OPERATING INSTRUCTIONS

CALLENDER & BARNES

SATISH BROTHERS

To determine the Mechanical Equivalent of heat (J) by the Callender and Barnes method.

Apparatus used: A Callender and Barne's calorimeter, AC mains with a step down trans-former, an AC Ammeter(3A) and an AC Voltmeter(20V), a rheostat, a stop watch, a measuring jar and 2 thermometers.

Theory :

When a steady electric current flows through the heating coil and a steady flow of water is maintained through the tube, the temperatures at all parts of the apparatus become steady. Under such steady-state conditions, the amount of electrical energy supplied during a known time interval is consumed in heating the amount of water which flows through the tube during the same interval and a small amount of heat is lost by radiation etc., to the surroundings during that interval.

Formula used: $J = (E_2C_2 - E_1 C_1)/(m_1 - m_2) (q_2 - q_1) s$ for water $S = 1.0$ Cal/gm °C.

Procedure:

1. Connect the apparatus as shown in the Fig.

2. Adjust the tap and the water reservoir till the rate of flow of water through the tube is about (one) c.c per second. Switch on the current and regulate the rheostat so that the current passing is about 2 amperes.
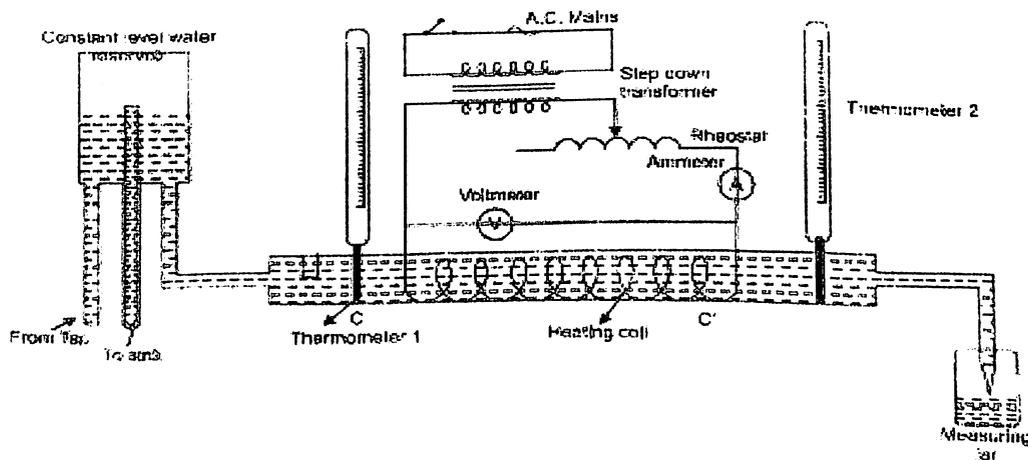
3. As soon as the temperature of the heated water going out becomes steady. Note the temperature of the two thermometers. Note the ammeter and the voltmeter readings.

4. Measure the rate of flow of water at this moment with the help of measuring Jar.

5. Change the rate of flow of water by varying the height of the reservoir and vary the electric current until the two thermometers again indicate their previous readings. Note the new readings of the ammeter and the voltmeter and measure the new rate of flow of water.

Observation:

Temperature of the cold water (inlet end)　　$= q_1$ _ _ _ _ _°C

Temperature of the hot water (exit end)　　$= q_2 =$ _ _ _ _ _°C

	E (in volts)	C (in amps)	Amount of flow of water per minute unit			
			I	II	III	Mean
I Case						
II Case						

Result: The value of J is found to be　　　= ergs/cal. (C.G.S. units)

= Joule/cal. (M.K. S. units)

Precautions:

1. The rate of flow of water in the tube should be uniform. To ensure this a number of measurements for the rate of out flow of water should be made.

2. Heating of the water should be uniform throughout tube.

3. Thermometers should be very sensitive.