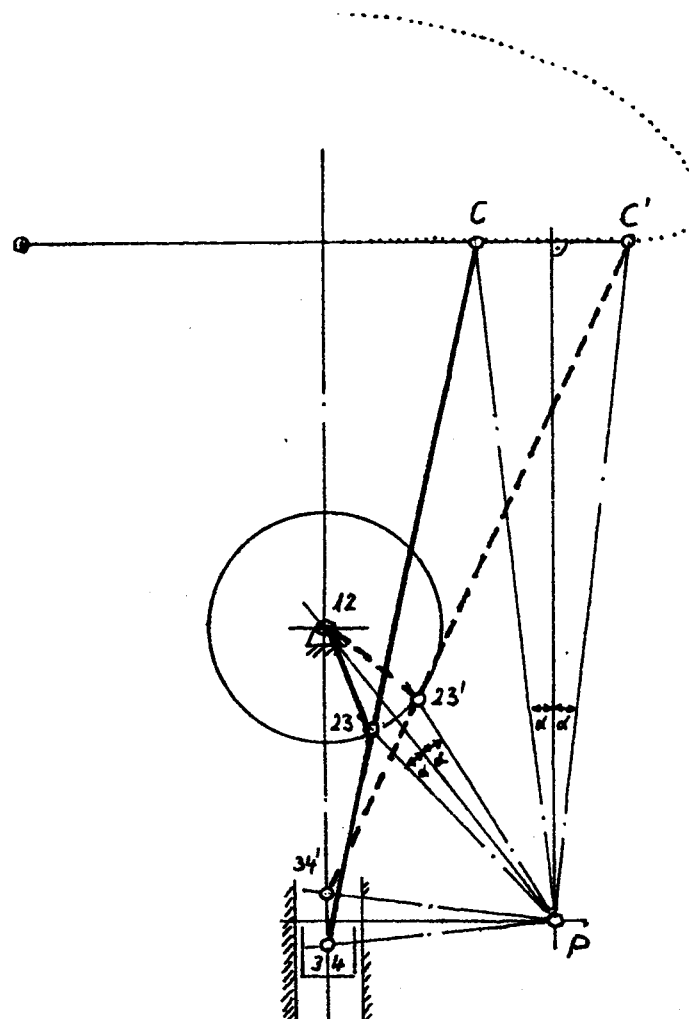
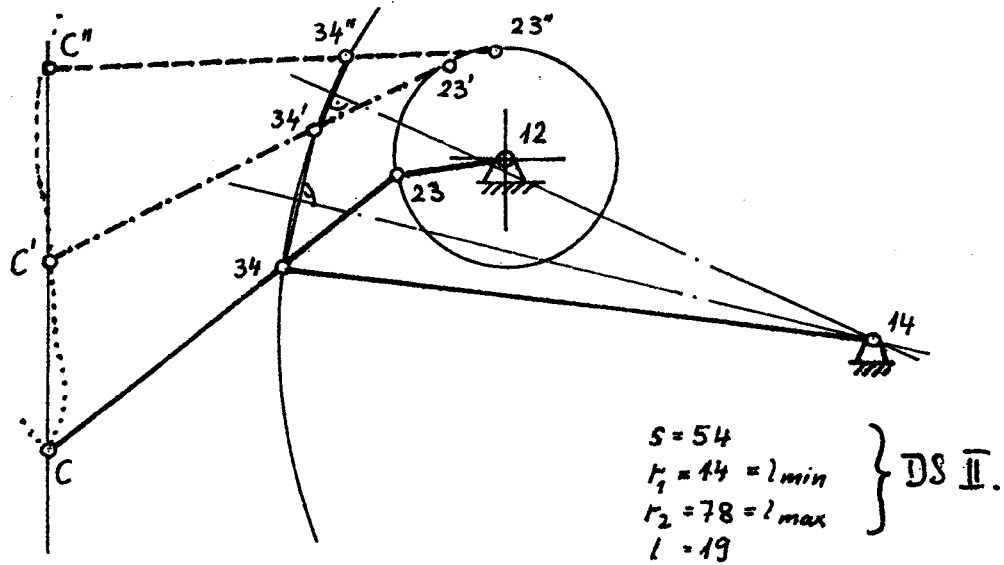
## Beispiele für Koppelkurven

