resistance ΔR_i due to this pressure was then read off from our pressure measurements and this together with our original R_i versus temperature curves at zero pressure gives R_i' the resistance at constant density over the whole temperature range. This is then converted to resistivity by a single conversion factor determined from the known resistivity above 0 °C. Values of the resistivity calculated in this way are included in tables 4 and 5.

Table 8. A comparison of results for the ideal resistivity of caesium at zero pressure

		$\rho_i(T)/\rho_i(273{\cdot}15)$			
T (°K)	1	2	3	4	5
273·15	1·000	1·000	1·000	1·000	1·000
87·8$_1$	—	0·302$_2$	—	—	0·272
82	—	—	—	0·248	0·253
77·60	—	0·269$_0$	—	—	0·238
20·6	—	—	—	0·051	0·051$_8$
20·4$_2$	0·057$_6$	0·095$_7$	—	—	0·051$_2$
14·0$_0$	0·032$_9$	—	—	—	0·028$_8$
4·2$_0$	0·001$_6$	0·002$_9$	0·0017	0·002$_1$	0·001$_6$

1, Justi (1948); 2, Meissner & Voigt (1930); 3, MacDonald *et al.* (1956); 4, McLennan *et al.* (1928); 5, This work.

To work out ρ_i' (the prime is used to indicate that ρ_i is evaluated at fixed density) at other densities we assumed that the compressibilities of rubidium and caesium were independent of temperature at a fixed density. Then we could work out the resistance changes at each temperature in a similar way for pressures of $(p'+1000)$ and $(p'+2000)$ atm and proceed as before. The values of ρ_i' obtained in this way are plotted in figures 1 and 2.

We can illustrate how the ideal resistivity of rubidium and caesium depends on temperature in a different way. In this we compare their resistivities (at constant density) with that predicted by the Bloch–Grüneisen formula. To do this we compare values of $(\partial \ln \rho_i/\partial \ln T)_V$ for the actual metal with that deduced from the Bloch–Grüneisen function and choose the value of the characteristic temperature θ_G involved in this function to make the two agree at each temperature (Kelly & MacDonald 1953). The results showing how θ_G varies with temperature for rubidium and caesium are shown in figure 3. The general behaviour is not unlike that of the lighter alkali metals (see I).

3·3. *Pressure dependence of resistance*

Tables 9 and 10 show the variation of ideal resistance of rubidium and caesium with pressure at various temperatures. They are smoothed curves of direct readings taken with the high pressure apparatus, Matthiessen's rule being applied to determine the ideal resistance.

In the solid helium range, the procedure was to plot curves of variation of resistance with temperature at several different pressures; the curves for rubidium specimen 3 are shown in figure 4. The residual resistances, indicated by arrows on this diagram were determined by linear extrapolations of plots of R against T^5. Figure 5 shows a typical set of results obtained in the liquid hydrogen range of temperature. It illustrates what happens when the helium, which transmits the pressure, solidifies; this is shown by the abrupt increase in slope of the resistance-temperature curve when solidification begins and an abrupt decrease in slope again when solidification is complete.

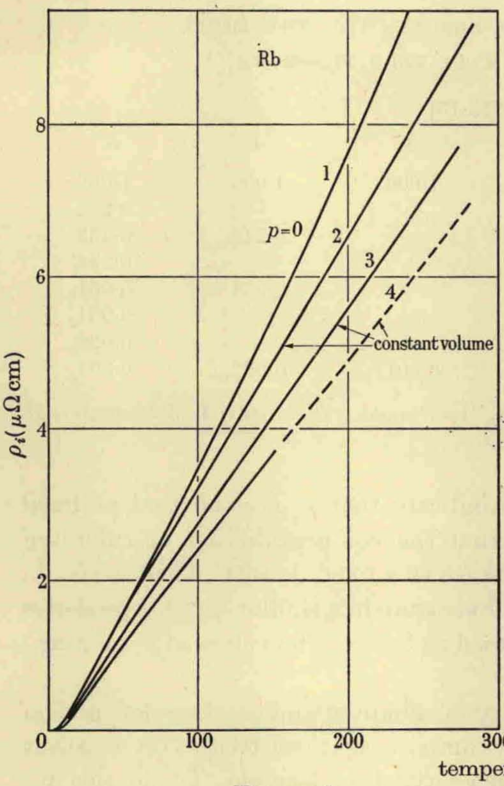

FIGURE 1

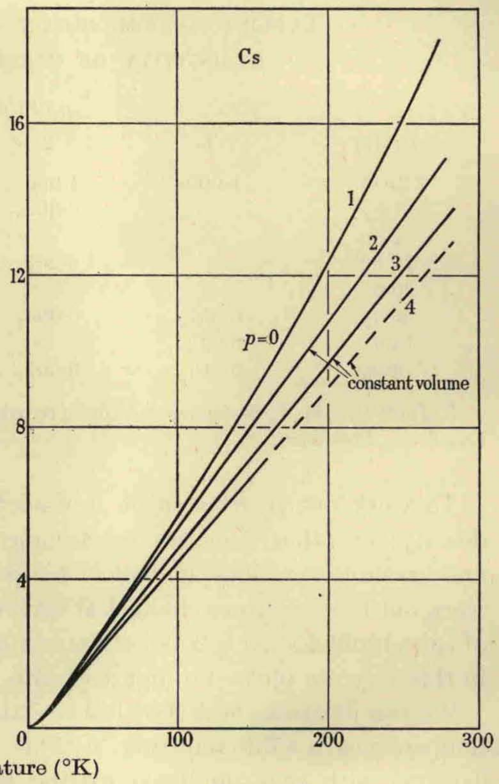

FIGURE 2

FIGURE 1. The ideal resistivity of rubidium as a function of temperature. Curve 1 is at constant pressure ($p = 0$); the rest at constant density. The densities are those of the solid at 0 °K and the following pressures: curve 2, zero; curve 3, 1000 atm; curve 4, 2000 atm. The dashed line is an interpolation between our results at lower temperatures and a point based on Bridgman's data at the ice point.

FIGURE 2. The ideal resistivity of caesium as a function of temperature. Curve 1 is at constant pressure ($p = 0$); the rest at constant density. The densities are those of the solid at 0 °K and the following pressures: curve 2, zero; curve 3, 1000 atm; curve 4, 2000 atm. The dashed line is an interpolation between our results at lower temperatures and a point based on Bridgman's data at the ice point.

Table 9 shows the effect of pressure on the resistance of two samples of rubidium of very different purity; this enables one to test the validity of Matthiessen's rule for determining the pressure coefficient of ideal resistivity at low temperatures. Consider in particular the results obtained at 4·2 °K. Specimens 1 and 3 which are of similar purity give concordant results, whereas specimen 5 which was much less impure (by