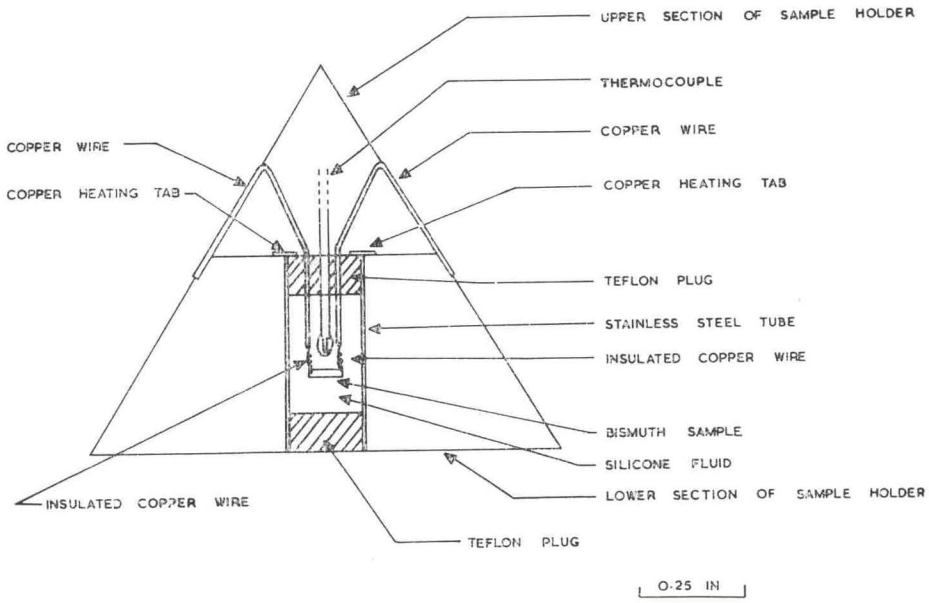
were used to apply a correction for the effects of pressure on the thermocouple output. The pressure calibration of the cell was done by measuring the change in electrical resistance of a manganin wire as the pressure was changed. A length of about 30 cm insulated manganin wire of diameter 0·0112 cm was non-inductively wound into the form of an unsupported coil and placed in the silicone fluid of the cell. Electrical contact was made to the measuring apparatus via two copper tabs which made contact with the two remaining anvils. It was found necessary to season the manganin wire to temperature and pressure by progressively raising the temperature and pressure together to about 25 kbar and 200°C and maintaining these conditions for about 2 hr. The resistance was very sensitive to plastic deformation and the seasoning was necessary to take account of shear stresses which were imposed on the parts of the wire emerging from the cell.

Fig. 1



The tetrahedral pressure cell when used for the bismuth calibration.

After this procedure the change in resistance of the manganin gauge was measured as the external load was decreased at a fixed cell temperature of 170°C. During all these treatments the liquid in the cell did not solidify. The bismuth I–II and II–III transitions were next determined by resistivity measurements of a bismuth wire at 170°C with a similar cell to give fixed points at 18·2 kbar and 22·8 kbar respectively (Butuzov 1957). Thus, by combining the two methods a calibration curve of applied load against the pressure in the cell could be made with the silicone fluid at 170°C. It was not possible to carry out pressure measurements during the ageing of the aluminium alloy under pressure, so all the cells were made as similar as

possible and it was assumed that the pressure–load calibration curve was applicable in all the experiments.

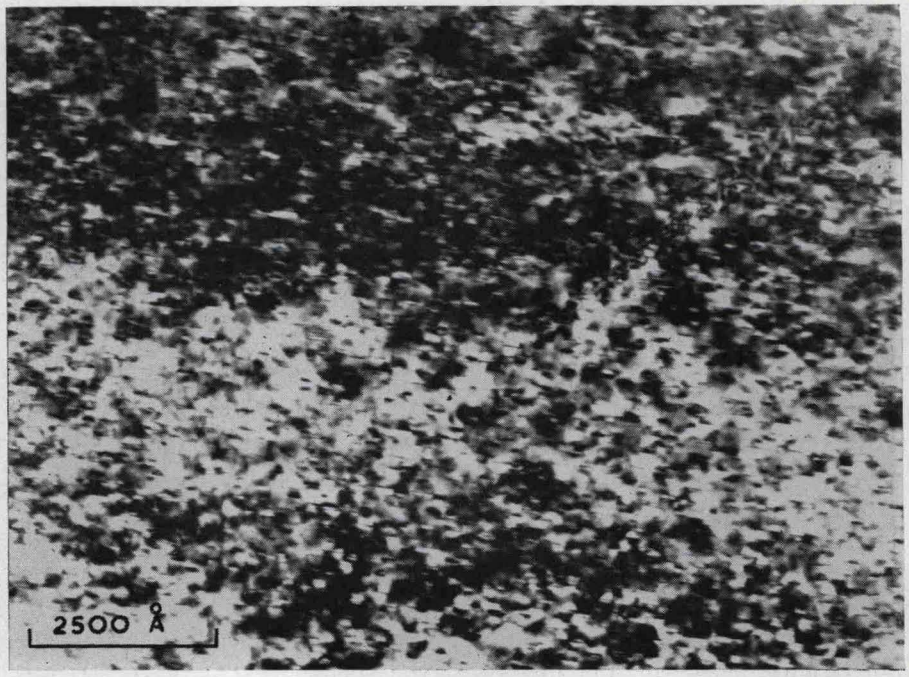
A standard amount of incomplete precipitation of θ'' at an ageing temperature of 170°C and atmospheric pressure was decided upon and the times required to produce the same amount of precipitation at various pressures were experimentally determined with the ageing temperature maintained at 170°C in the pressure cell by a sensitive temperature control unit. The same procedure was followed for the formation of θ' precipitates at 220°C. The amount of precipitation produced in a particular experiment was determined by transmission electron microscopy after the specimens had been suitably thinned (Nicholson, Thomas and Nutting 1958—using chromium trioxide instead of their recommended chromium oxide in the polishing solution). The standard amount of precipitation for θ'' and θ' was also produced at atmospheric pressure by varying the ageing temperatures to determine the activation energies for the two processes.

§ 3. Results

3.1. *Formation of θ'' Precipitates*

It was first necessary to obtain a standard amount of precipitation at atmospheric pressure of θ''. Specimens were homogenized, quenched and

Fig. 2



The standard θ'' result. The ageing conditions were: 170°C, atmospheric pressure, 4 hr.