### Kardankreispaar



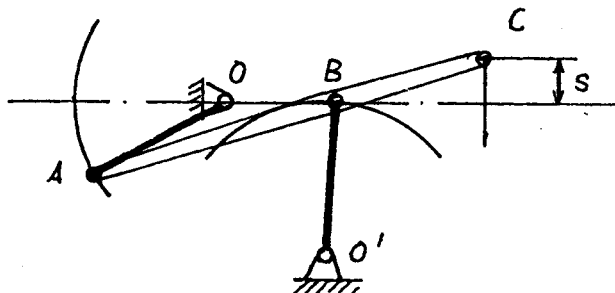
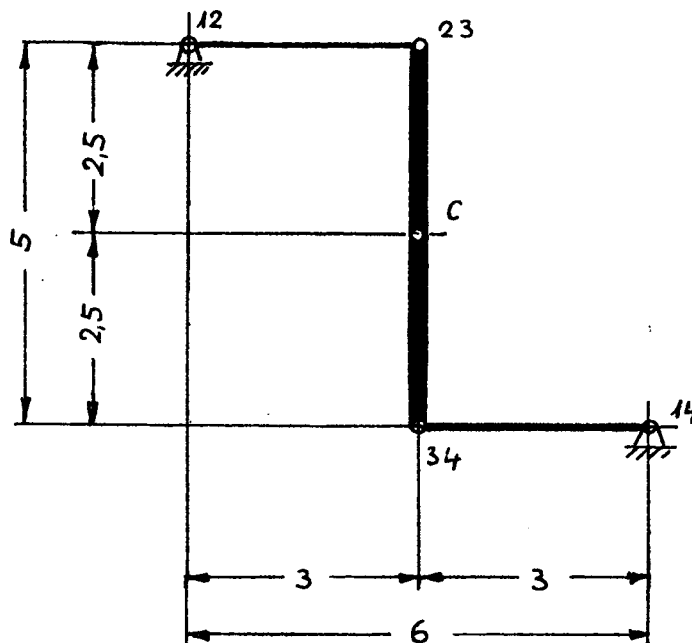
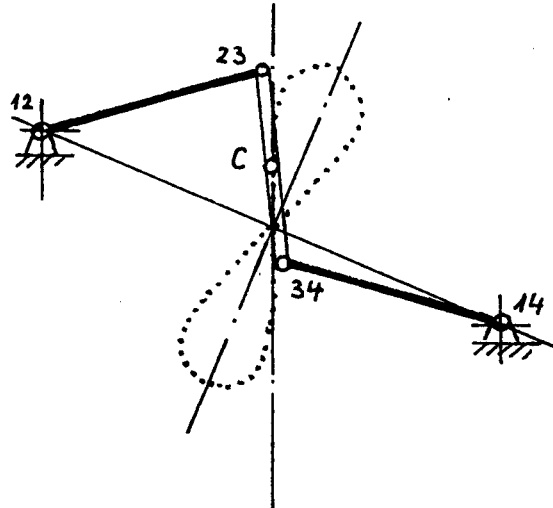
## Anwendungen von Koppelkurven

