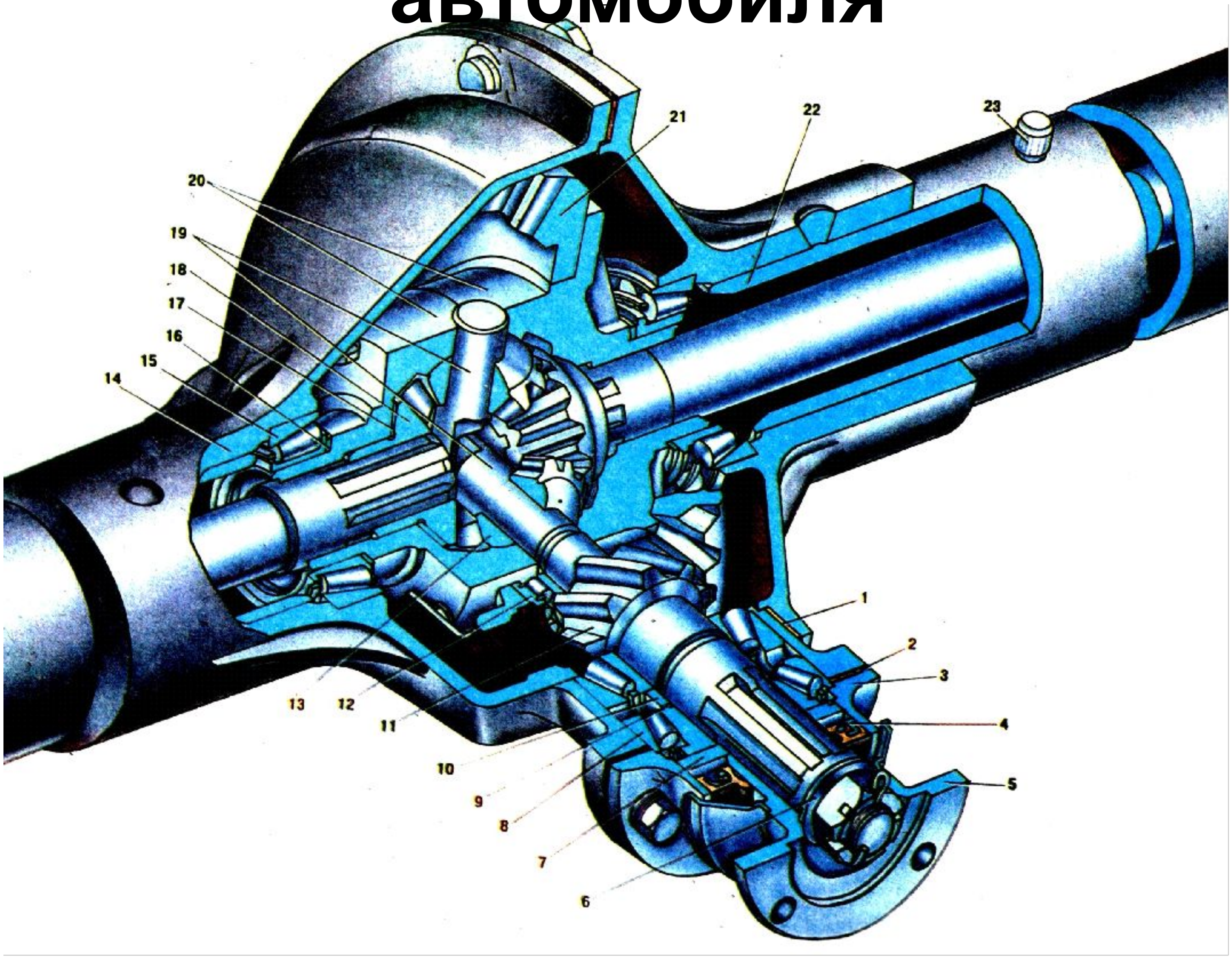
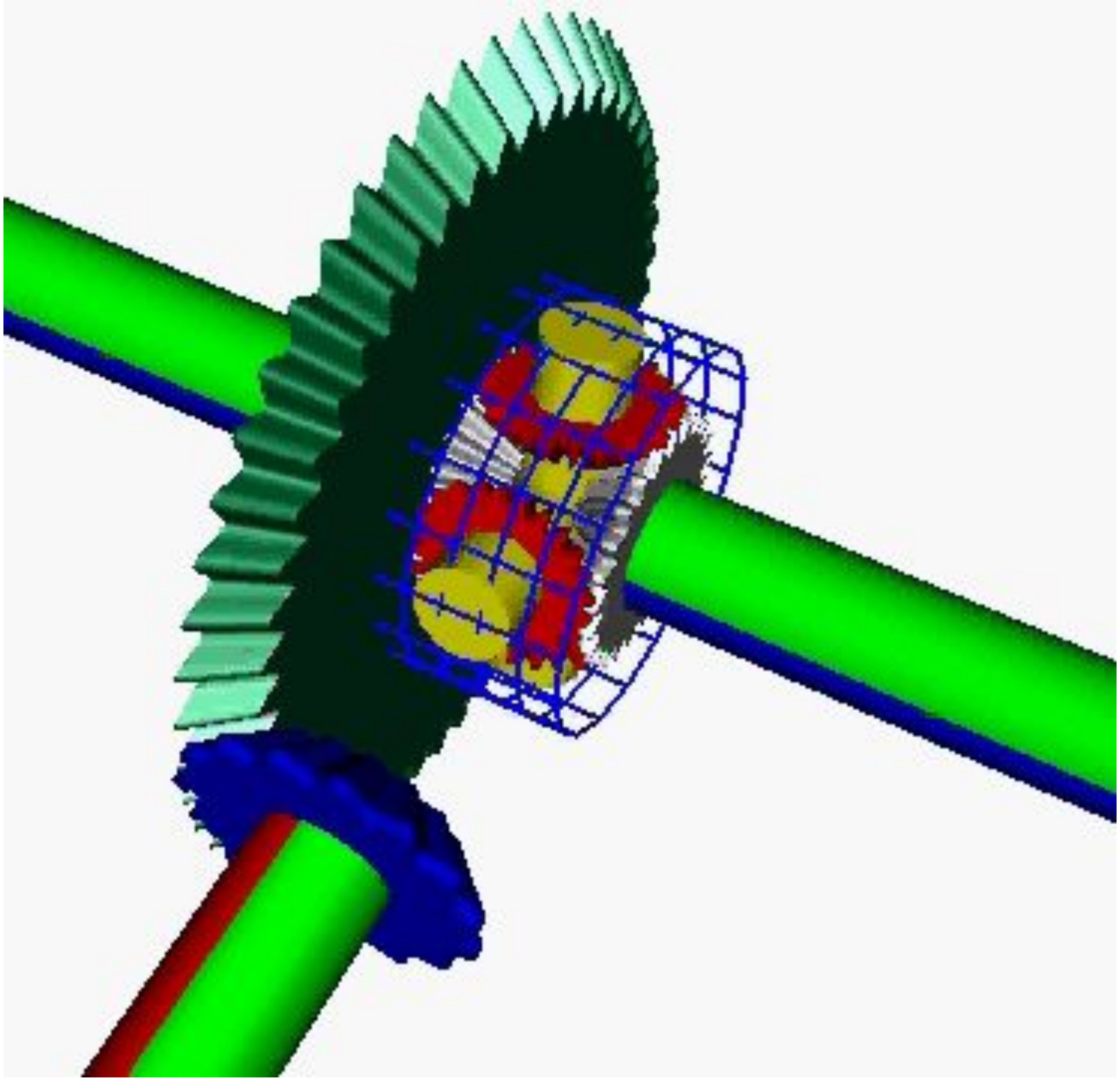
