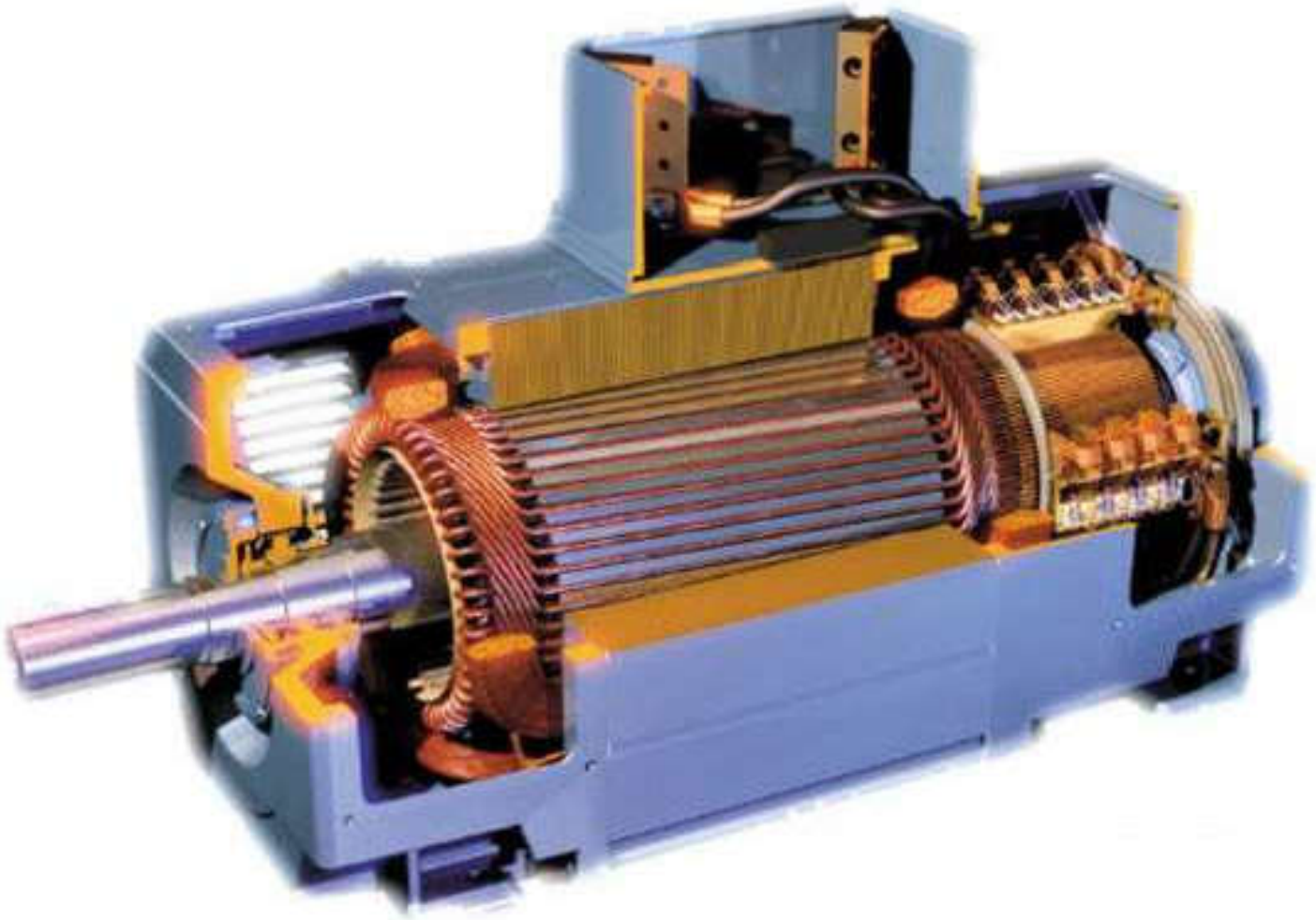
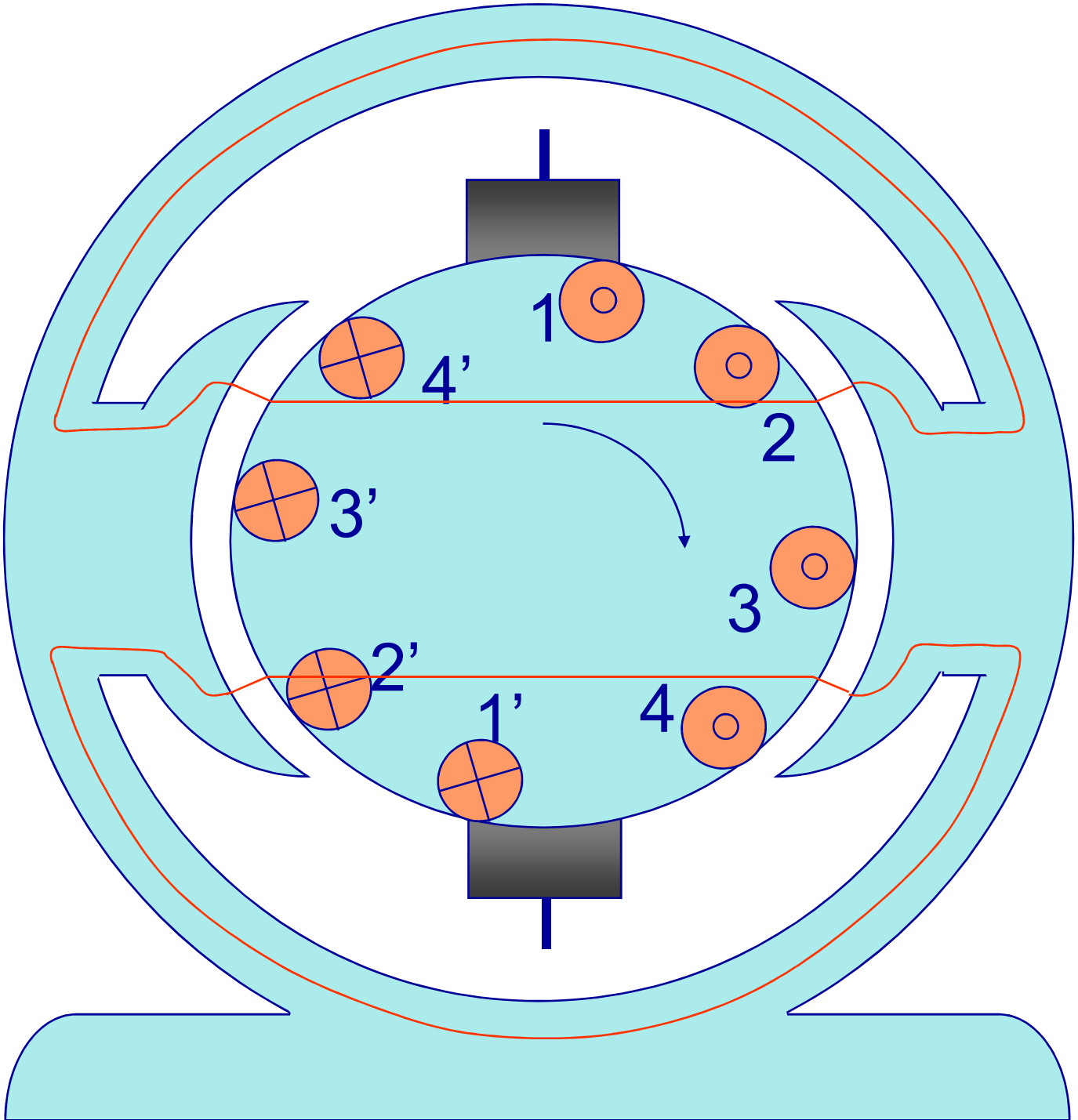
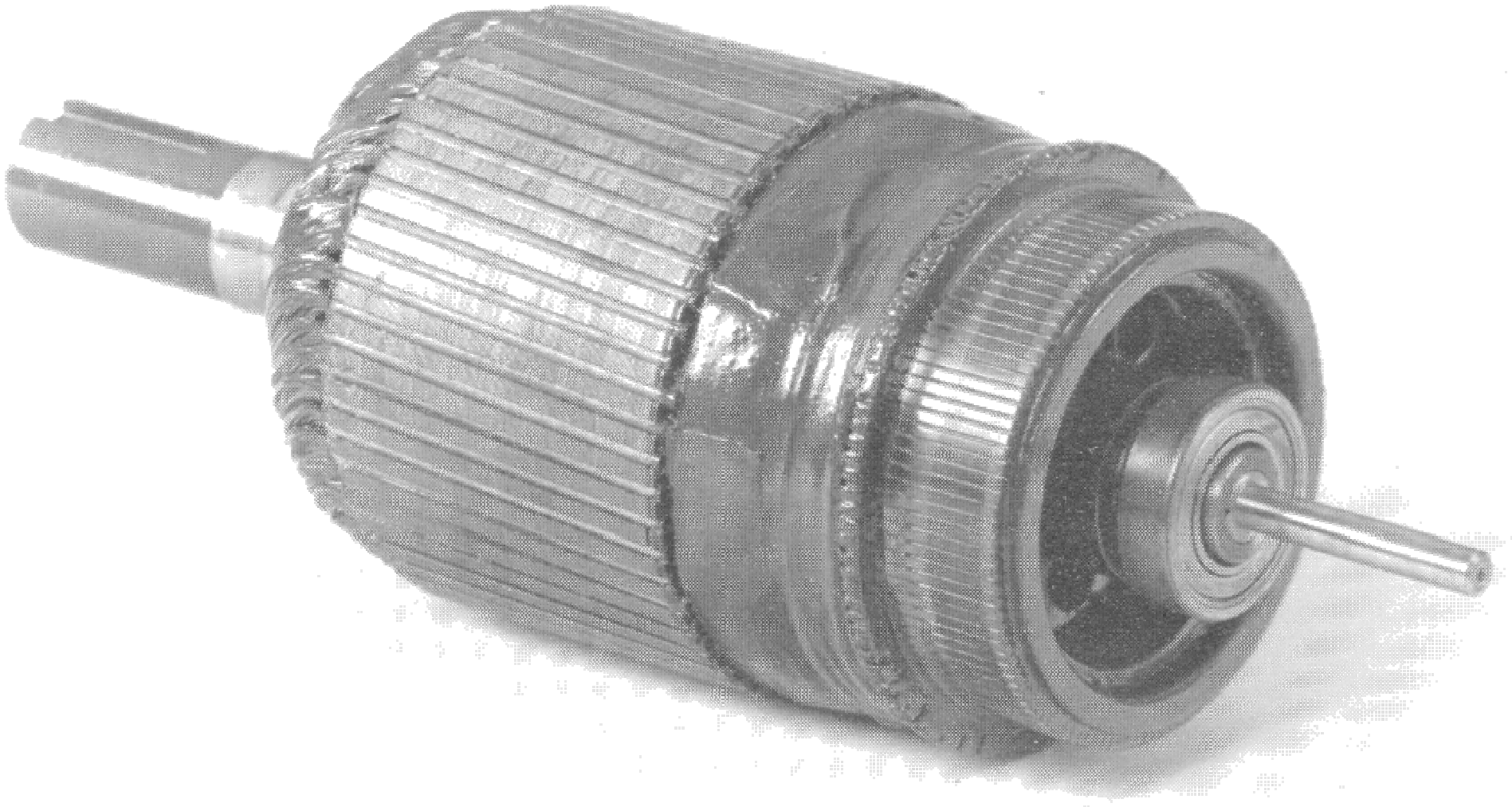
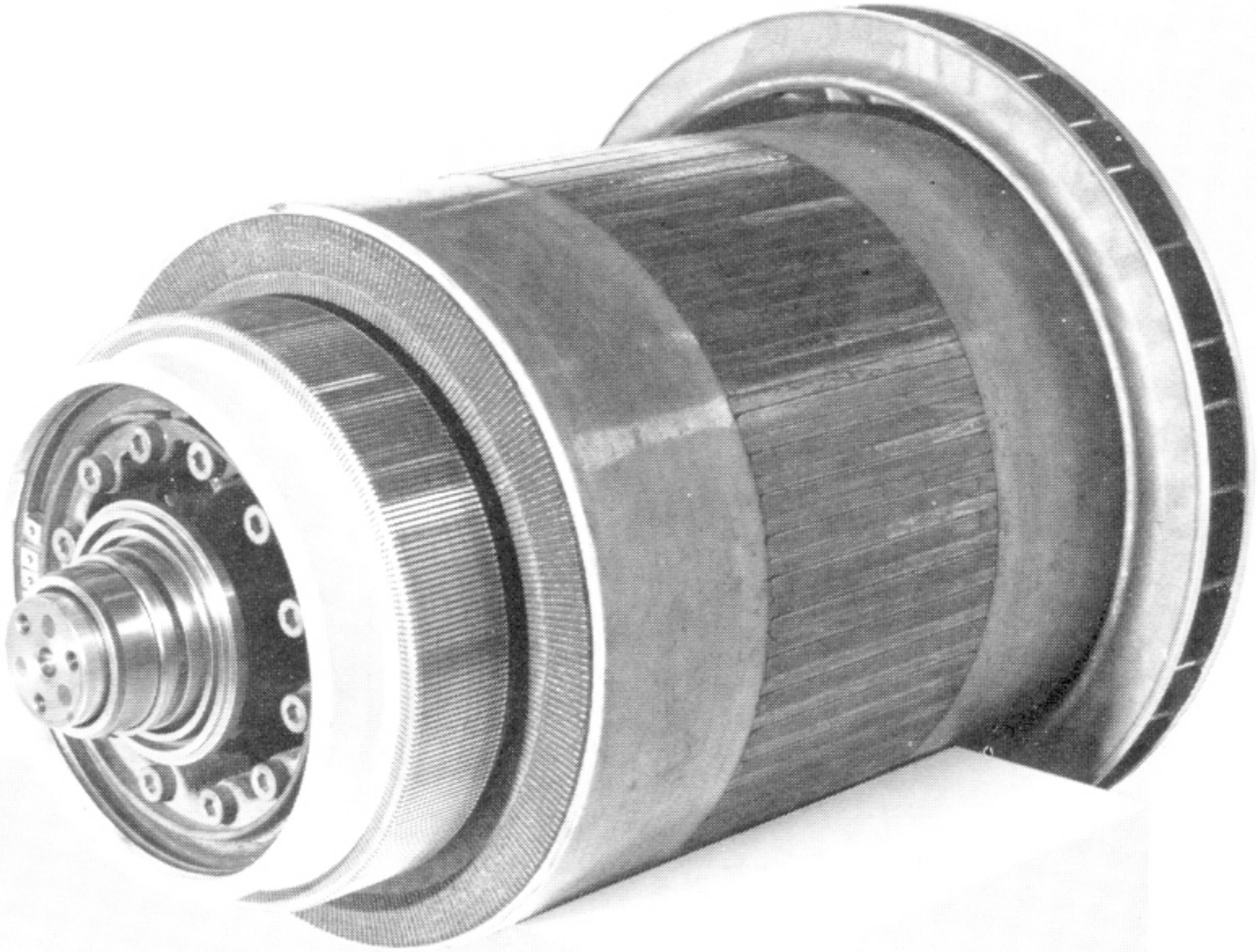
La machine à courant continu



