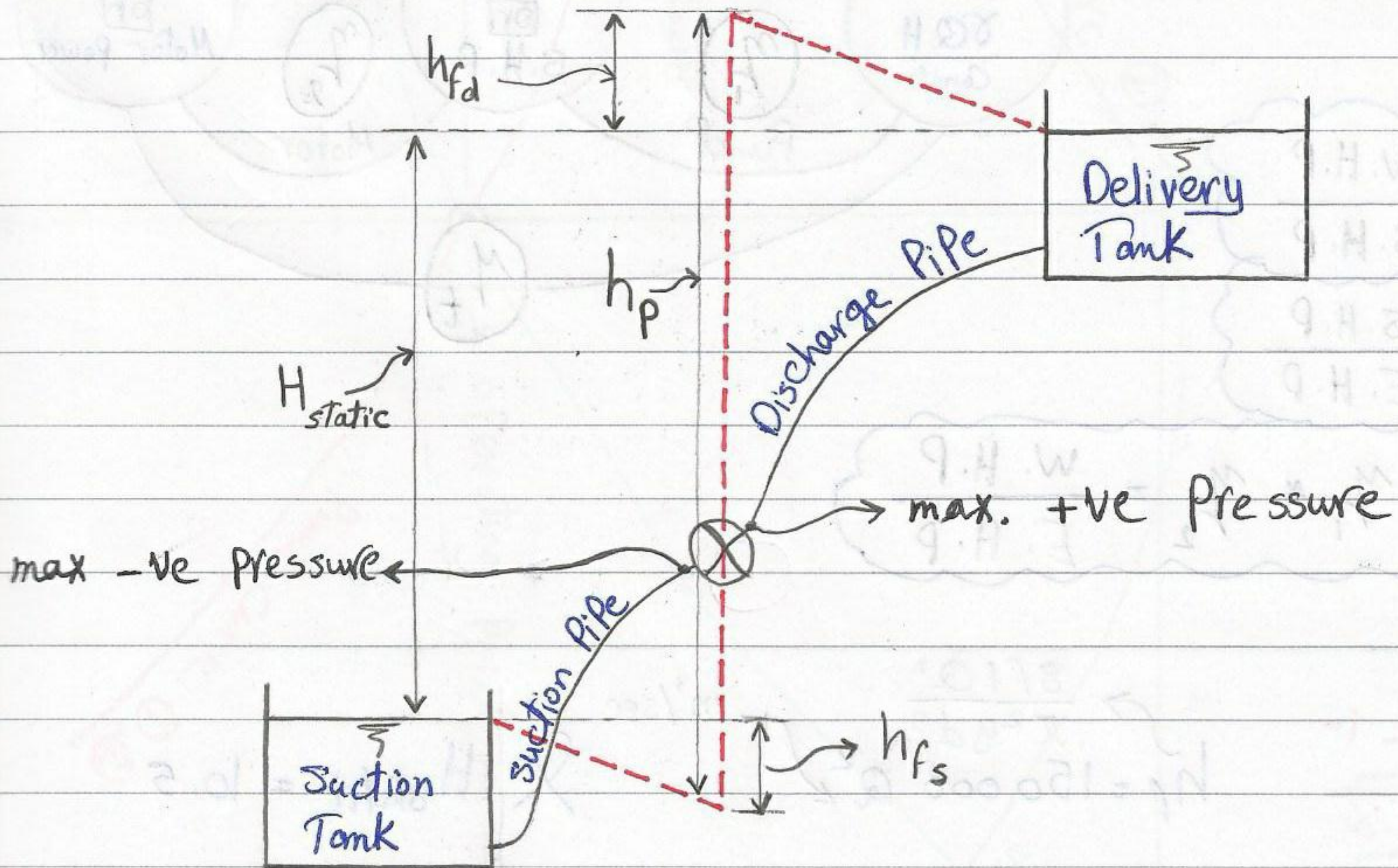


الاستخدامات الـ Pump

١- المباني السكنية

٢- المياه الجوفية

٣- عمليات الري الحديثة (الري بالتنقيط والرش)