### Geradführungen



## Anwendungen von Koppelkurven

### Geradführungen

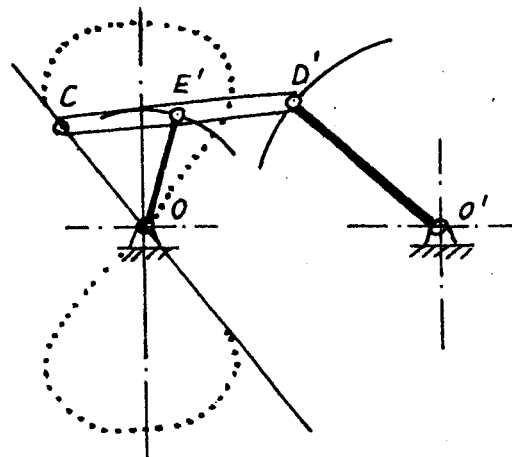
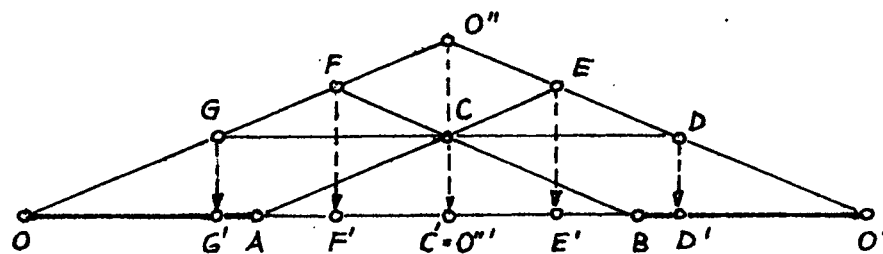
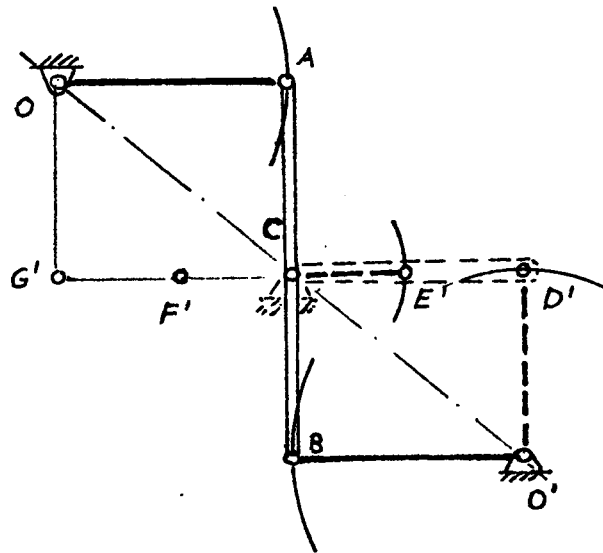


$$\begin{aligned} O-A &= 1 \\ A-B &= 1,63 \\ B-C &= 1,03 \\ B-O' &= 1,03 \end{aligned}$$