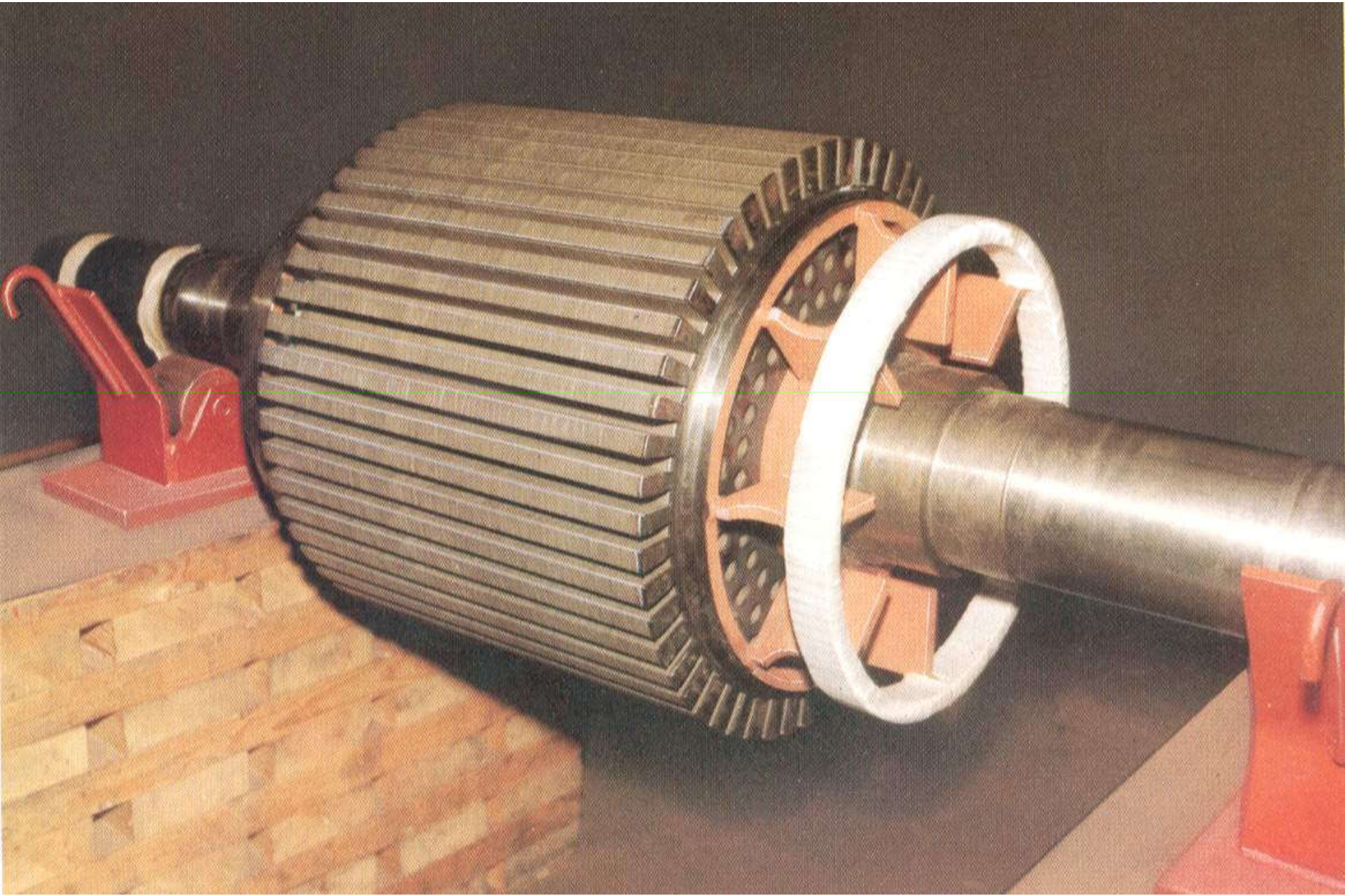

1
4’
2
3’
3
2’
1’
4

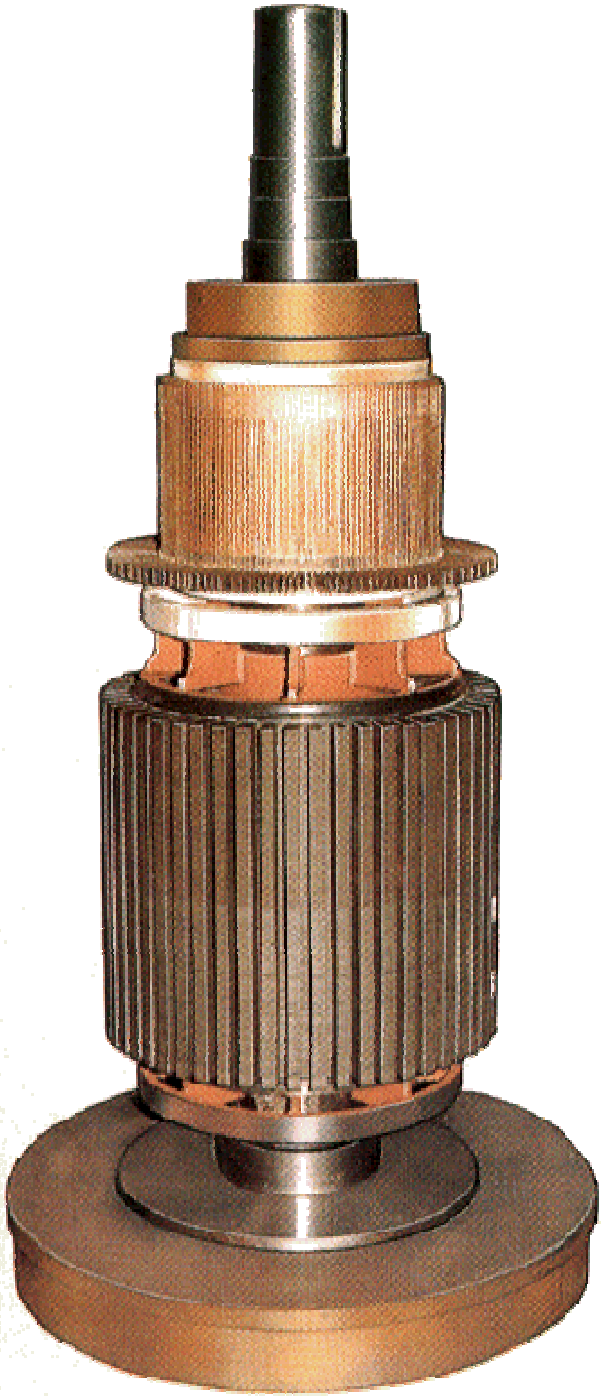
Le rotor avec son collecteur





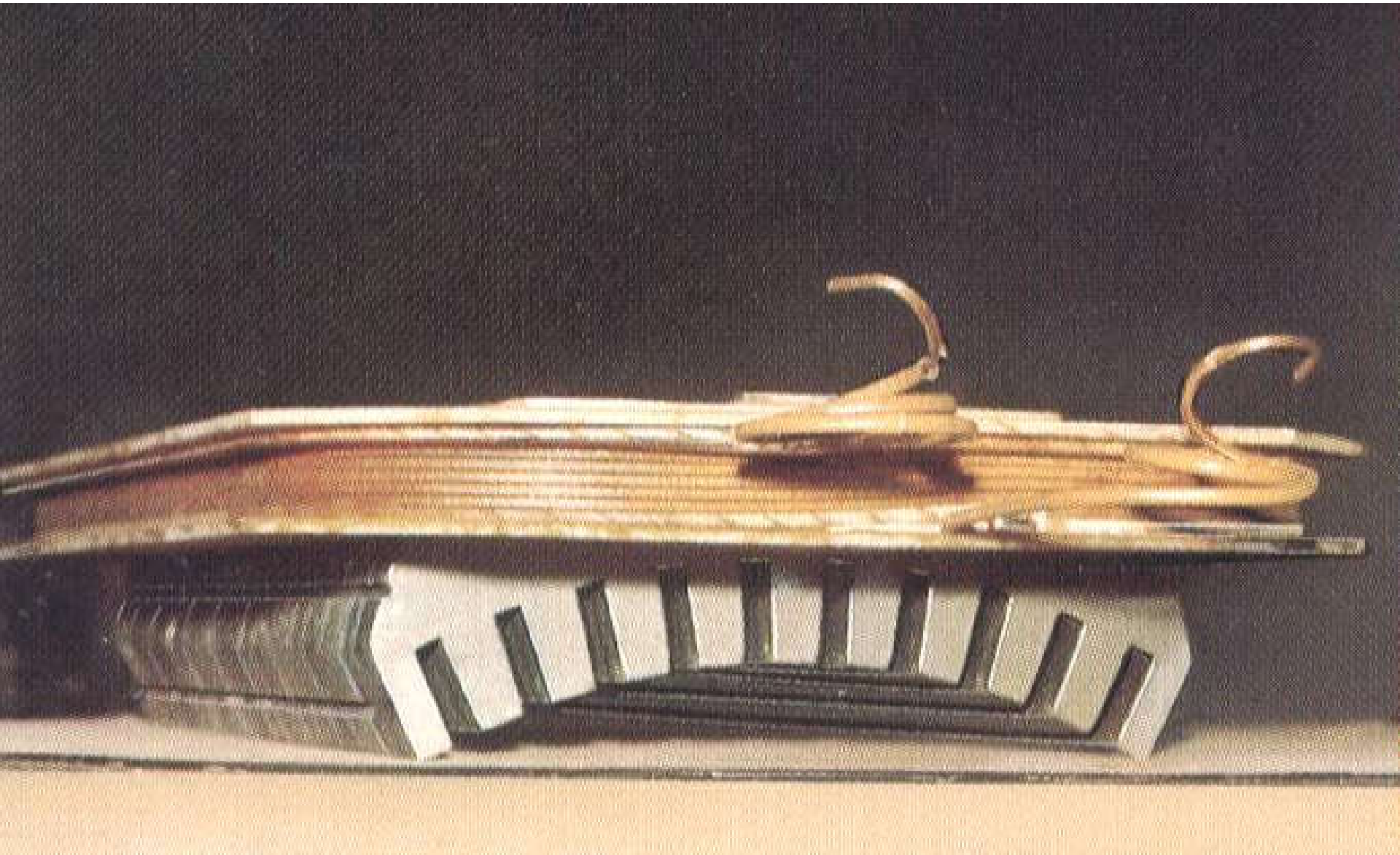
Le rotor



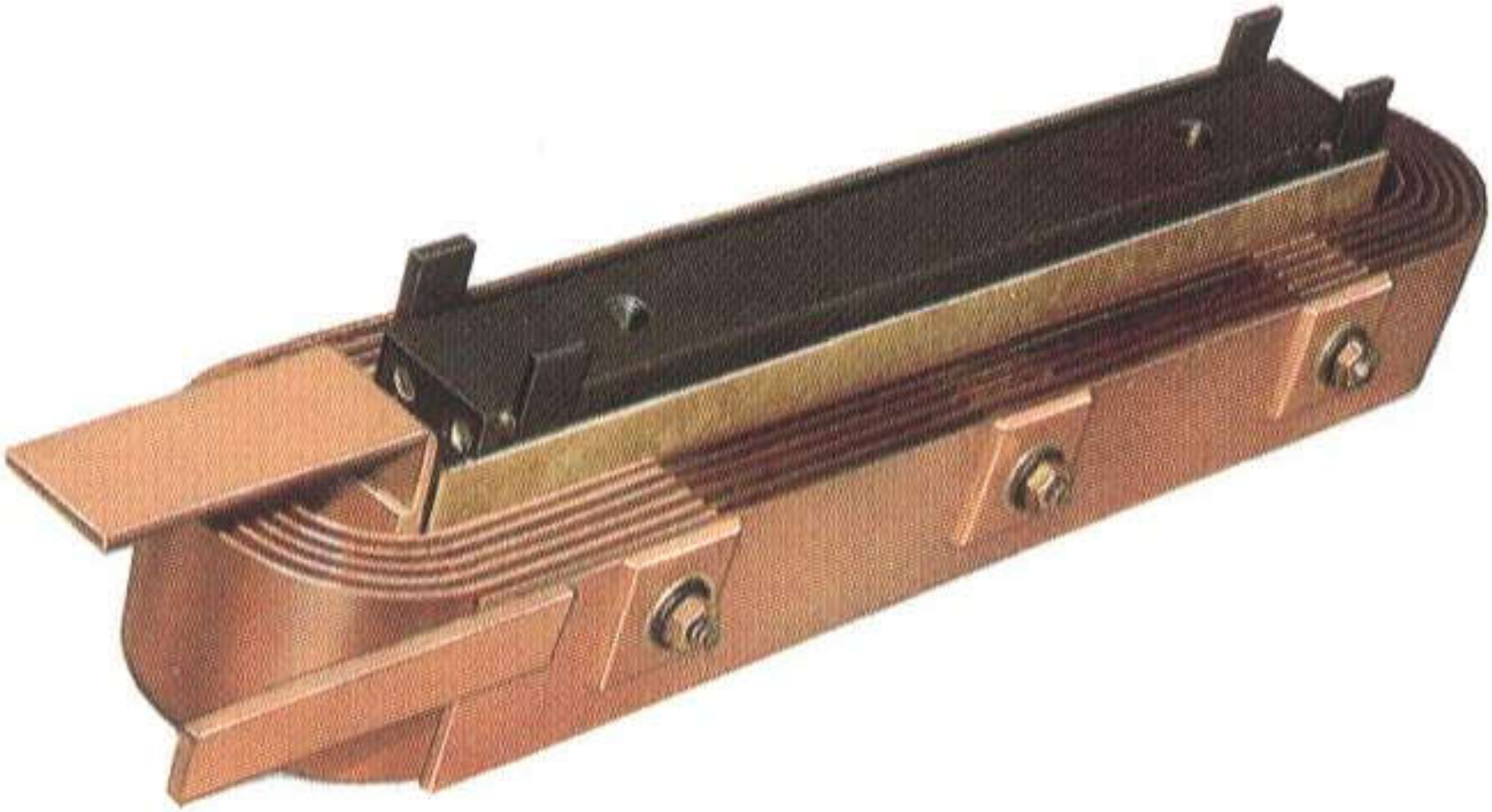


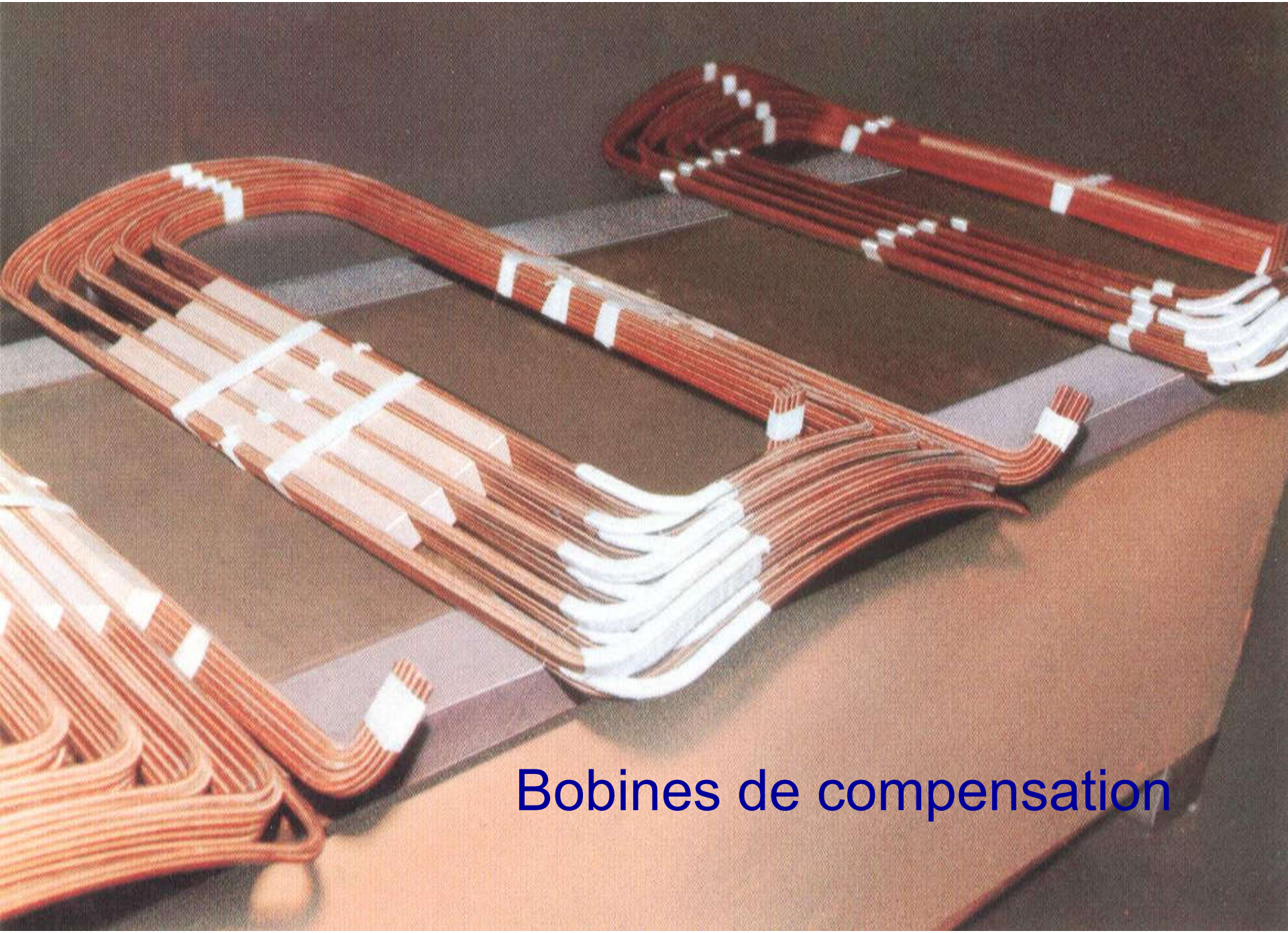
Le stator

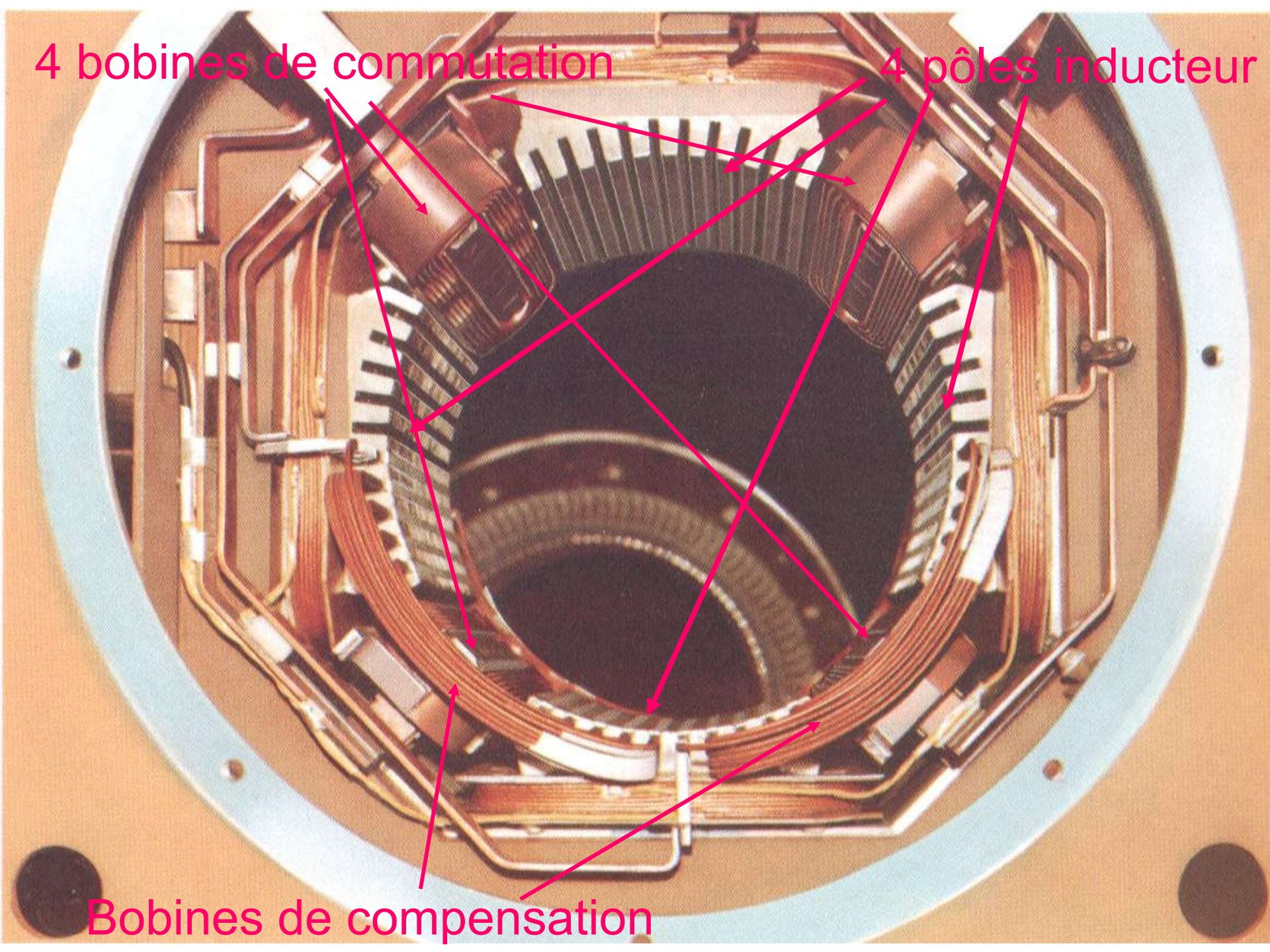
Pôle inducteur



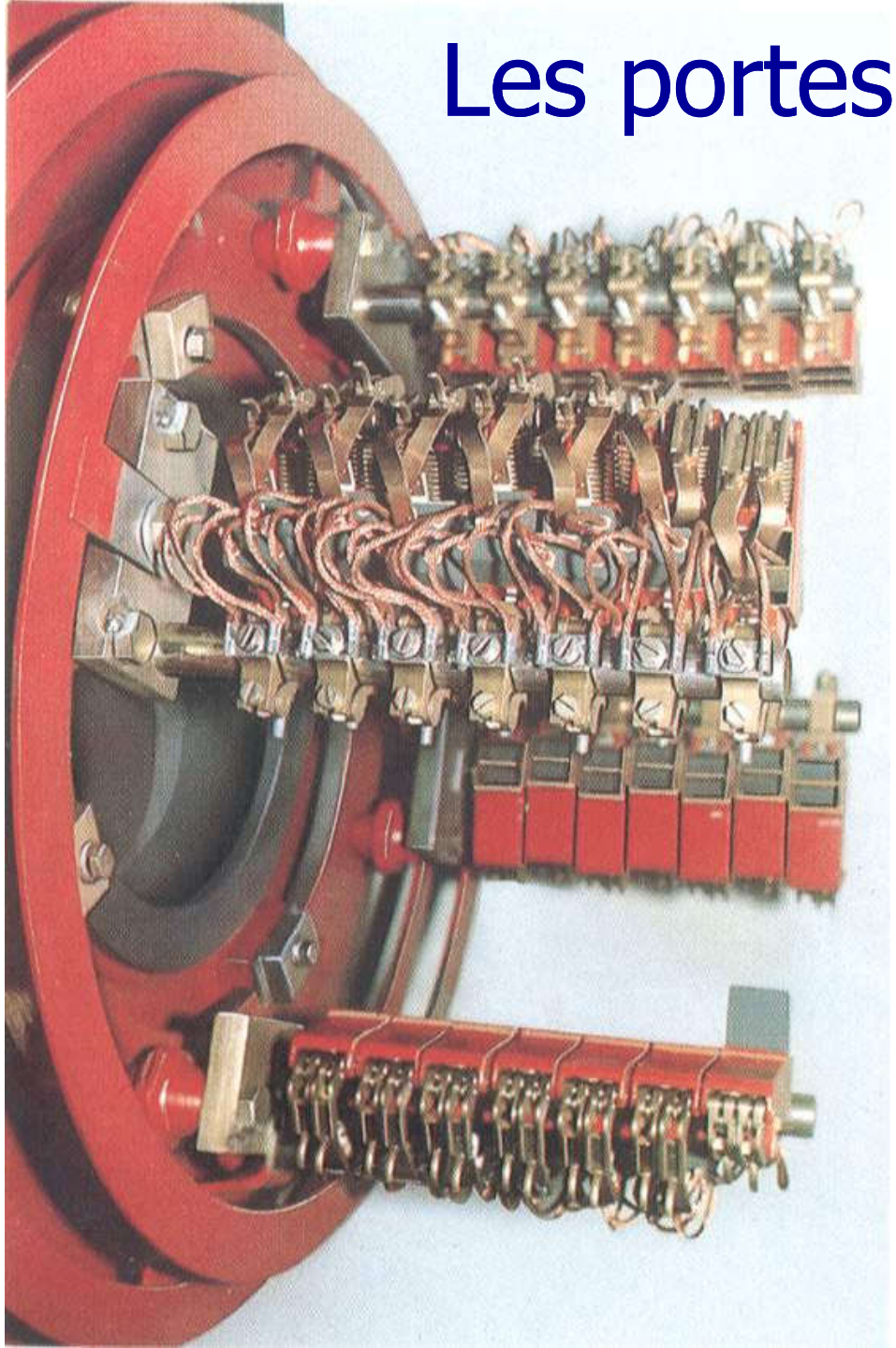
Pôle de commutation




Bobines de compensation