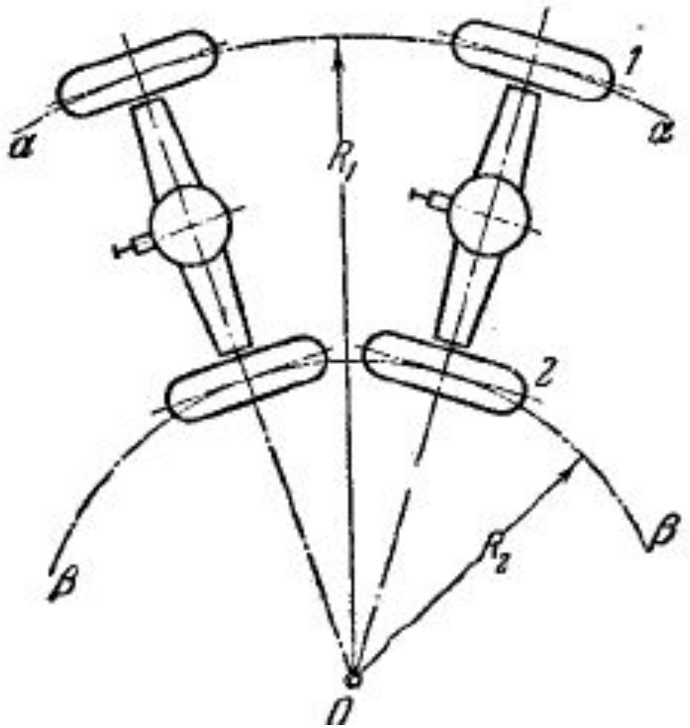
