A device for lifting water with thermal energy, a pulsating-steam water pump, is studied and its behaviour characteristics are investigated. The pump system consists of an evaporator tank, a condenser tank, and a heater. The general operation, involving four stages (heating, pumping, cooling and suction), is considered and a model of each stage is also developed. The system performance parameters such as suction height, discharge water volume and efficiency are investigated. It is found that the predicted results from the model agree quite well with the measured results. The discharge water volume directly depended on the discharge pressure setting and the total height.