4 bobines de commutation
4 pôles inducteur
Bobines de compensation

Les portes balais



Machines complètes

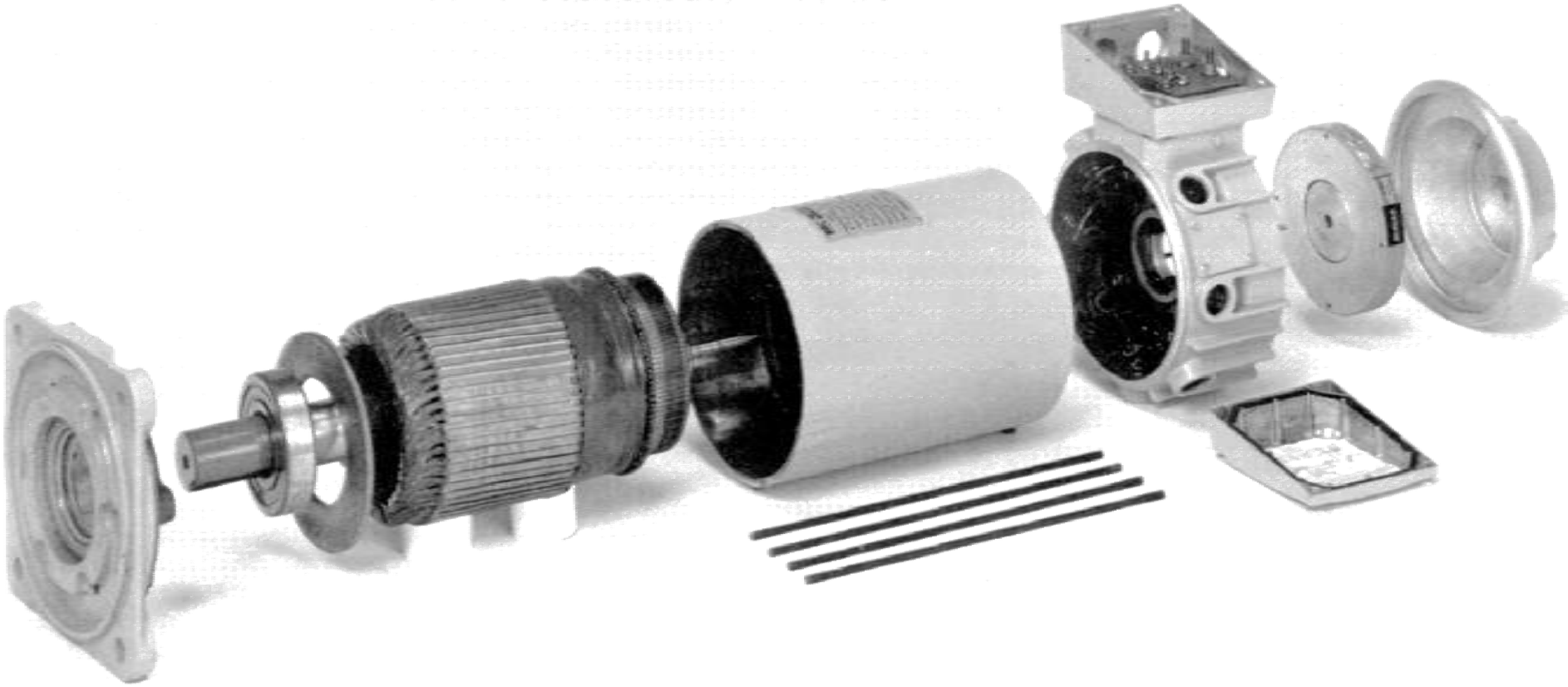
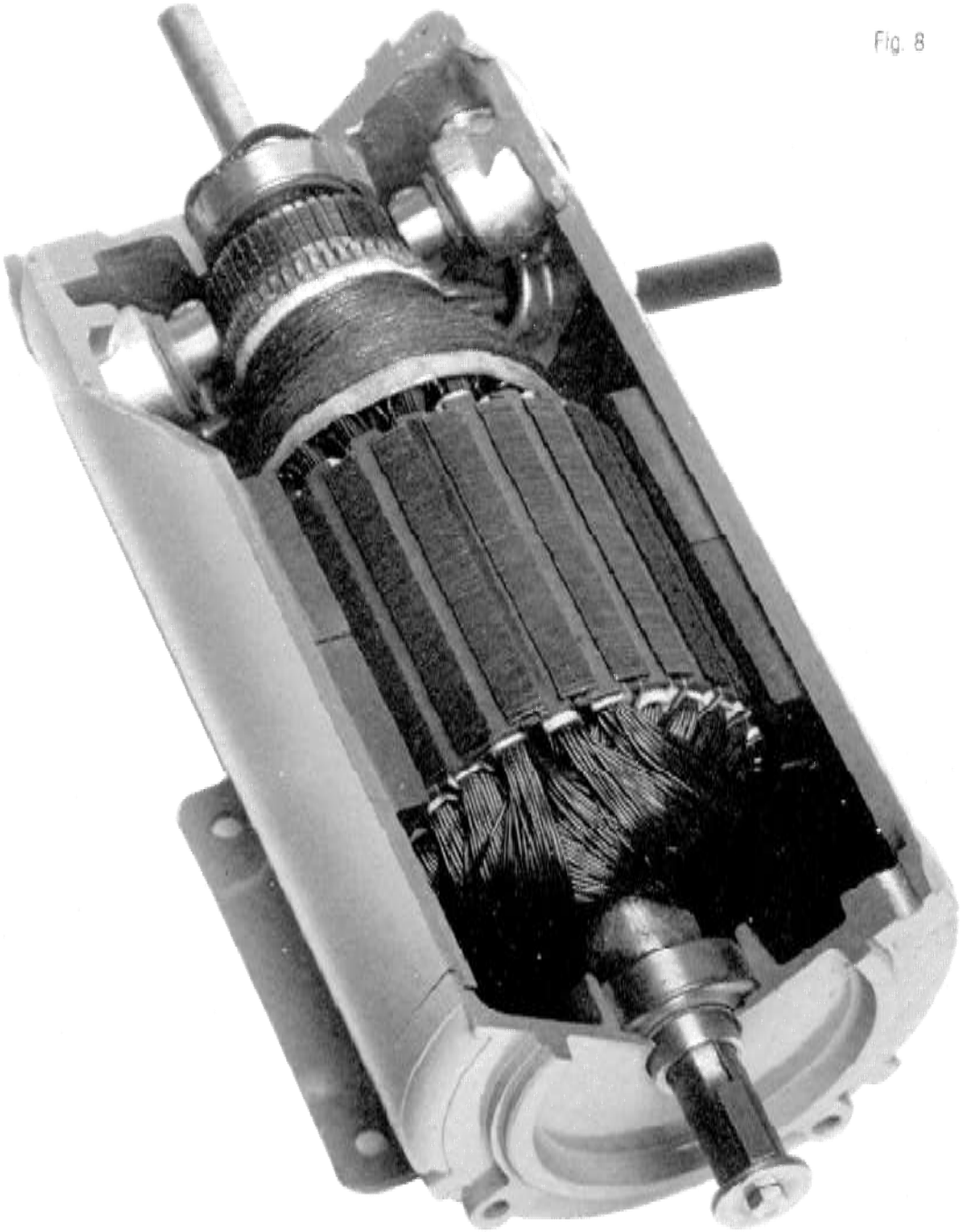


Fig. 8



Équations générales

Formule générale de la f.é.m.

$$E = n N \phi$$

Si l'inducteur comporte 2p pôles :

$$N \Rightarrow p N$$

Si il y a 2.a voies pour le courant entre les balais :

$$n \Rightarrow \frac{n}{a}$$

D’où la formule générale :