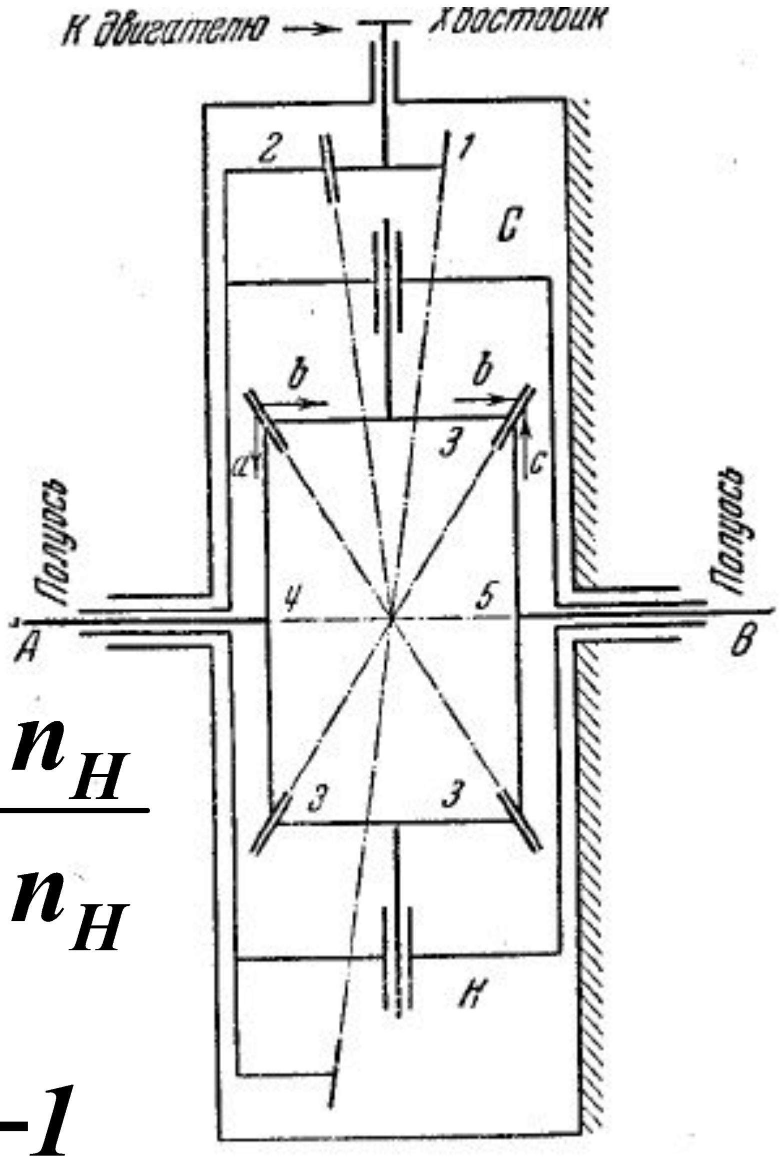
Дифференциальная передача автомобиля