$$\begin{aligned} S &= 0,12 \\ \text{mit } 2,2\% \text{ Fehler} \end{aligned}$$

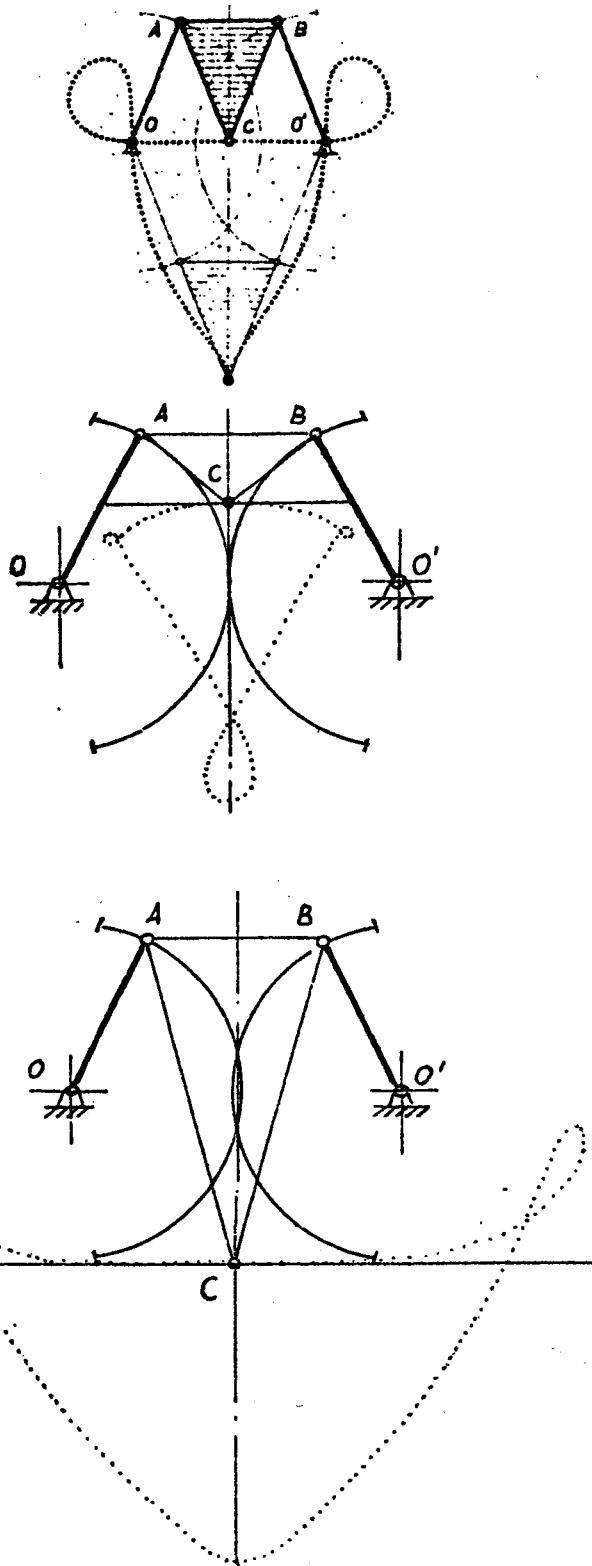
## Anwendungen von Koppelkurven

### Geradführungen



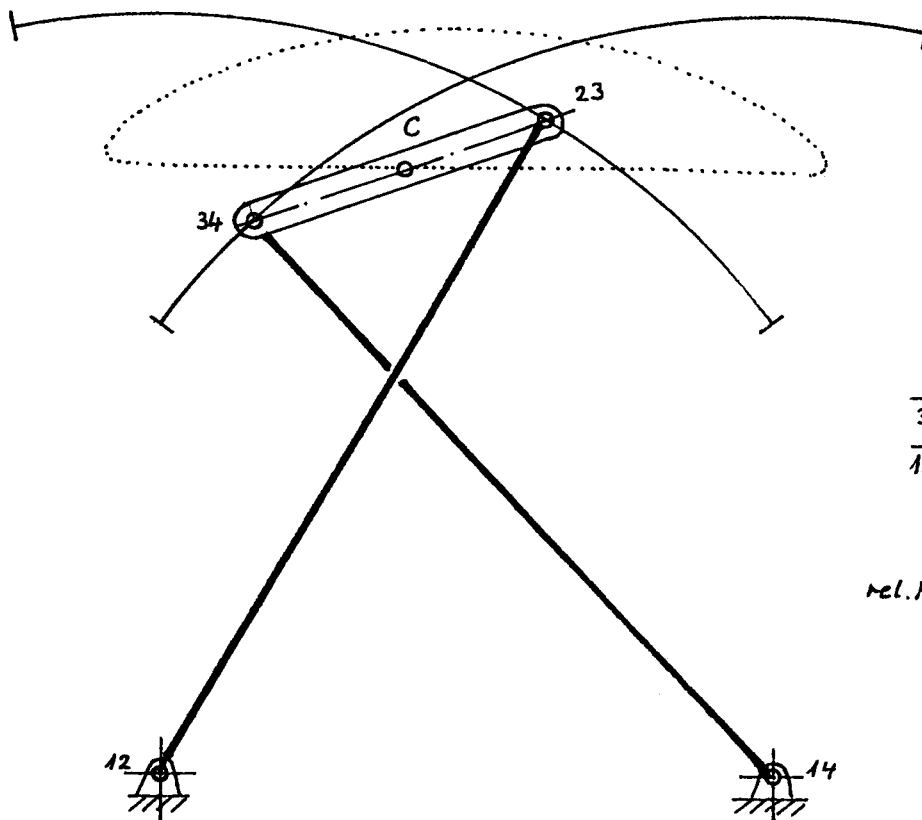
## Anwendungen von Koppelkurven

### Geradführungen



## Anwendungen von Koppelkurven

### Geradführungen



$$\overline{34, C} = \overline{C, 23}$$

$$\overline{12, 23} = \overline{14, 34} = 5$$

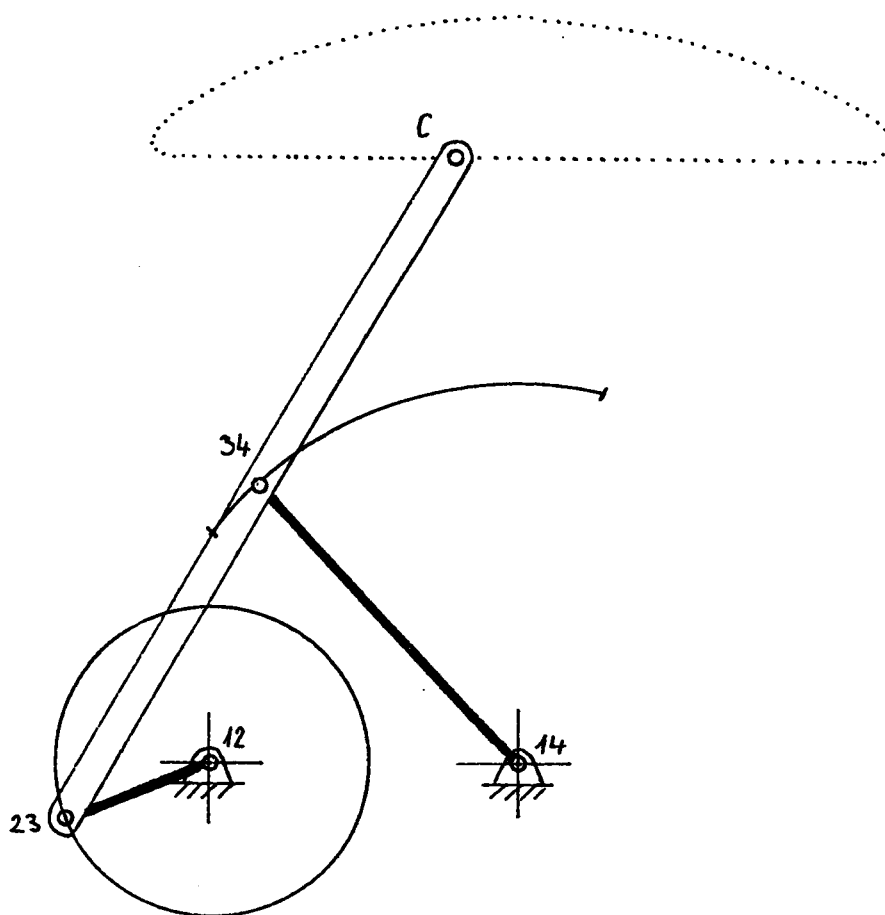
$$\overline{12, 14} = 4$$

$$\overline{23, 14} = 2$$

$$\text{rel. Fehler: } 2,2\%$$