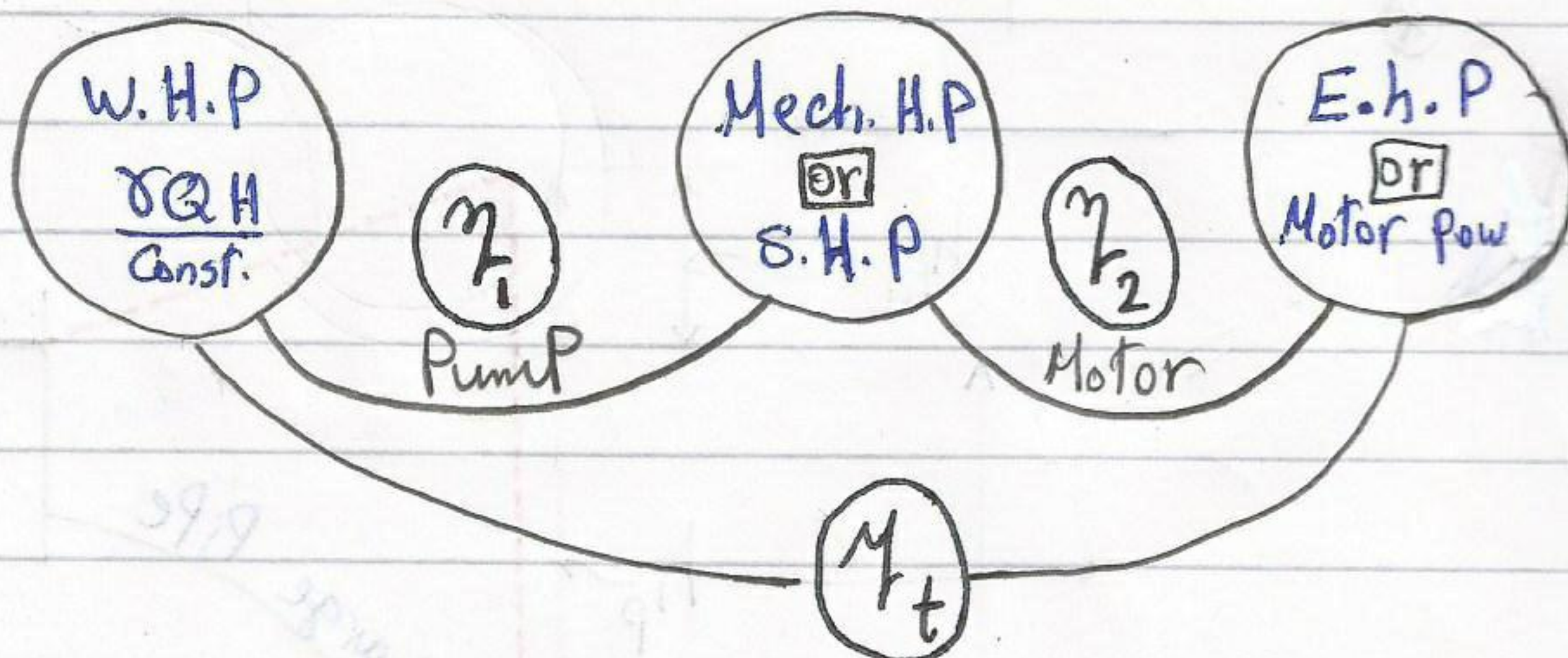
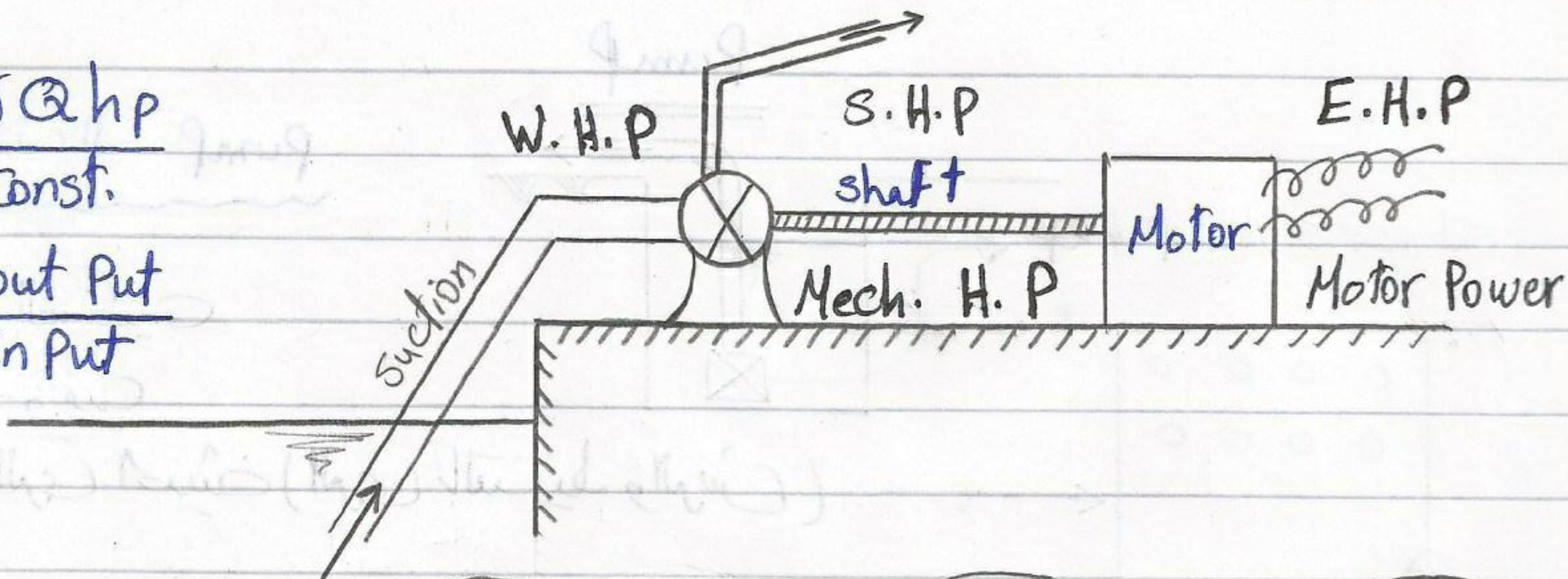
$$h_p = H_{static} + \sum \text{Losses}$$

