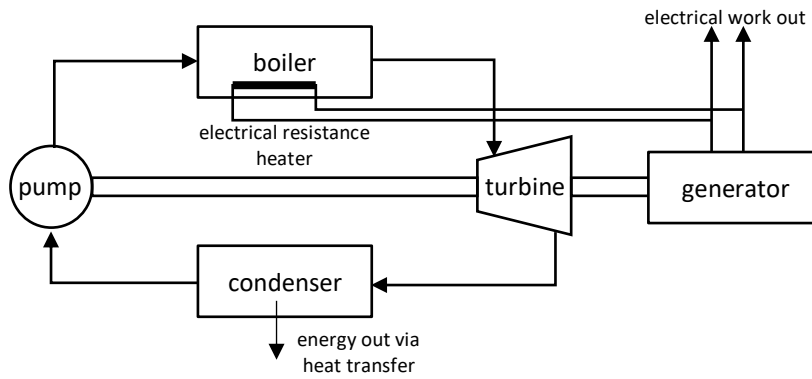
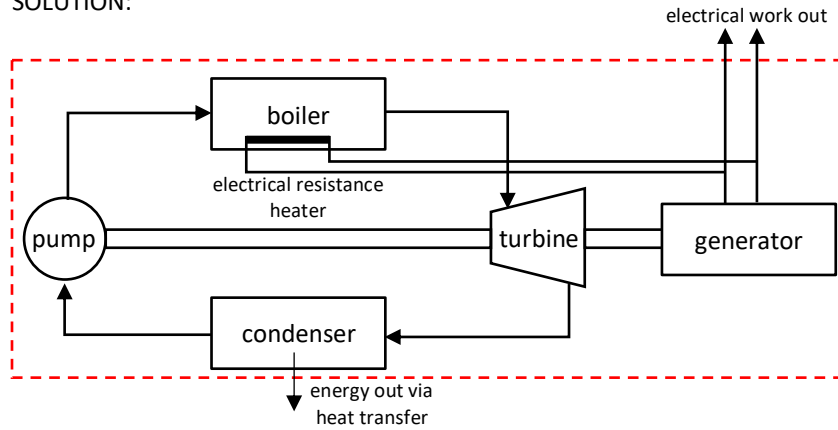


Consider the combination of devices shown in the following figure. Explain why this configuration of equipment is not possible.



SOLUTION:



Consider the system shown by the red dashed line in the figure. From the Kelvin-Planck Statement of the Second Law, we must have,

$$W_{by,cycle} \leq 0 \quad (\text{single reservoir}). \quad (1)$$

Since the identified system has $W_{by,cycle} > 0$ (the electrical work out) and interaction with a single thermal reservoir (where the energy leaves the system via heat transfer), the Second Law is violated. Thus, the design shown in the figure is not possible.