21
22
23
20
19
18
17
16
15
14
1
2
3
4
5
13
12
11
10
9
8
7
6




a
a
1
R_1
2
β
β
R_2
O


К двигателю →
Хвостовик
2
1
C
b
b
3
a
c
Полуось
Полуось
4
5
A
B
3
3
K

$$u_{45}^{(H)} = \frac{\omega_4 - \omega_H}{\omega_5 - \omega_H} = \frac{n_4 - n_H}{n_5 - n_H}$$

$$u_{45}^{(H)} = \frac{z_5}{z_3} \cdot \frac{z_3}{z_4} = \frac{z_5}{z_4} = -1$$

$$u_{45}^{(H)} = \frac{n_4 - n_H}{n_5 - n_H} = -1$$

$$n_4 - n_H = n_H - n_5$$

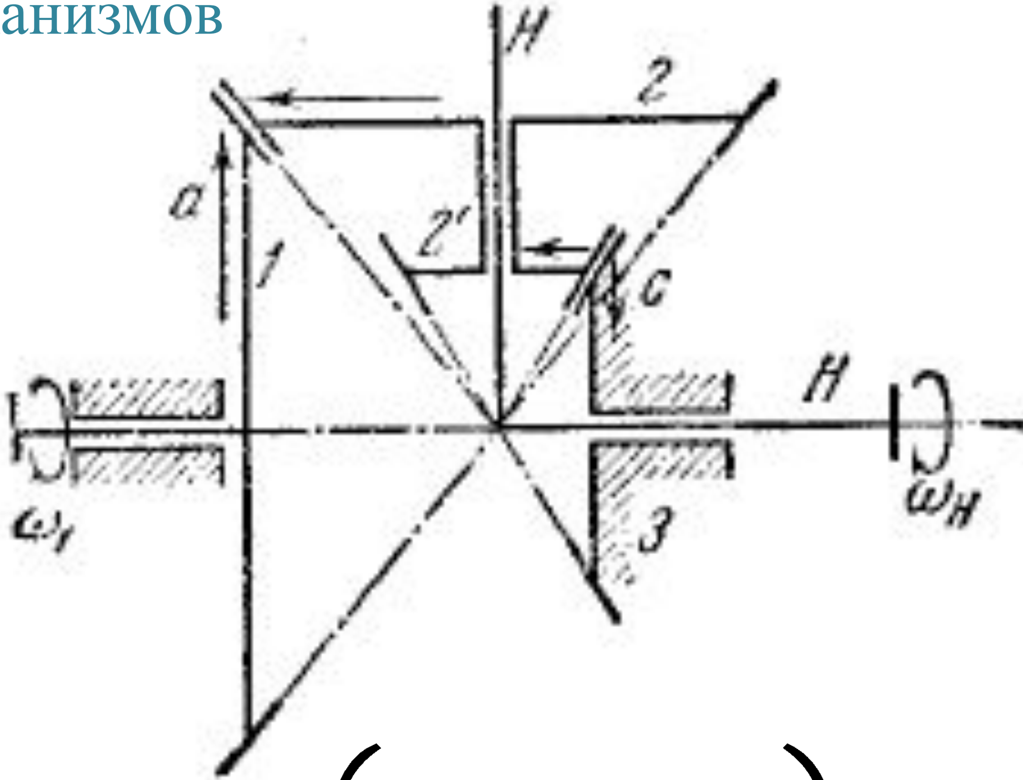
$$n_H = \frac{n_4 + n_5}{2}$$

Остановлено колесо 4 ⇒ $n_H = \frac{n_5}{2}$

Остановлено коробка Н ⇒ $n_4 = -n_5$

