



**Figure 5-8**

**5-7** The circle in Fig. 5-8 represents a reversible engine. During some integral number of complete cycles the engine absorbs 1200 J from the reservoir at 400 K and performs 200 J of mechanical work. (a) Find the quantities of heat exchanged with the other reservoirs, and state whether the reservoir gives up or absorbs heat. (b) Find the change in entropy of each reservoir. (c) What is the change in entropy of the universe?

**5-13** A system is taken reversibly around the cycle  $a-b-c-d-a$  shown on the  $T$ - $S$  diagram of Fig. 5-9. (a) Does the cycle  $a-b-c-d-a$  operate as an engine or a refrigerator? (b) Calculate the heat transferred in each process. (c) Find the efficiency of this cycle operating as an engine graphically as well as by direct calculation. (d) What is the coefficient of performance of this cycle operating as a refrigerator?