## Anwendungen von Koppelkurven

### Geradführungen



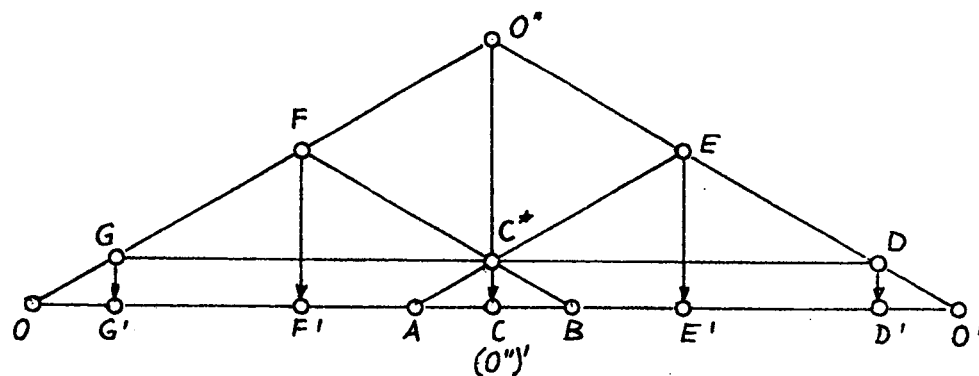
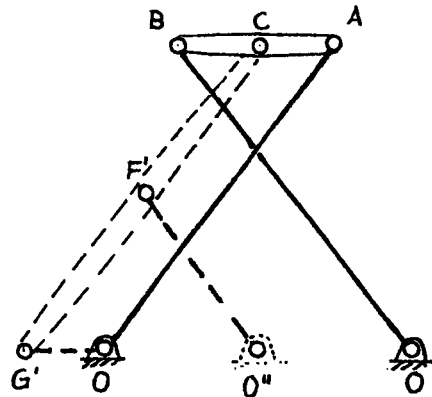
$$\begin{aligned}\overline{12,23} &= 1 \\ \overline{14,34} &= 2,5 \\ \overline{23,34} &= 2,5 \\ \overline{23,C} &= 5\end{aligned}$$

$$\text{Fehler: } 0,002 \cdot \overline{12,23}$$

## Anwendungen von Koppelkurven

### Geradführungen

Ableitung der Geradführung nach HOECKEN aus dem Kreuzlenker nach TSCHEBYSCHEFF mit Hilfe des Satzes von ROBERTS.



## Anwendungen von Koppelkurven

### Stillstandsgetriebe