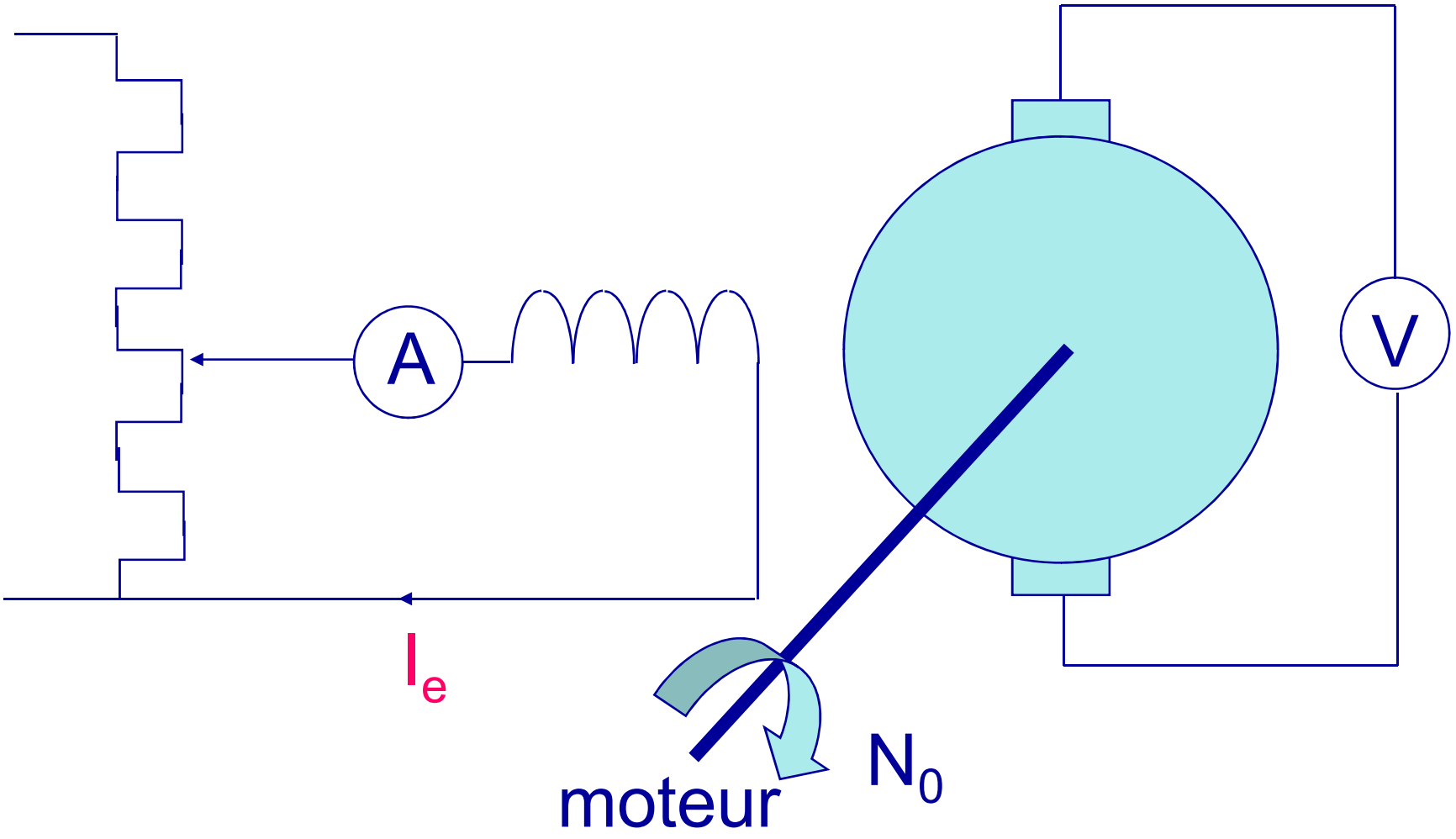
$$E = \frac{p}{a}\, n\, N\, \phi(I_e)$$

p, n, a, sont des paramètres fixés par construction.

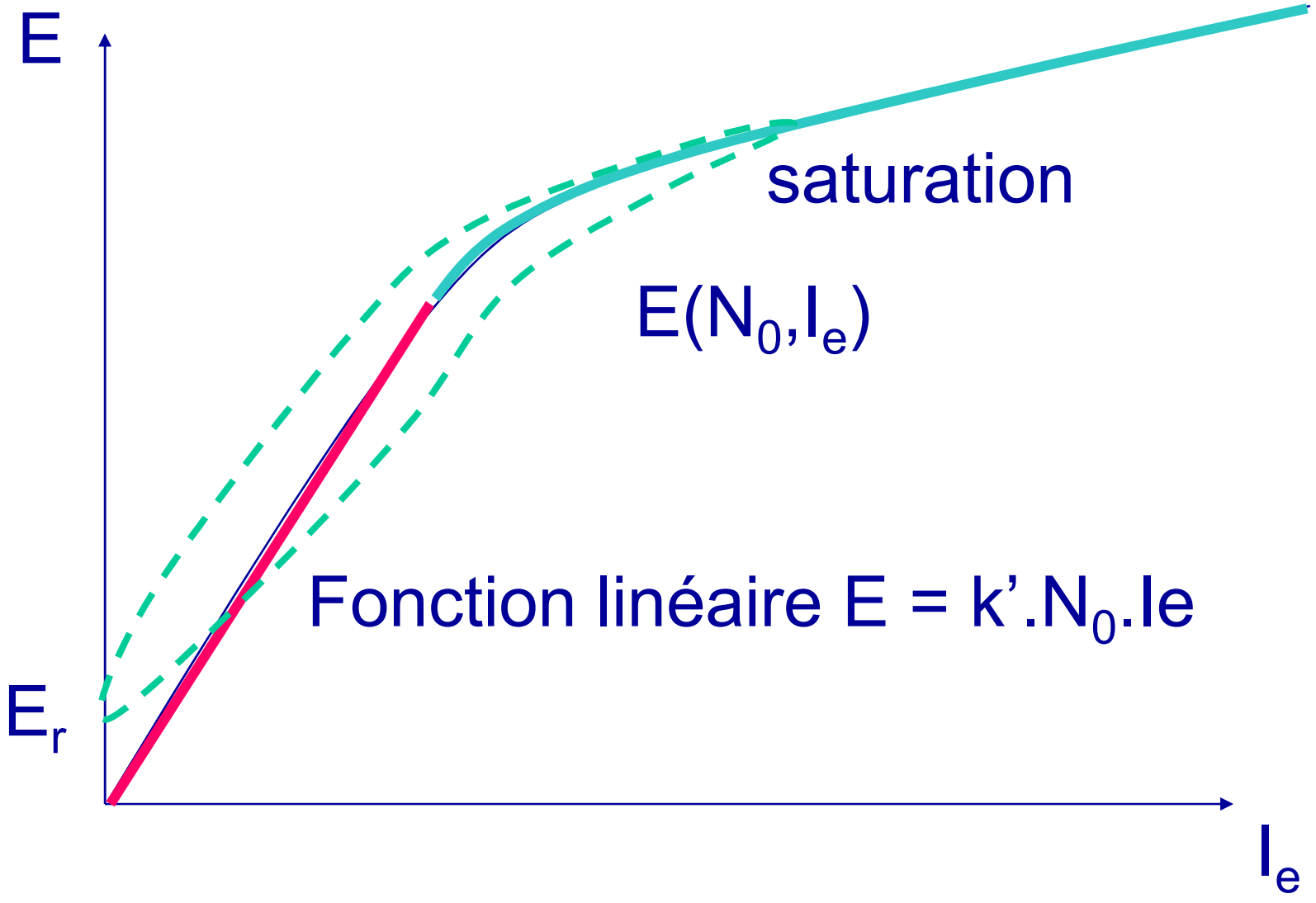
On pourra écrire :

$$E = k\, N\, \phi(I_e)$$

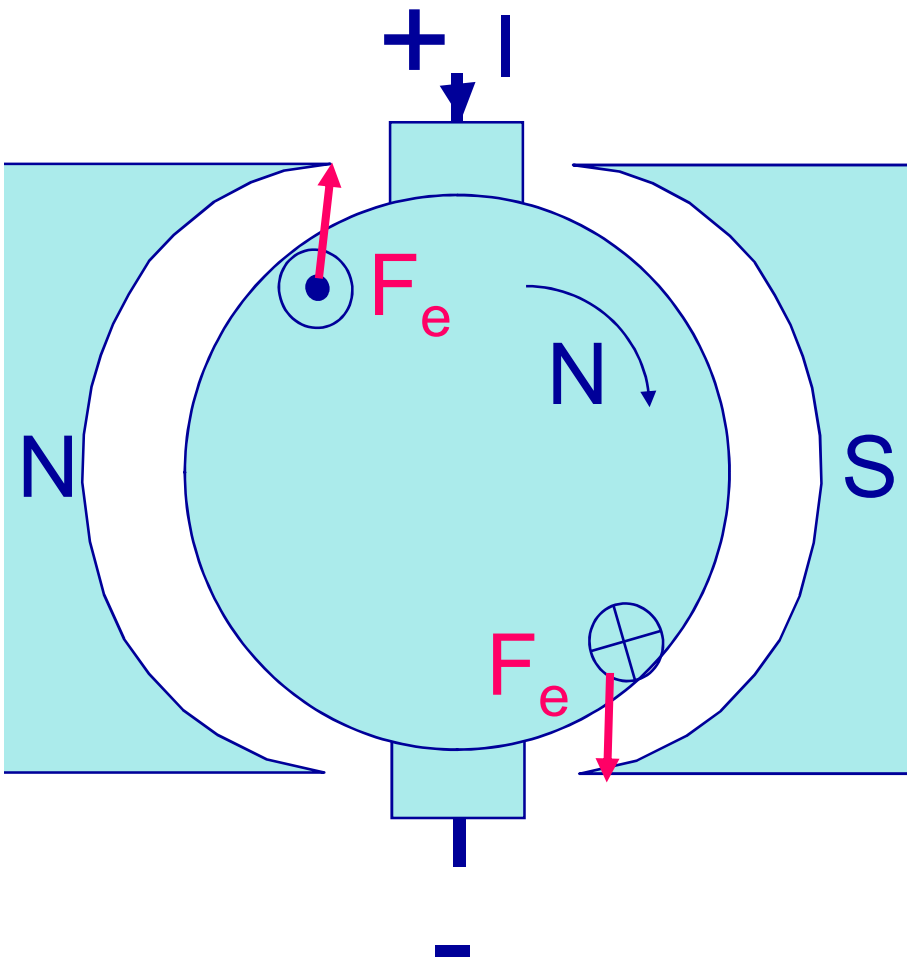
Caractéristiques à vide



Caractéristiques à vide

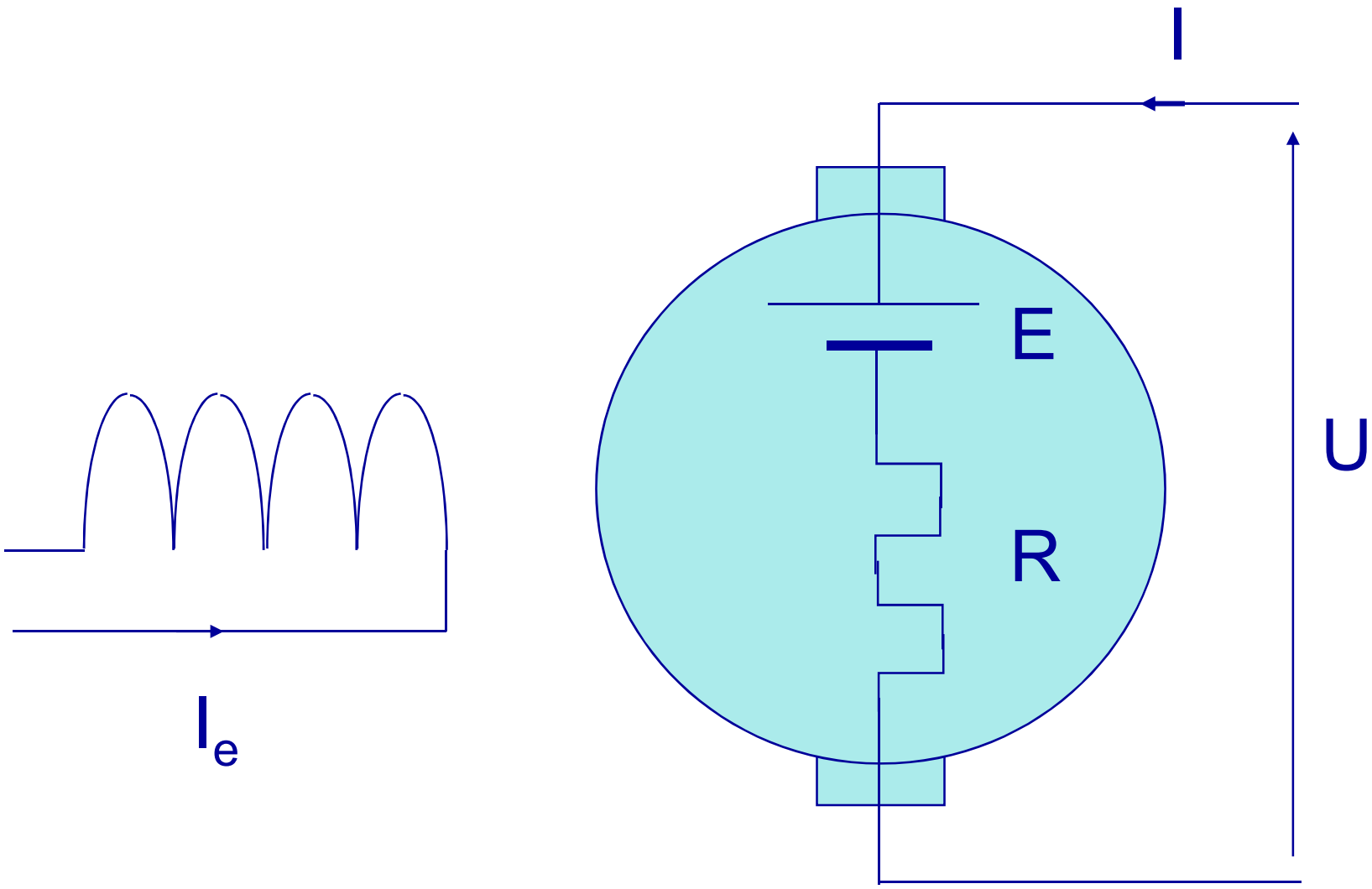


Couple électromagnétique



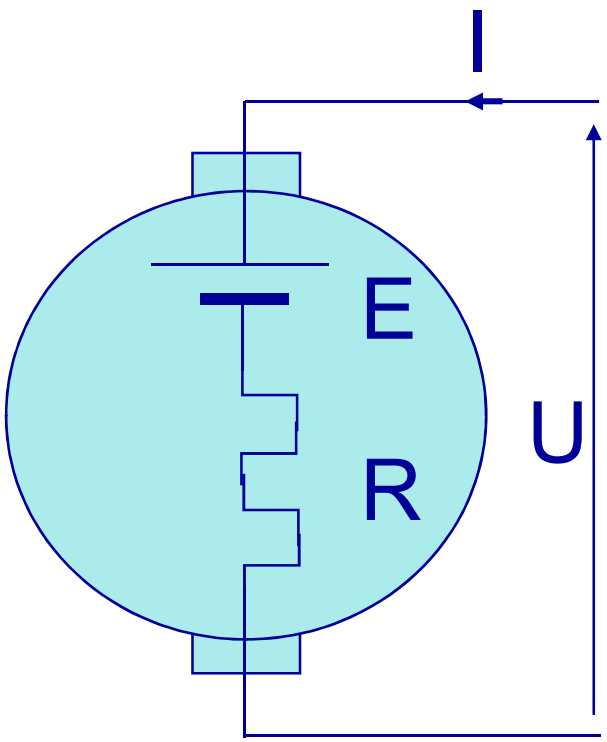
$$C_e = \sum F_e \times r$$

Modèle de la machine en régime permanent



L'inductance des enroulements n'a pas d'effet :
lorsque I = cte, $e = d\varphi/dt = 0$