$h_f$       minor losses



$$* H_p = \frac{\gamma Q h_p}{\text{Const.}}$$

$$* \text{eff.} = \frac{\text{out Put}}{\text{in Put}}$$



$$* \eta_1 = \frac{\text{W.H.P}}{\text{S.H.P}}$$

$$* \eta_2 = \frac{\text{S.H.P}}{\text{E.H.P}}$$

$$* \eta_t = \eta_1 * \eta_2 = \frac{\text{W.H.P}}{\text{E.H.P}}$$

Example 1-

$$h_p = 150000 Q^2 \quad \left( \frac{8f l Q^2}{\pi^2 g d^5} \right) \quad \text{m}^3/\text{sec}$$

$$H_{\text{static}} = 10.5$$

①	H (m)	30	27	24	18	12	6
②	Q (L/sec)	0	6.9	11.4	15.8	18.9	21.5
③	ηₜ (%)	0	60	70	65	40	20

$$h_p = 150000 Q^2 + 10.5$$

Q			
h <sub>p</sub>			

هذا المخطط لا يعبر عن عدد ال Pumps أو طريقة توصيلهم  
ولكنه يعبر عن خواص النظام و H<sub>static</sub>

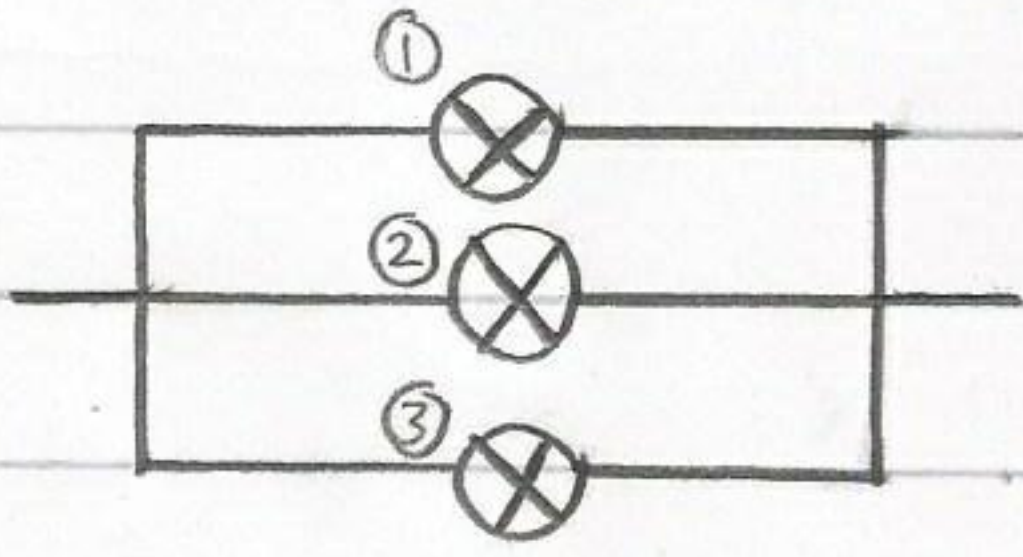






## Pumps in Parallel

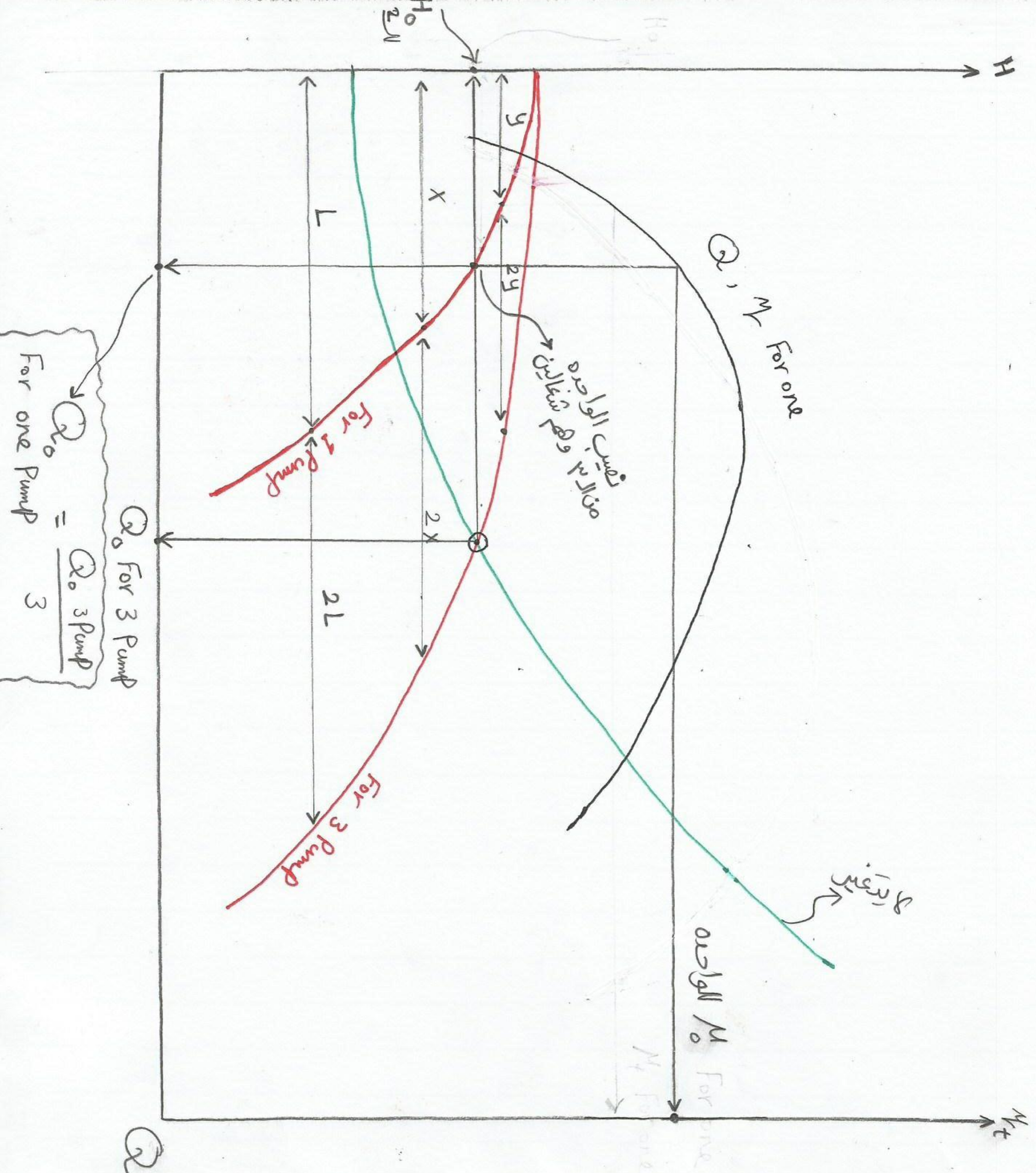
### Identical Pump



$$Q = Q_1 + Q_2 + Q_3$$

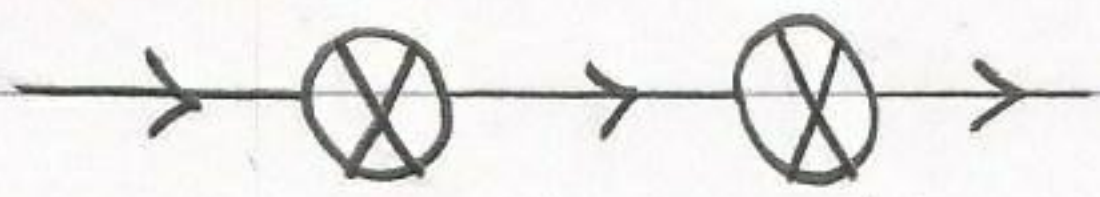
$$H_1 = H_2 = H_3$$

$$H_0 = H_{02}$$





# Pumps in series



$$Q_1 = Q_2$$

$$H = H_1 + H_2$$

