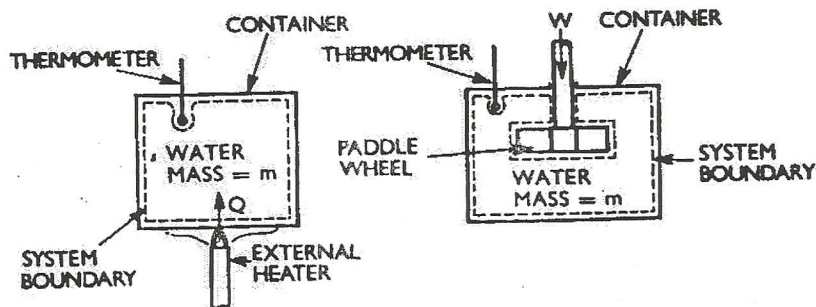


31. **Relationship Between Heat and Work**

Consider the figure below in which a certain amount of water is being heated using two different methods. In the first figure, the water is heated using a burner (external heat source), while in the second it is heated using a paddle wheel. The paddle wheel is rotated using external energy source which due to the rotation of the paddle wheel, in the water, heat is transferred to the water due to friction between the paddle wheel and the water molecules.



First System

Heat is transferred by a heat source

Temperature Rise = $(T_2 - T_1)$

Δt is caused by heat transfer, (Q)

This gives us a relationship between Heat (Q) and Work (W) as $Q = W$

Note that this is *not* an equation, but a "relation"

Second System

Heat is transferred to the water through friction by rotating the paddle wheel a high speed.

Temperature Rise = $(T_2 - T_1)$

Δt is caused by work transfer, (W)