$$P = U.I = (E + R.I).I = E.I + R.I^2$$

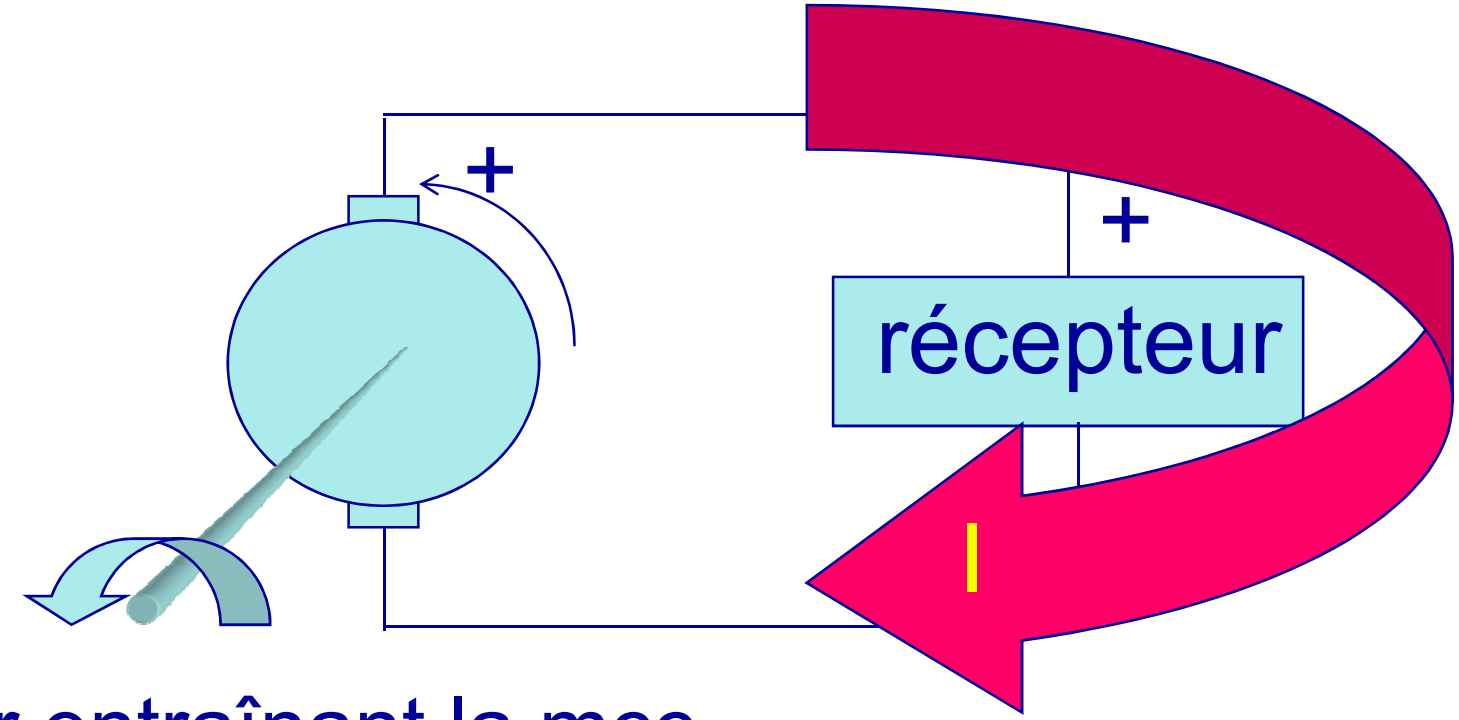


$$P_e = E.I = C_e.\Omega = C_e.2\pi.N$$

$$C_e = \frac{E.I}{2\pi.N}$$

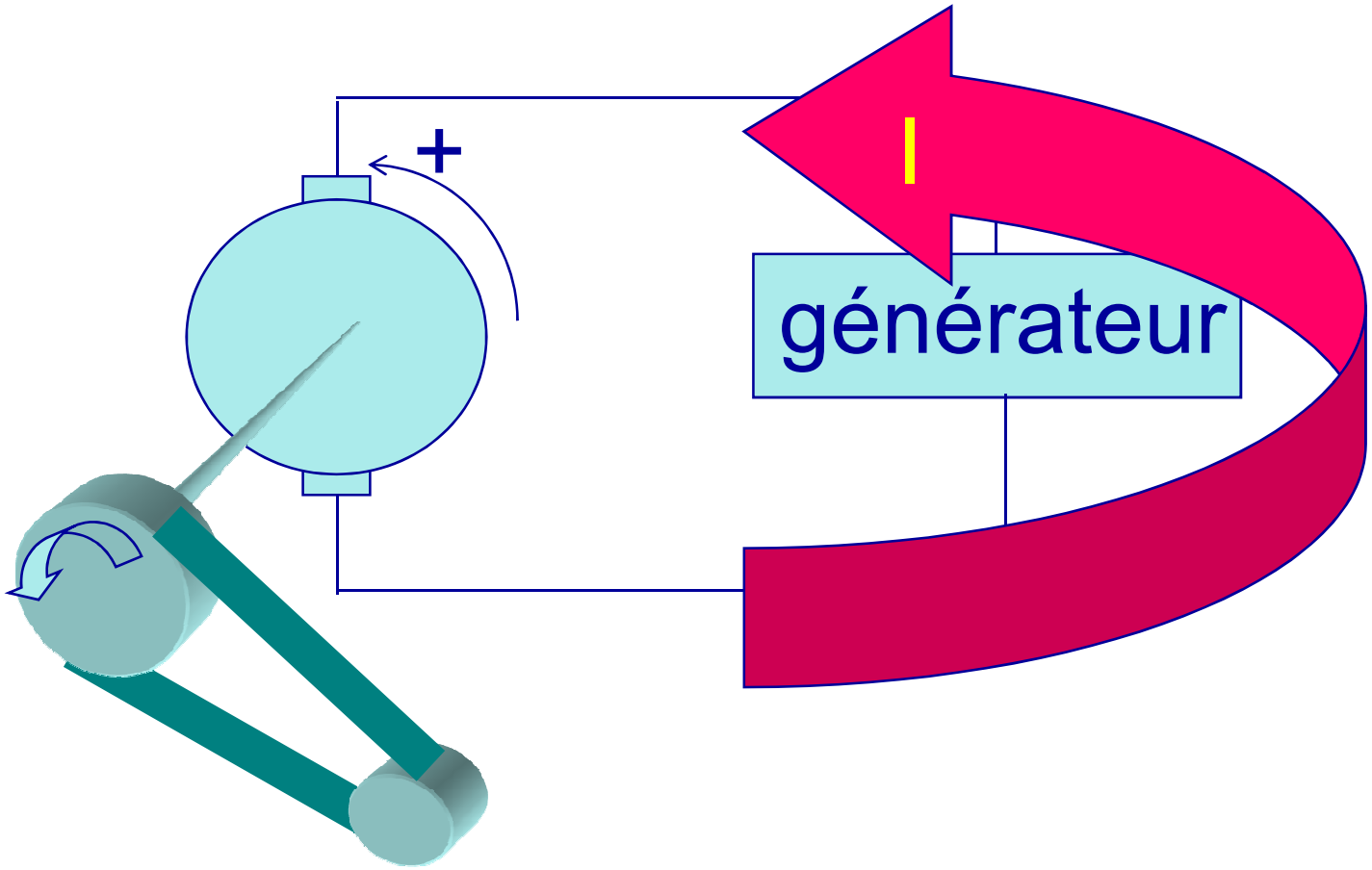
$$C_e = \frac{k}{2\pi}\ I.\phi(I_e)$$

La machine à courant continu est soit :
une f.é.m. = génératrice



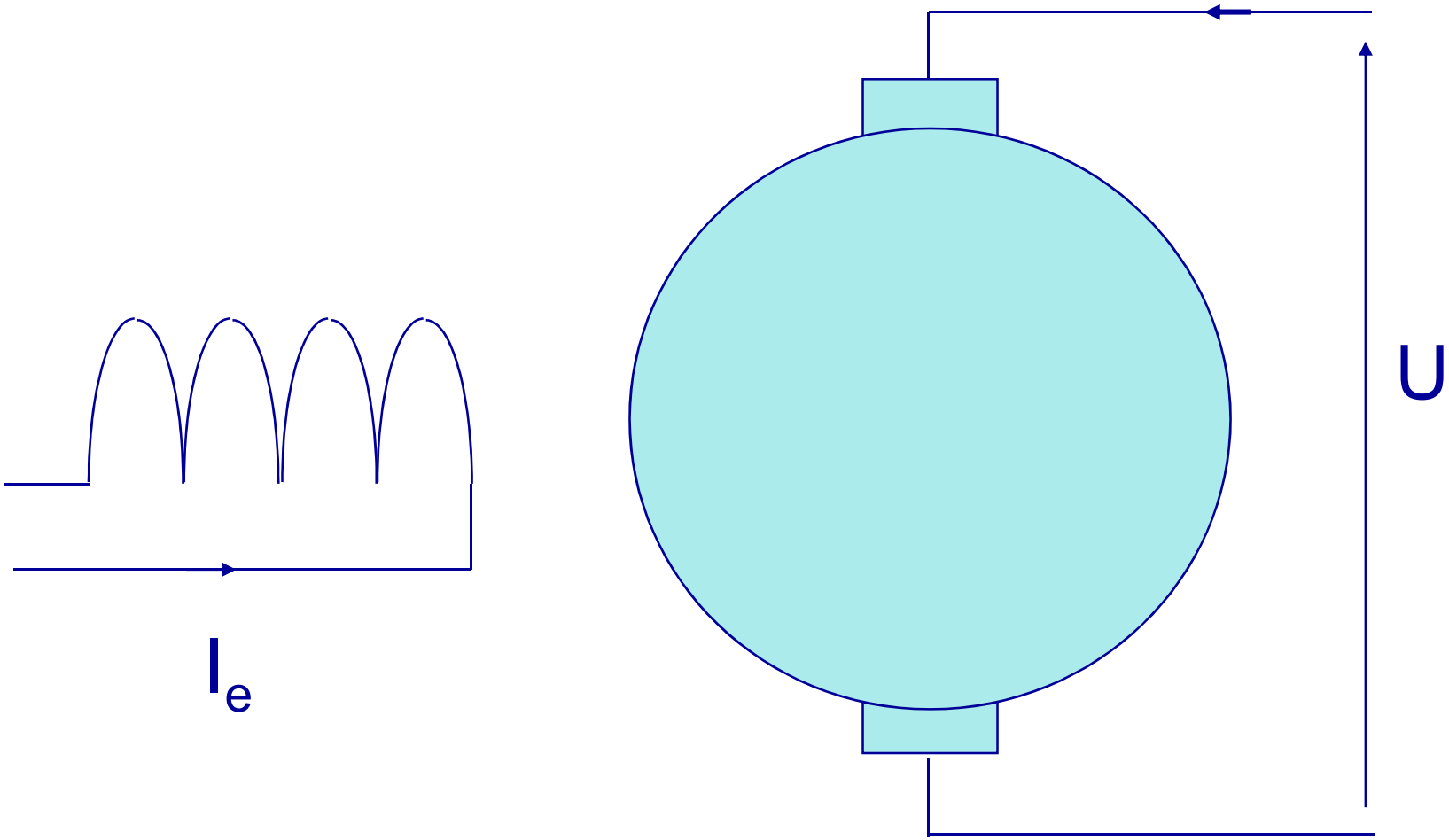
moteur entraînant la mcc

soit une f.c.é.m. = moteur

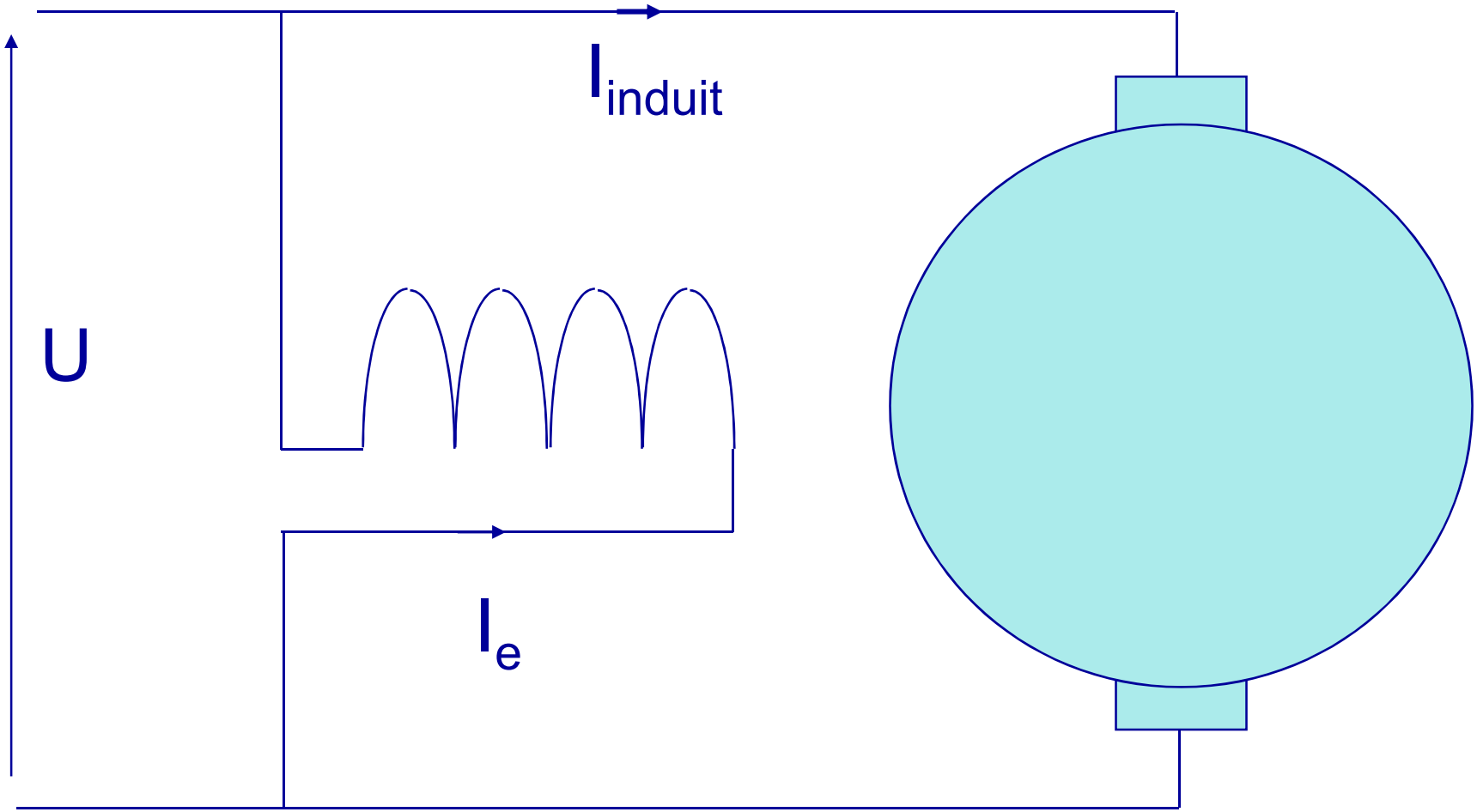


Les différents modes d'excitation de la machine à courant continu

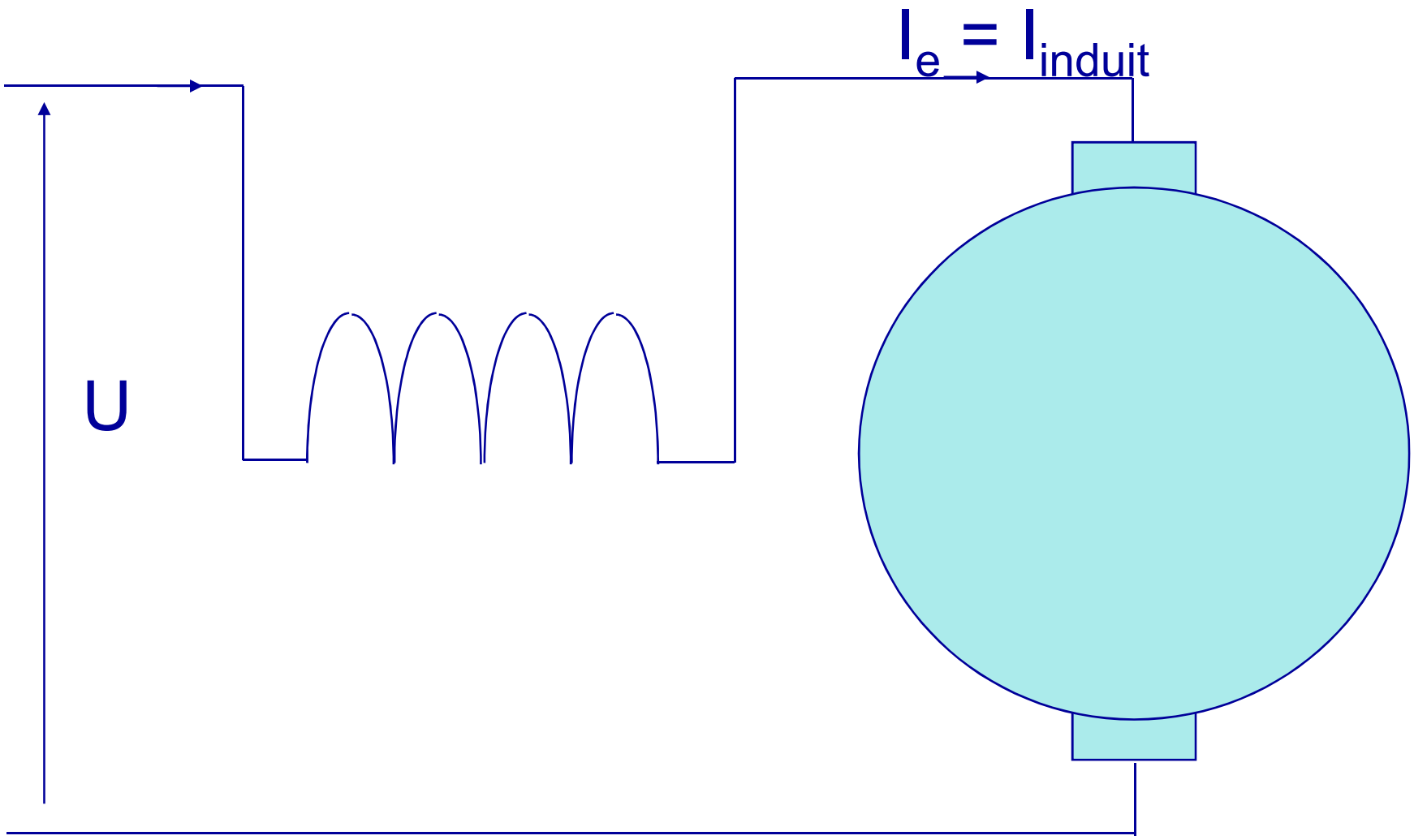
Machine à excitation séparée :



