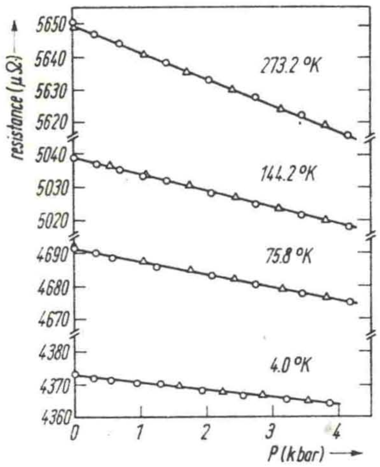
Fig. 2. Typical resistance versus pressure isotherms for the 25 at% Au-75 at% Ag alloy. ○ indicates increasing pressure and △ indicates decreasing pressure



to measure all voltages. Coarse temperature control was effected by positioning the pressure bomb in the vapor just above the liquid bath and fine control (±0.05 °K) was accomplished with a Cryogenics Research model TC 101 controller. Below 30 °K temperature was measured within ± 0.05 °K using a Cu–AuFe thermocouple. Above 30 °K temperature was measured to within ± 0.5 °K using a Cu–constantan thermocouple.

The resistance data were taken as a function of pressure at various constant temperatures. Typical isotherms are shown in Fig. 2 for the $c = 0.25$ alloy. The resistance data were taken with both increasing and decreasing pressure to insure that the sample had not been strained and that the temperature remained stable during the run. Several runs at the same temperature indicated that the initial pressure derivative, $R^{-1}\,\mathrm{d}R/\mathrm{d}P$, could be determined to within $\pm\,0.05\times10^{-3}$ kbar^{-1}.

To compare the experimental results with theory the pressure derivative of the resistance must be measured at a constant volume, V_0 (usually taken as the volume of the sample at 0 °K). For $T > 0$ °K the volume, $V(T)$, is calculated from the thermal expansion and the pressure, P', required to compress the sample back to V_0 is calculated from the compressibility. The constant volume pressure derivative, $R'^{-1}\,\mathrm{d}R'/\mathrm{d}P$, is the pressure derivative measured at P', and for the $Ag_{1-c}Au_c$ alloys at 298 °K, $P' \approx 10$ to 12 kbar. The resistance of the $c = 0.25$ alloy was measured as a function of pressure up to 20 kbar at 298 °K in a high pressure liquid pentane press. The constant volume pressure derivative $R'^{-1}\,\mathrm{d}R'/\mathrm{d}P$ (measured at 12 kbar) was found to be 9% less than $R^{-1}\,\mathrm{d}R/\mathrm{d}P$ (measured at 1 bar). For $T < 200$ °K the difference between $R'^{-1}\,\mathrm{d}R'/\mathrm{d}P$ and $R^{-1}\,\mathrm{d}R/\mathrm{d}P$ was found to be within the experimental error. To convert from resistance to resistivity the following expression is used to account for the pressure dependence of the geometrical factor

$$\frac{1}{\varrho}\frac{\mathrm{d}\varrho}{\mathrm{d}P} = \frac{1}{R'}\frac{\mathrm{d}R'}{\mathrm{d}P} - \frac{\chi(T)}{3}, \tag{1}$$

where $\chi(T)$ is the compressibility at T. The compressibility of the alloys was obtained by extrapolating between the values for pure Ag and Au [5 to 7].

3. Results

The measured initial pressure derivative, $R^{-1}\,\mathrm{d}R/\mathrm{d}P$, as a function of temperature for three of the alloys is shown in Fig. 3. For these alloys $R^{-1}\,\mathrm{d}R/\mathrm{d}P$ is observed to increase smoothly with decreasing temperature ($\approx -1.4\times10^{-3}$ kbar^{-1} at 273 °K to $\approx -0.7\times10^{-3}$ kbar^{-1} at 4 °K). In the case of pure