Примеры расчета передаточных отношений планетарных механизмов

Пример. 1



$z_1 = 60 \quad z_2 = 48$

$z_{2'} = 18 \quad z_3 = 30$

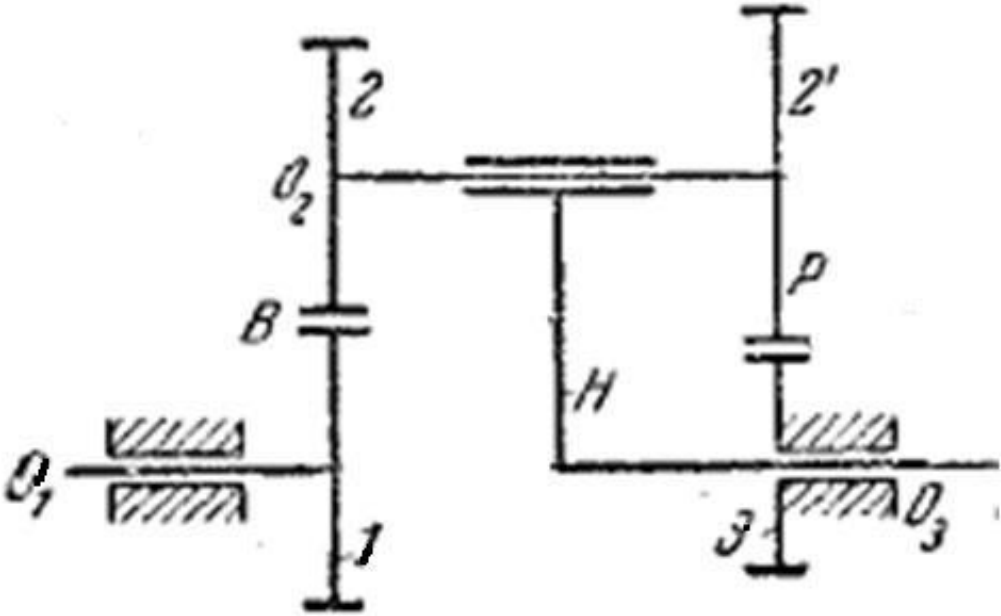
$$u_{1H}^{(3)} = 1 - u_{13}^{(H)} = 1 - \left(- \frac{z_2}{z_1} \cdot \frac{z_3}{z_{2'}} \right) =$$

$$= 1 + \frac{48}{60} \cdot \frac{30}{18} = 7{,}3$$

Пример. 2

$z_1 = 20 \quad z_2 = 22$

$z_{2'} = 20 \quad z_3 = 18$



$$u_{1H}^{(3)} = 1 - u_{13}^{(H)} = 1 - u_{12} \cdot u_{2'3} =$$

$$= 1 - (-1)^2 \left(\frac{z_2}{z_1} \cdot \frac{z_3}{z_{2'}} \right) = 1 - \frac{22}{20} \cdot \frac{18}{20} = 0{,}01$$