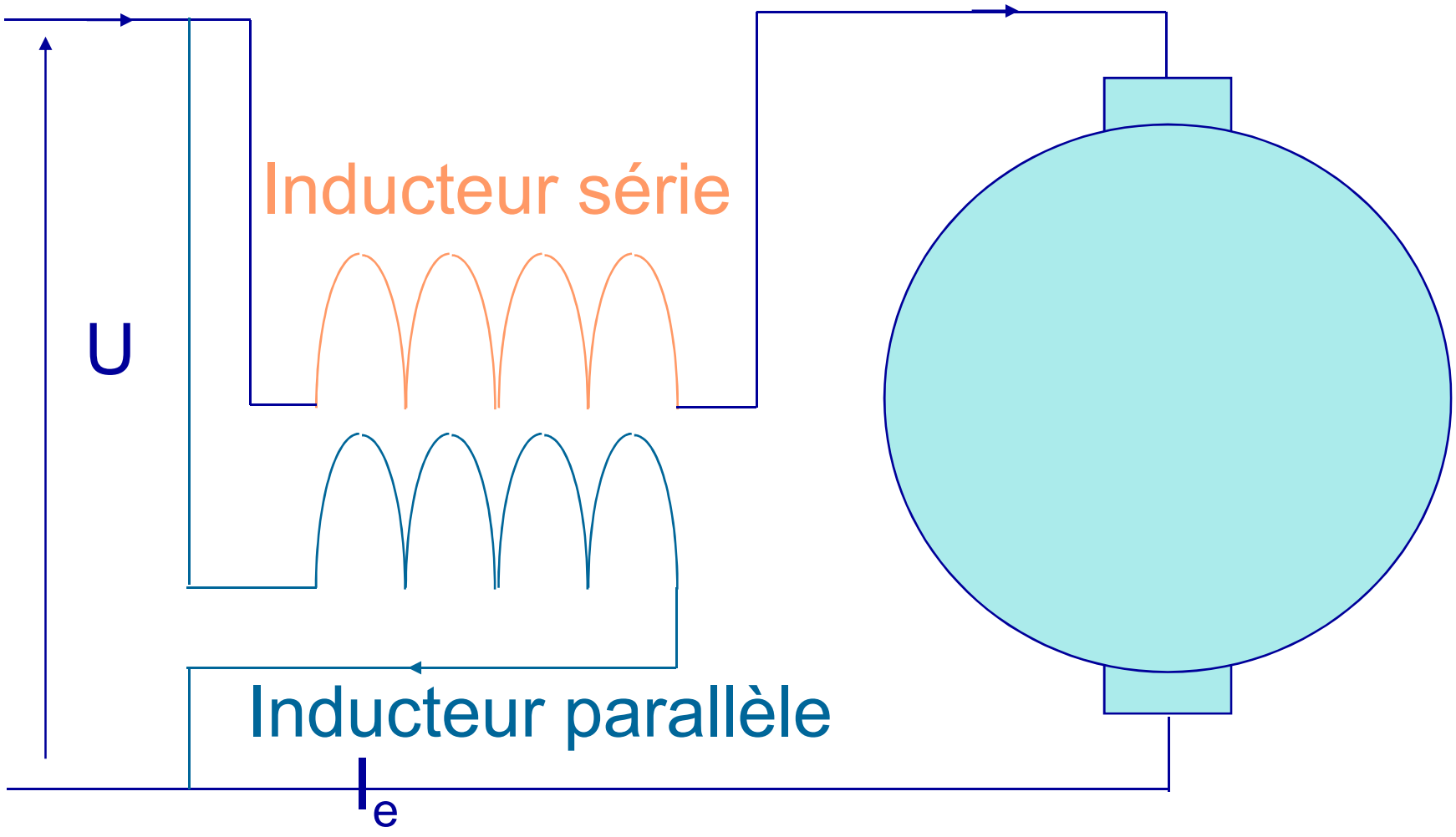
Machine à excitation dérivée :



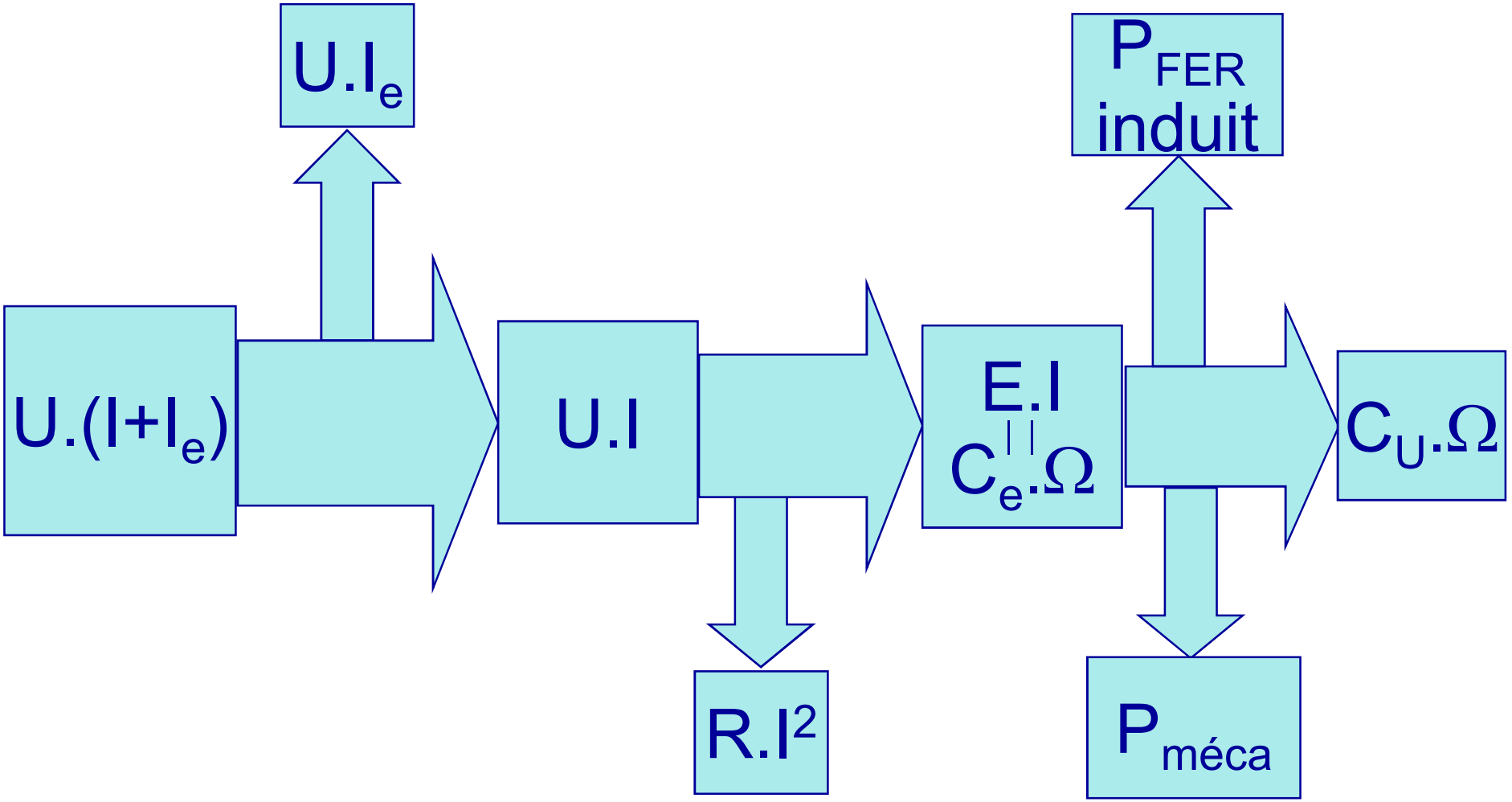
Machine à excitation série :



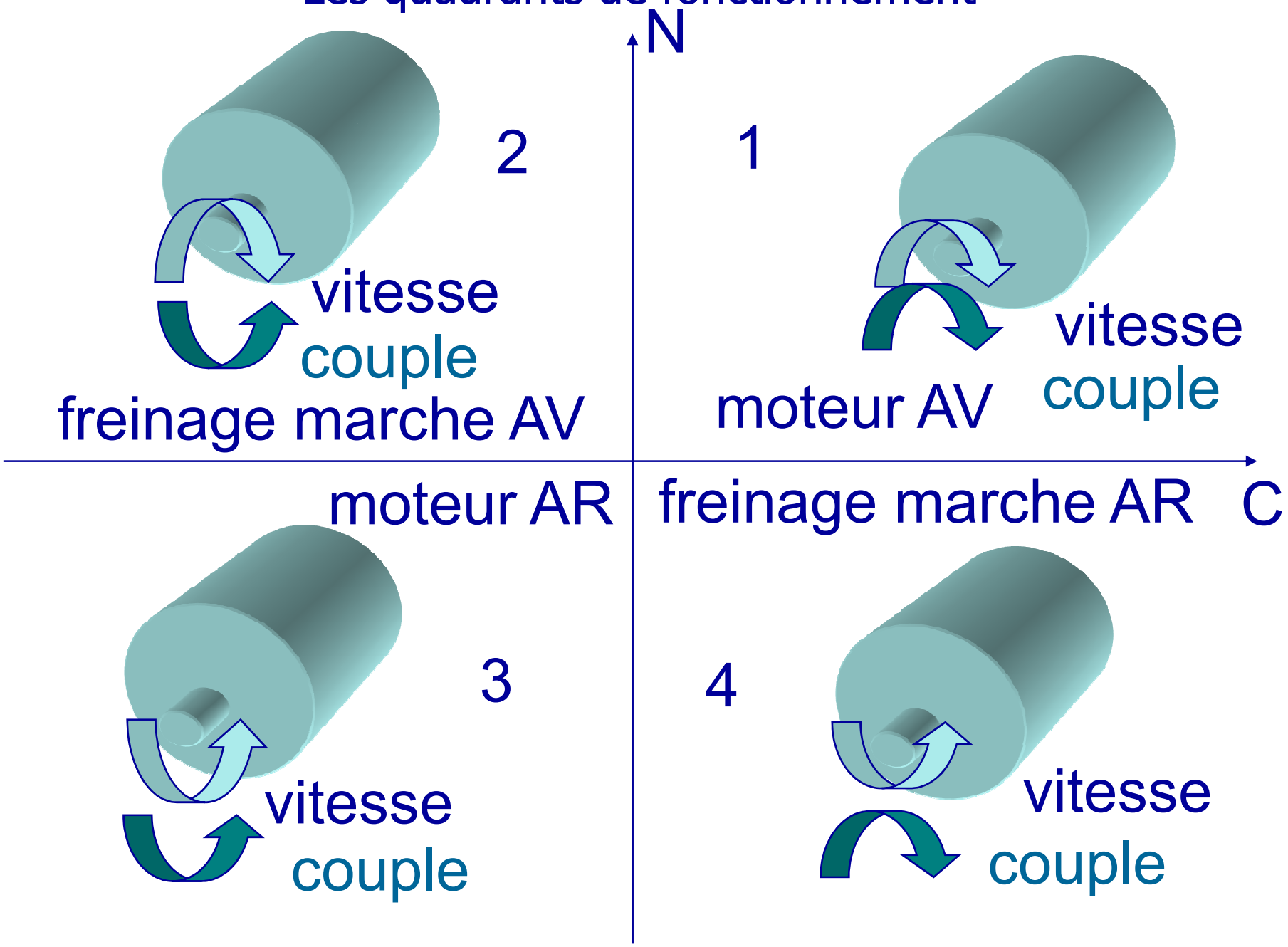
Machine à excitation composée :



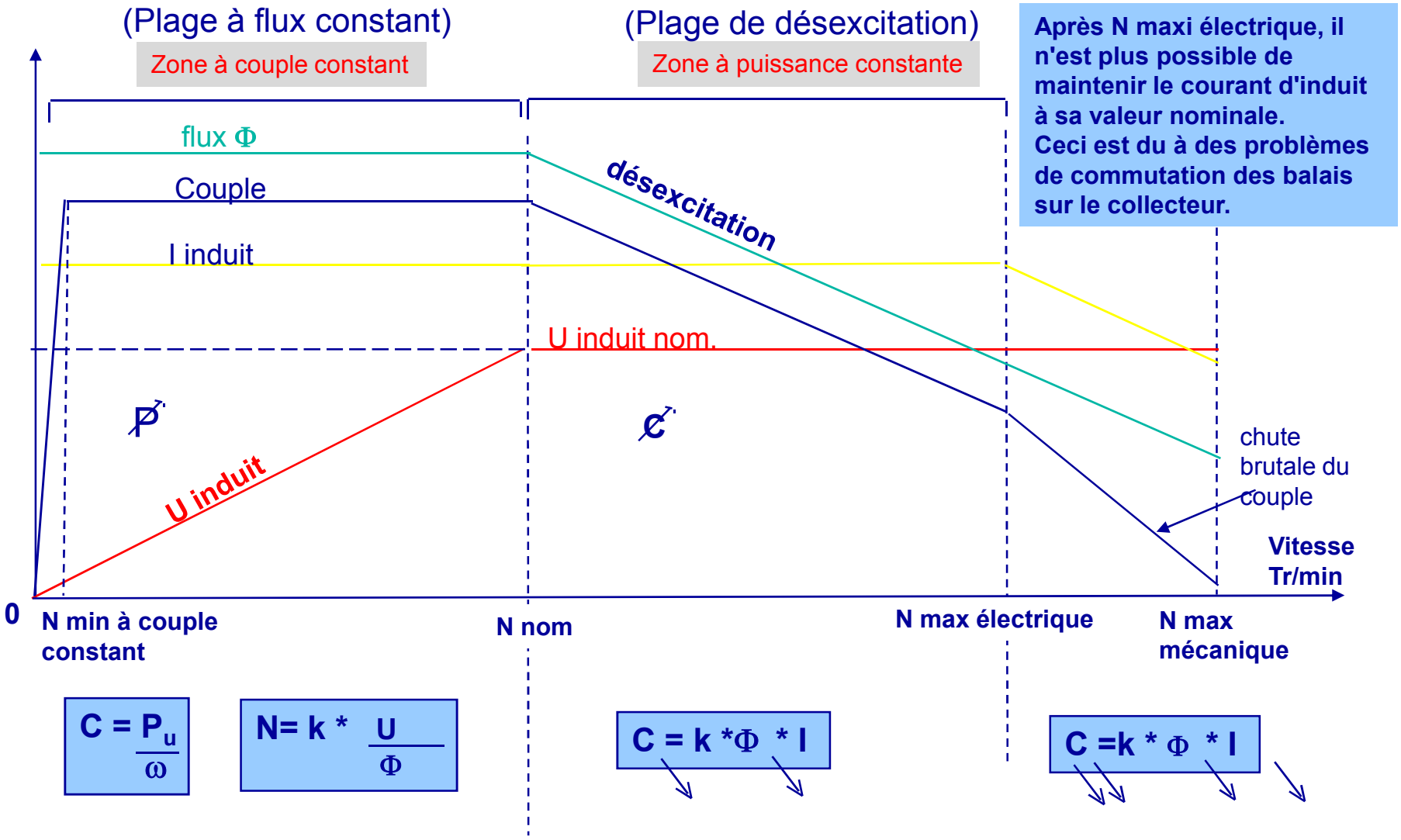
Rendement de la machine à courant continu



Les quadrants de fonctionnement



Moteur à Courant Continu



Après N maxi électrique, il n'est plus possible de maintenir le courant d'induit à sa valeur nominale. Ceci est du à des problèmes de commutation des balais sur le collecteur.

