the range 130°C–170°C at atmospheric pressure for times such that the standard θ'' result was obtained. The results are shown in fig. 5. By applying the above formula at atmospheric pressure and varying temperature:

$$\ln t = \frac{\Delta U}{RT} + \ln \frac{\alpha}{D_0},$$

and the slope of $\ln t$ versus $1/T$ will be $\Delta U/R$.

From fig. 5 the activation energy for the θ'' precipitation is $27{\cdot}45 \pm 1{\cdot}15$ kcal mole^{-1}, i.e. $(1{\cdot}19 \pm 0{\cdot}05$ ev) for the atomic activation energy.

3.3. *Formation of θ' Precipitates at 220°C*

The next series of experiments was concerned with the effects of pressure on the formation of θ' precipitates. The experimental method was the same as that for the investigation of θ'' precipitates and a standard θ' result was obtained. This standard result was obtained by homogenizing a

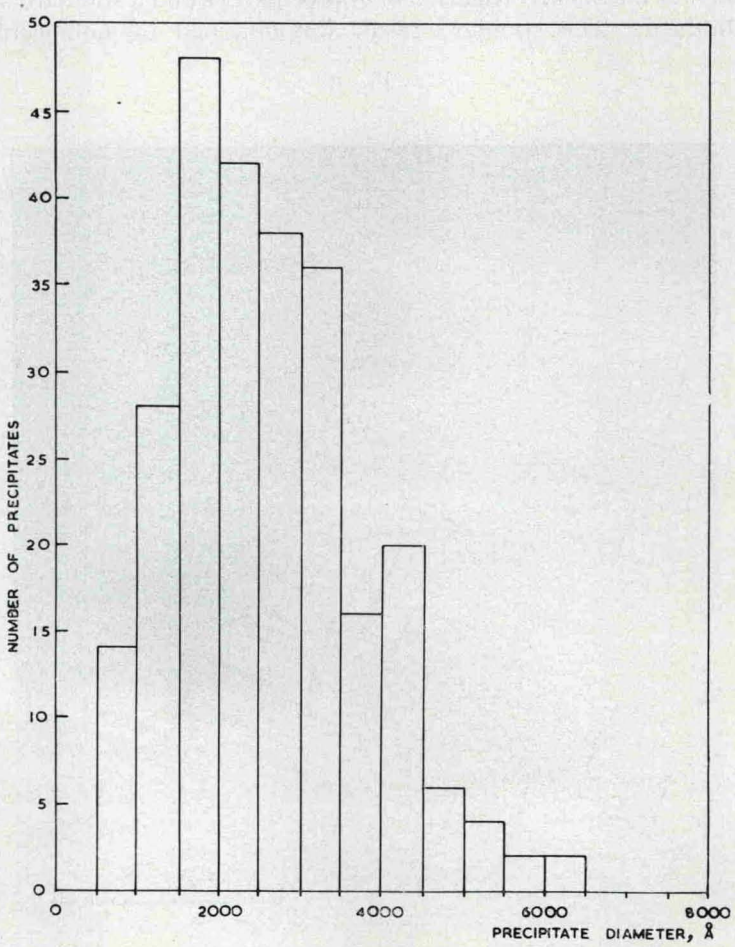
Fig. 6

The standard θ' result. The ageing conditions were: 220°C, atmospheric pressure, 1·5 hr.

specimen, quenching, ageing for 24 hr at room temperature at atmospheric pressure and then ageing at 220°C for 1·5 hr at atmospheric pressure (fig. 6).

The distribution of θ' diameters obtained from the micrographs is shown in fig. 7 and the mean diameter was 2700 Å. Unlike the θ'' precipitates the θ' precipitates were not uniformly distributed throughout the specimens but occurred in wide bands with a lower density of θ' precipitates in between. It is possible that the θ' precipitates formed preferentially at dislocations but there was no direct evidence for this. The micrographs used for the measurement of precipitate diameters were taken at the high density regions. The standard result was for incomplete precipitation, since if the ageing times were longer than 1·5 hr at 220°C the θ' precipitates increased further in size.

Fig. 7



Histogram of the distribution of θ' diameters in a specimen which had been aged under the standard conditions.