$\omega_H = 100\omega_1$ или $n_H = 100 n_1$

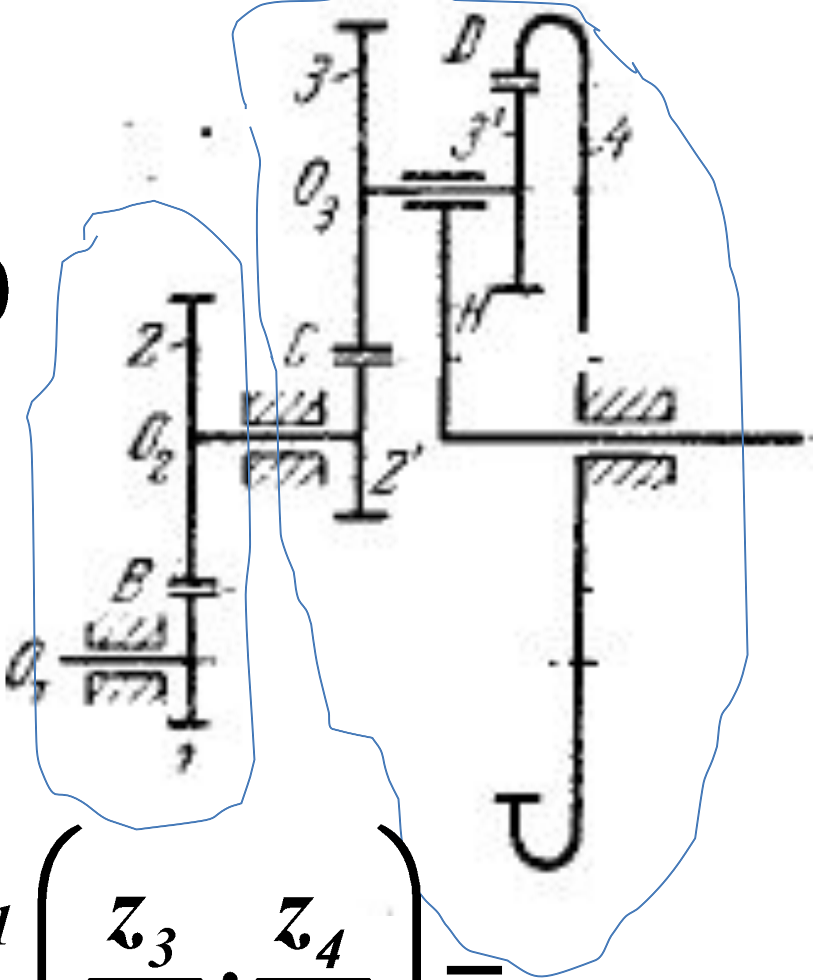
Пример. 3

$$z_1 = 25 \quad z_2 = 50 \quad z_{2'} = 20$$

$$z_3 = 40 \quad z_{3'} = 30 \quad z_4 = 90$$

$$u_{1H}^{(4)} = u_{12} \cdot u_{2'H}^{(4)}$$

$$u_{12} = (-1)^1 \frac{z_2}{z_1} = -\frac{50}{25} = -2$$



$$u_{2'H}^{(4)} = 1 - u_{2'4}^{(4)} = 1 - (-1)^1 \left(\frac{z_3}{z_{2'}} \cdot \frac{z_4}{z_{3'}} \right) =$$

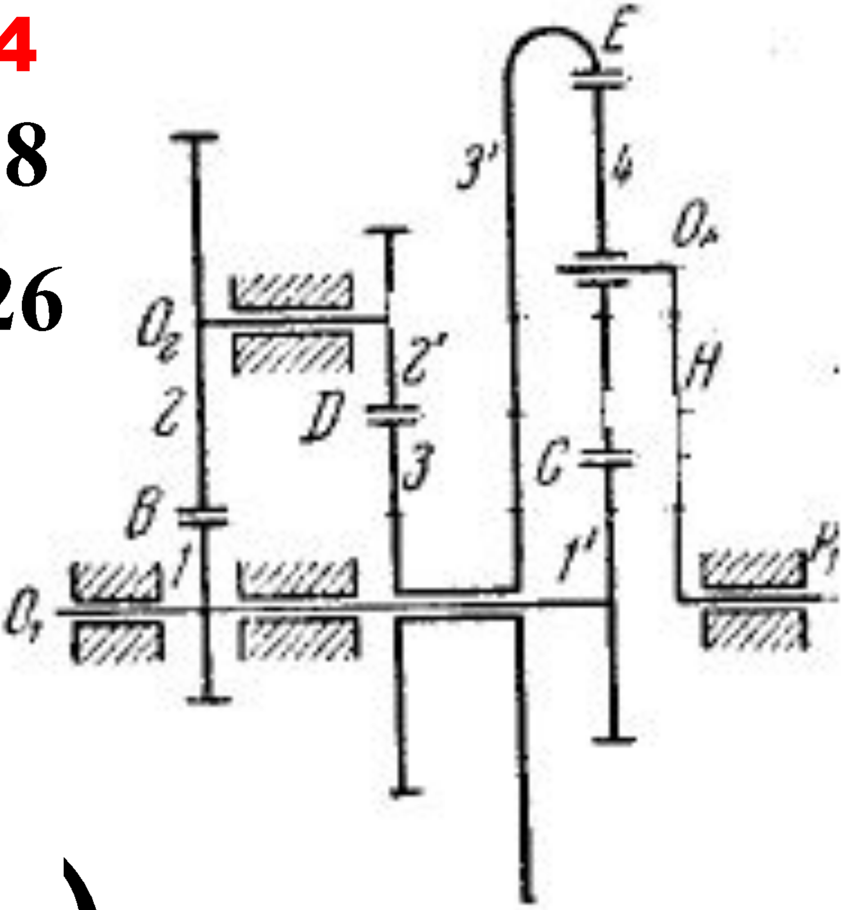
$$= 1 + \frac{40}{20} \cdot \frac{90}{30} = 7 \quad u_{1H}^{(4)} = u_{12} \cdot u_{2'H}^{(4)} = (-2) \cdot 7 = -14$$