$C = \frac{P_u}{\omega}$

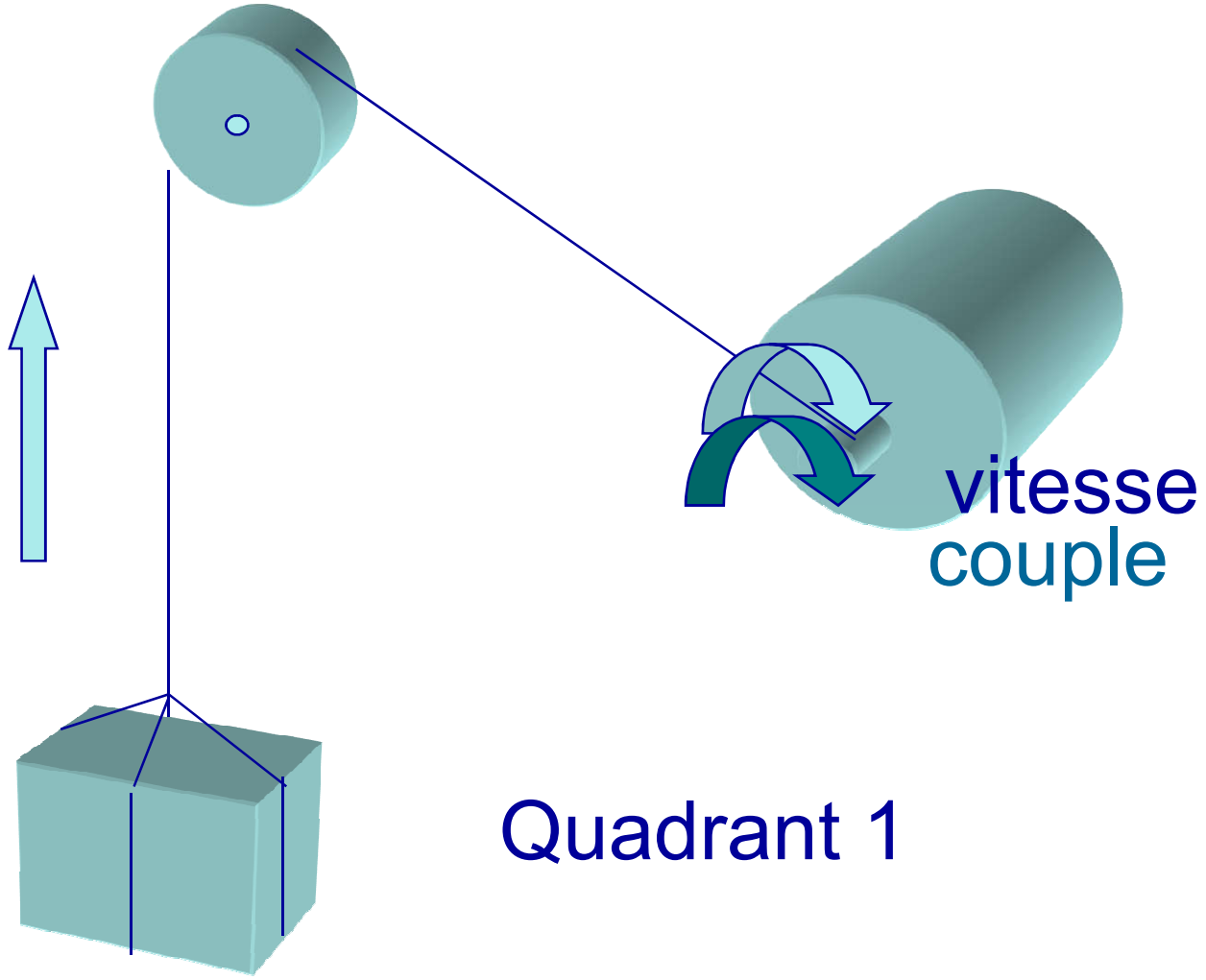
$N = k * \frac{U}{\Phi}$

$C = k * \Phi * I$

$C = k * \Phi * I$

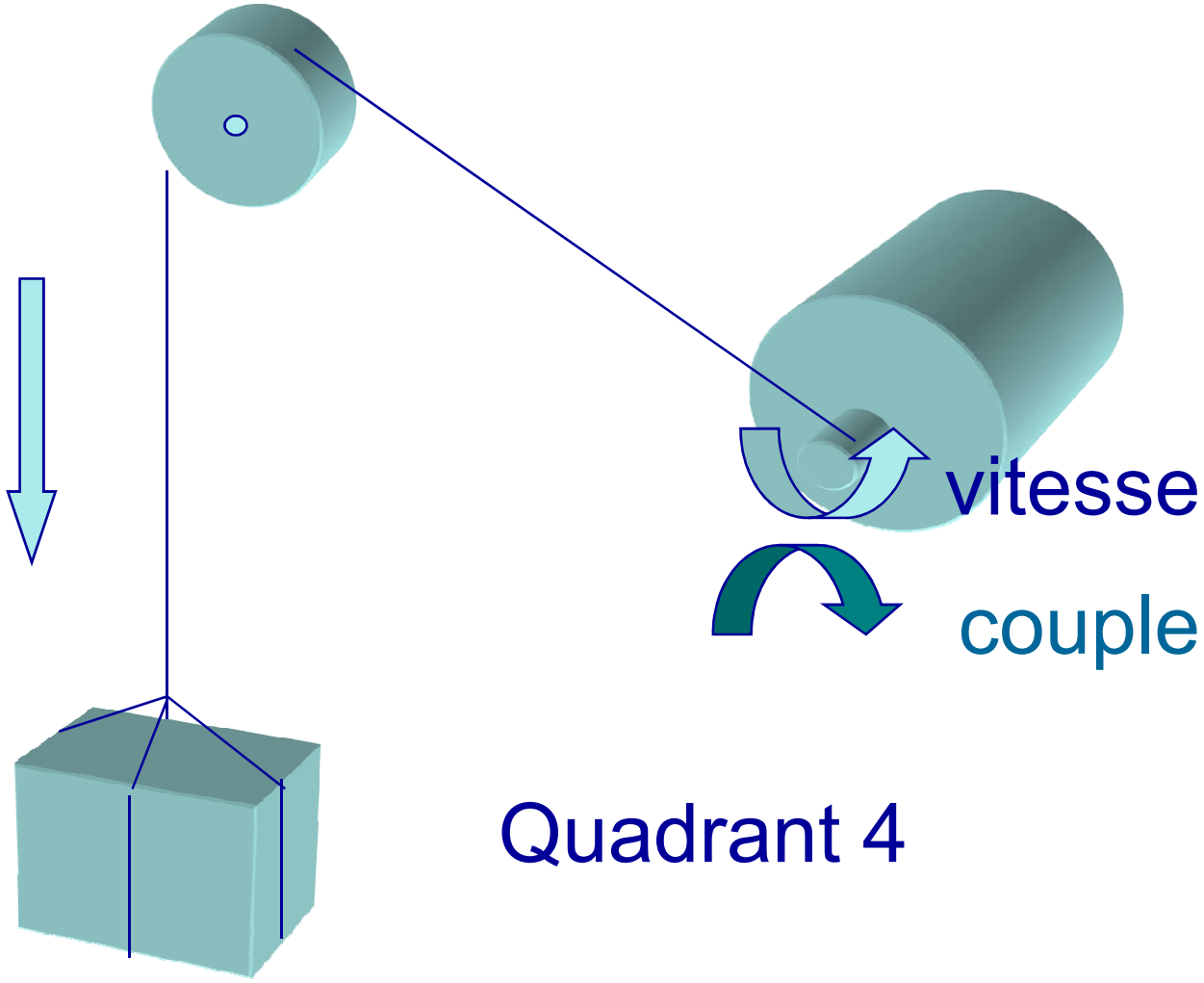
Exemple :

