DETERMINATION OF SPECIFIC HEATS OF GASES AT CONSTANT VOLUME

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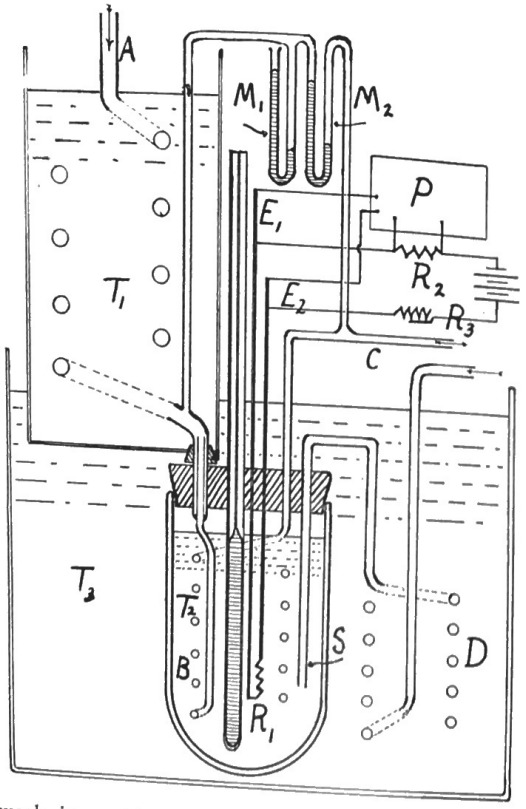
As no doubt everyone knows, the specific heat of a substance is the number of calories required to raise the temperature of one gram of the substance one degree Centigrade. Gases have two specific heats, spoken of as specific heat at constant pressure and specific heat at constant volume. If a gas is not confined when it is heated,



it does work in pushing back the atmosphere and more work in pushing the molecules further apart. The specific heat at constant pressure is, therefore, higher than the specific heat at constant volume. The specific heats of gases at constant volume have not yet been

satisfactorily determined. The figures given in tables are calculated in some manner from the specific heats at constant pressure.

There is an urgent need for more accurate information concerning the heat capacity of gases. Such information will help us to a clearer understanding of the gaseous state of matter and especially as to the distribution of heat energy between the kinetic energy of the molecule as a whole and that of the parts of the individual molecule.

In the method to be described, the gas whose specific heat is to be measured is led through the coil, A, where it acquires the temperature of the thermostatically controlled bath whose temperature is T_1. Next it passes into the coil, B, which is surrounded by an oil bath of temperature T_2 which is less than T_1. The outlet, C, of the second coil leads to the measuring apparatus (not shown on the diagram) by which the rate of flow is determined. The heat given up by the gas at T_2 is dissipated through the walls of the vacuum flask, B, to a thermostatically controlled bath whose temperature is T_3. In order to prevent change in volume of the gas as its temperature drops from T_1 to T_2 the pressure must be reduced by an appropriate amount. That amount can be calculated from the coefficient of cubical expansion at constant volume of the gas in question or may be determined by a separate experiment. The rate of flow of the gas is gradually decreased or increased until the drop in pressure due to the resistance of the small coil attains the desired value. The difference in pressure in the two coils is indicated by the manometer, M_2.

TABLE 1

The specific heat of Oxygen at constant volume

	Exp. No. 1	Exp. No. 2
T_1	32.85	45.00
T_2	28.65	29.66
T_3	25.60	29.10
Current (oxygen flowing)	.3562 amp.	.0000
Voltage (oxygen flowing)	.3543	.0000
Current (without oxygen)	.3700	.3260
Voltage (without oxygen)	.3681	.3247
Grams O^2 per second	.001778	.0109
Specific heat	.1531	.1520