DISCUSSION

(*a*) *The Thermal Component of Resistance*

A valuable summary of attempts to predict theoretically the effect of volume change on electrical resistivity and of comparisons with existing experimental data has recently been given by Lawson (1956). The main theoretical work on the volume dependence of resistivity at low temperatures is by Mott (1934) and by Grüneisen (1941). In these treatments, the Bloch–Grüneisen expression for the temperature dependence of resistivity was used as a basis for deriving the temperature dependence of the pressure coefficient.

For our present purpose this is not the best approach because the Bloch–Grüneisen theory does not describe at all satisfactorily the temperature dependence of the resistivity at constant volume of rubidium.

Consequently we have made a different comparison with theory. Instead of comparing the pressure coefficients directly, we have here computed the θ-values at several temperatures for two different pressures. The method used was that of comparing the logarithmic derivatives of resistivity with respect to temperature derived from experiment with those deduced from the Bloch–Grüneisen law (Kelly and MacDonald 1953). The results are given in Table II.

TABLE II

Temperature, ° K.	θ (100 atm.)	θ (2500 atm.)
10	45	45
20	58	58
30	63	65
45	50	65
50	46	65
60	50	65

We see thus that, as would be expected, the θ-value at a given temperature is usually increased when the volume is reduced, corresponding to a "stiffening" of the lattice under pressure, but that below about 30° K., although the ideal resistivities are markedly reduced by pressure, the θ-values appear to be unchanged.

(*b*) *The Residual Resistance*

Lenssen and Michels (1935) have discussed from a theoretical point of view the effect of pressure on the residual resistance. On the basis of the assumption that the electrons are truly free and that the scattering cross-section of the scattering centers is independent of volume, they deduce that $d \ln \rho_0 / d \ln V = -\frac{1}{3}$. If, on the other hand, the scattering centers are deformed by pressure in the same way as the dimensions of the specimen, then one deduces that $d \ln \rho_0 / d \ln V = +\frac{1}{3}$. From our measurements on sample II we deduce that for this specimen $d \ln \rho_0 / d \ln V = -1.1$.

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