Montée = marche AV



Quadrant 1

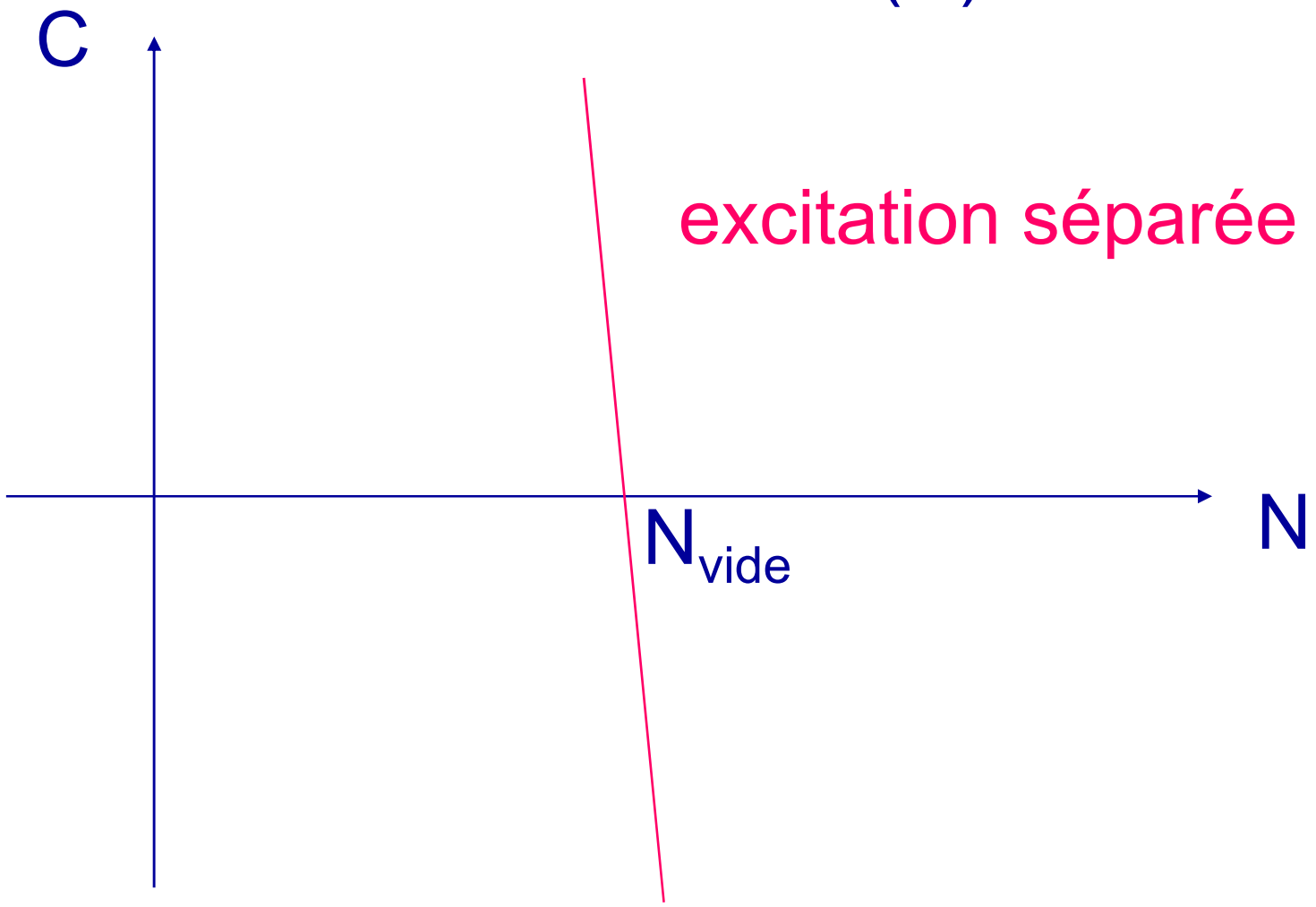
Descente = marche AR



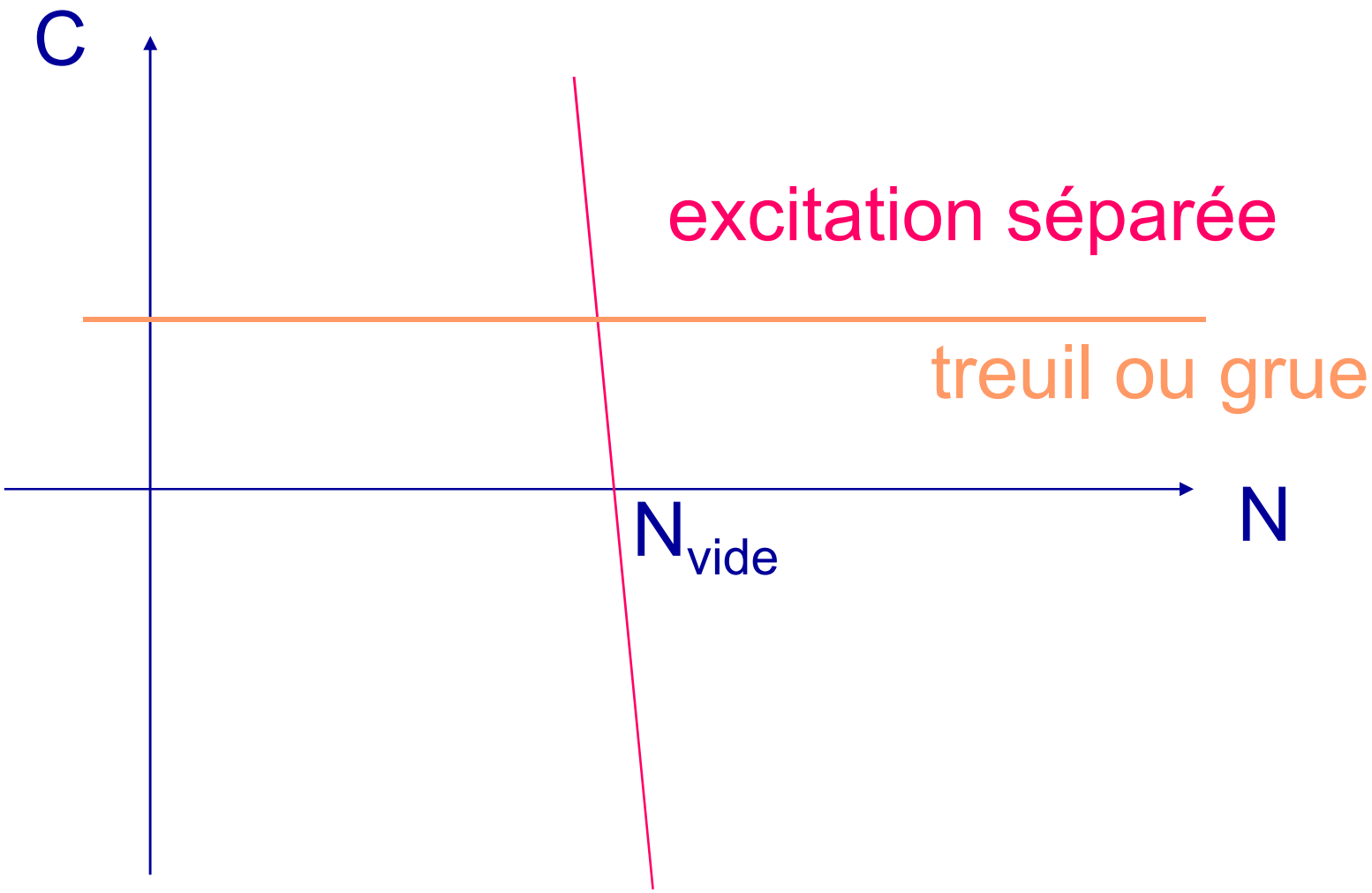
Quadrant 4

Caractéristique mécanique

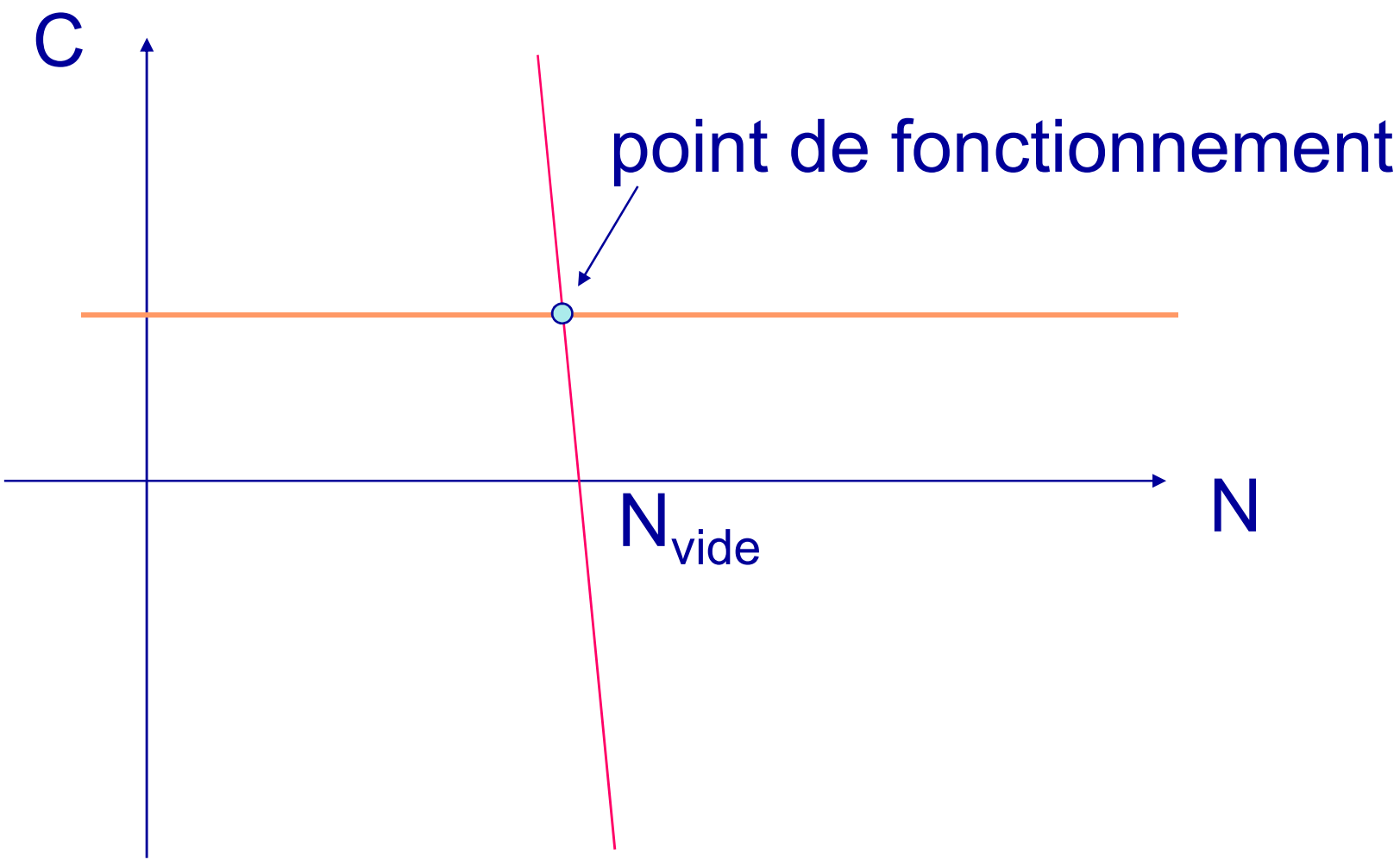
C'est la courbe C = f(N)



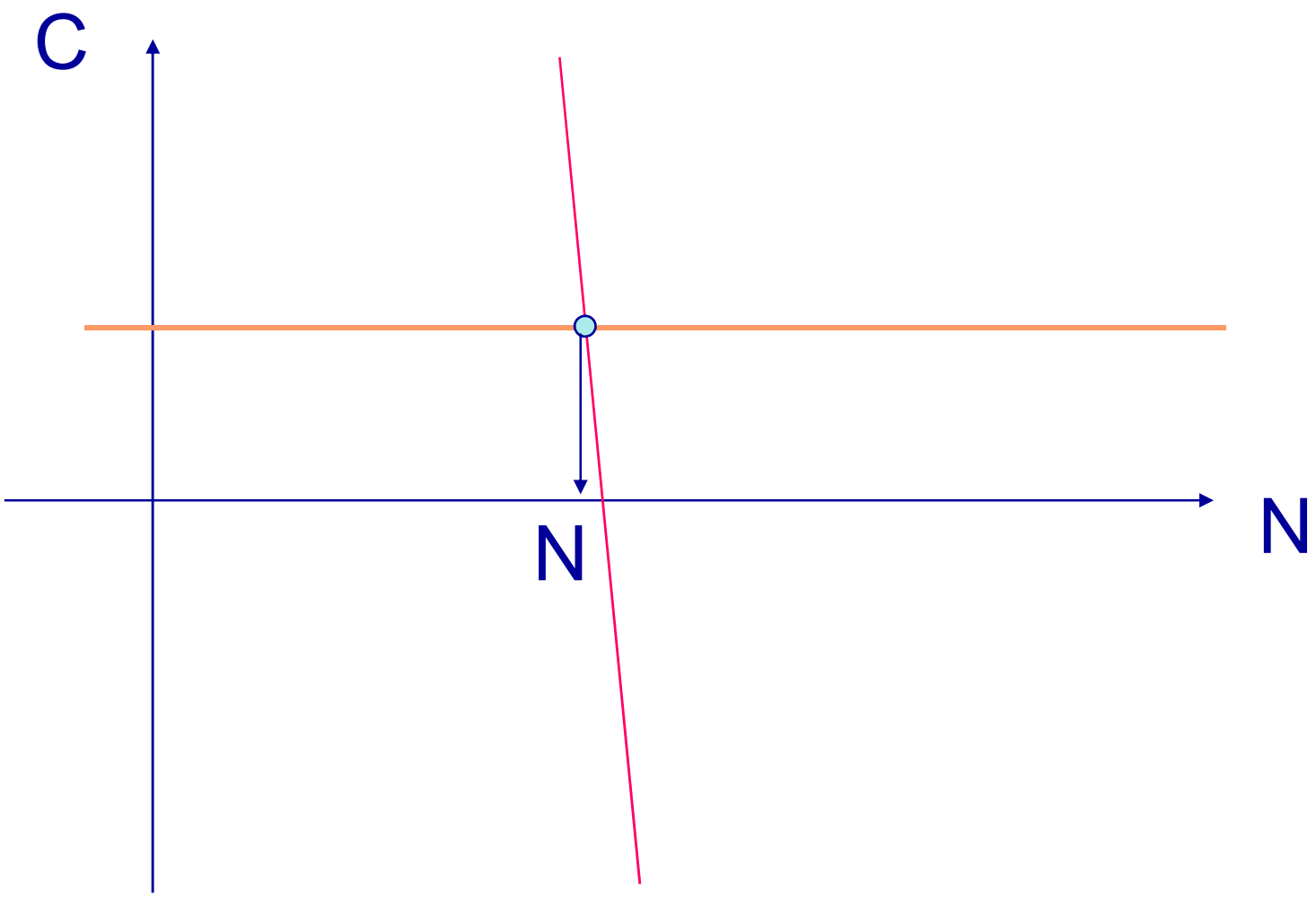
Caractéristique mécanique



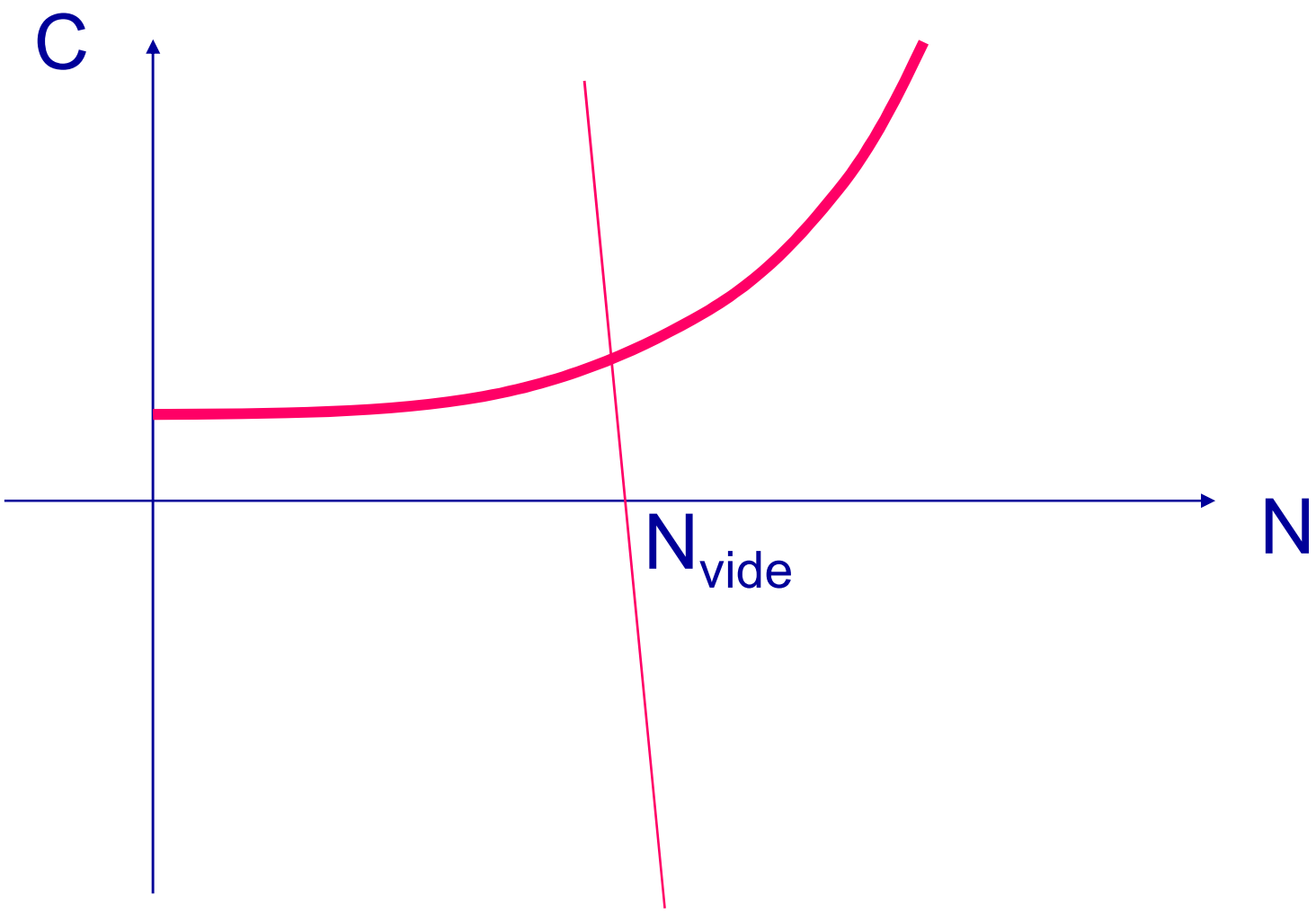
Caractéristique mécanique



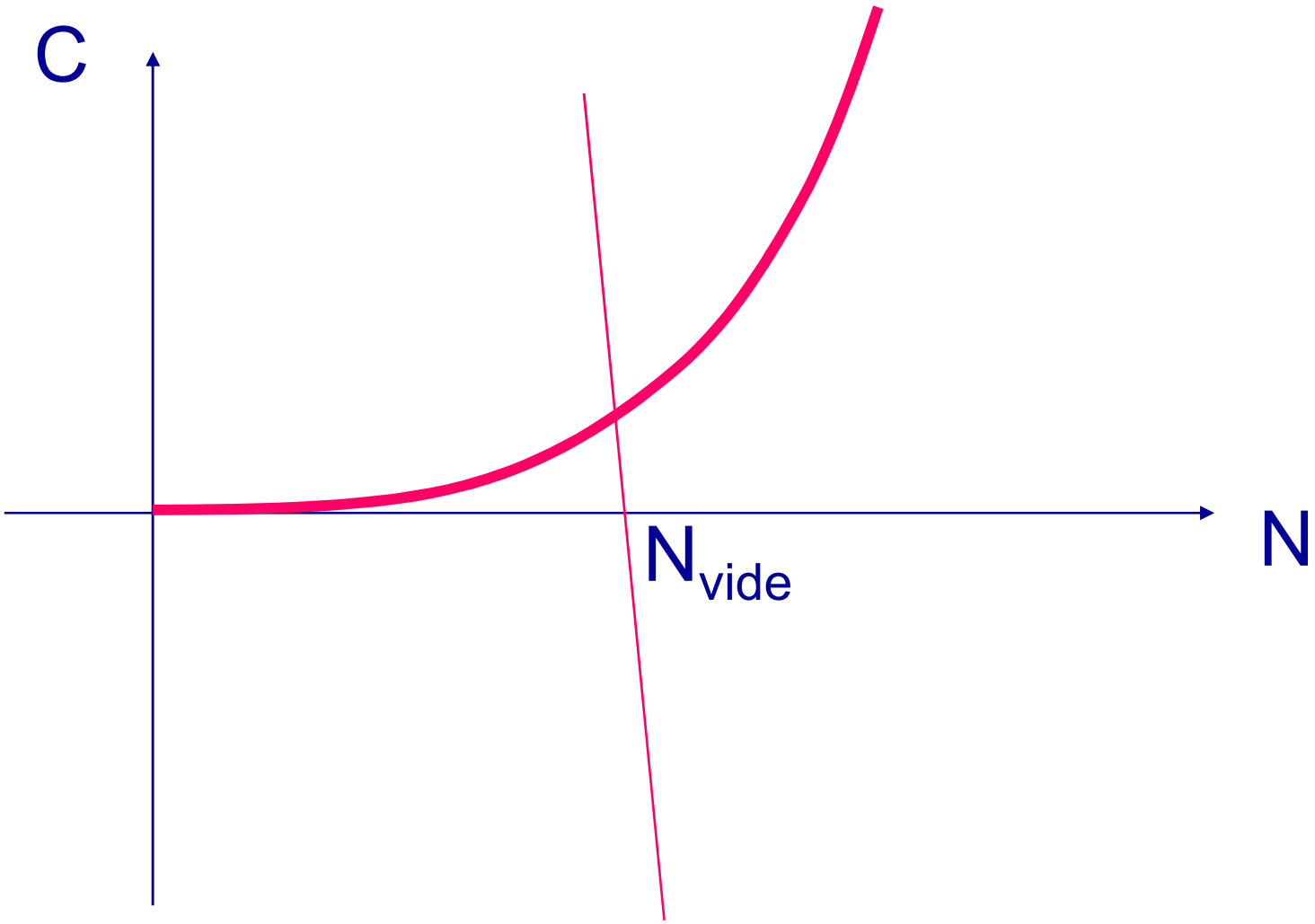
Caractéristique mécanique



Caractéristique mécanique de pompe



Caractéristique mécanique de ventilateur



Caractéristique mécanique de concasseur