Пример. 4

$z_1 = 20 \quad z_2 = 34 \quad z_{2'} = 18$

$z_3 = 36 \quad z_{3'} = 78 \quad z_4 = 26$

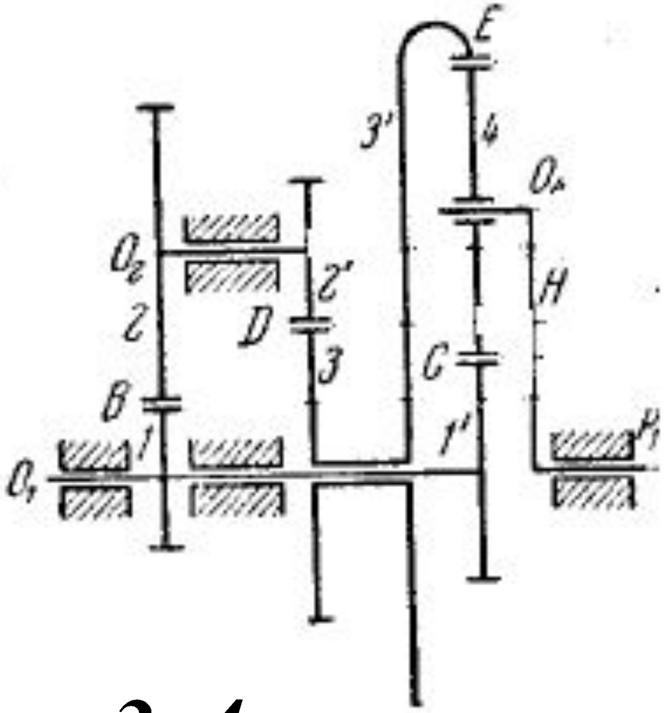
$z_{1'} = 26$


E
3'
4
O4
O2
2'
H
2
D
3
C
B
1
1'
O1
K1

$$u_{1'3'}^{H} = \frac{\omega_{1'} - \omega_H}{\omega_{3'} - \omega_H}$$

$$u_{1H} = \frac{u_{13}\left(u_{1'3'}^{(H)} - 1\right)}{u_{1'3'}^{(H)} - u_{13}} = \frac{u_{1'3'}^{(H)} - 1}{\dfrac{u_{1'3'}^{(H)}}{u_{13}} - 1}$$

$$u_{1'3'}^{(H)} = -\frac{z_{3'}}{z_{1'}} = -\frac{78}{26} = -3$$


E
3'
4
O_4
O_2
2'
H
2
D
3
C
B
1
1'
O_1
H_1

$$u_{13} = \frac{z_2}{z_1}\cdot\frac{z_3}{z_{2'}} = \frac{34\cdot 36}{20\cdot 18} = 3{,}4$$

$$u_{1H} = \frac{-3-1}{-\frac{3}{3{,}4}-1} = 2{,}125$$