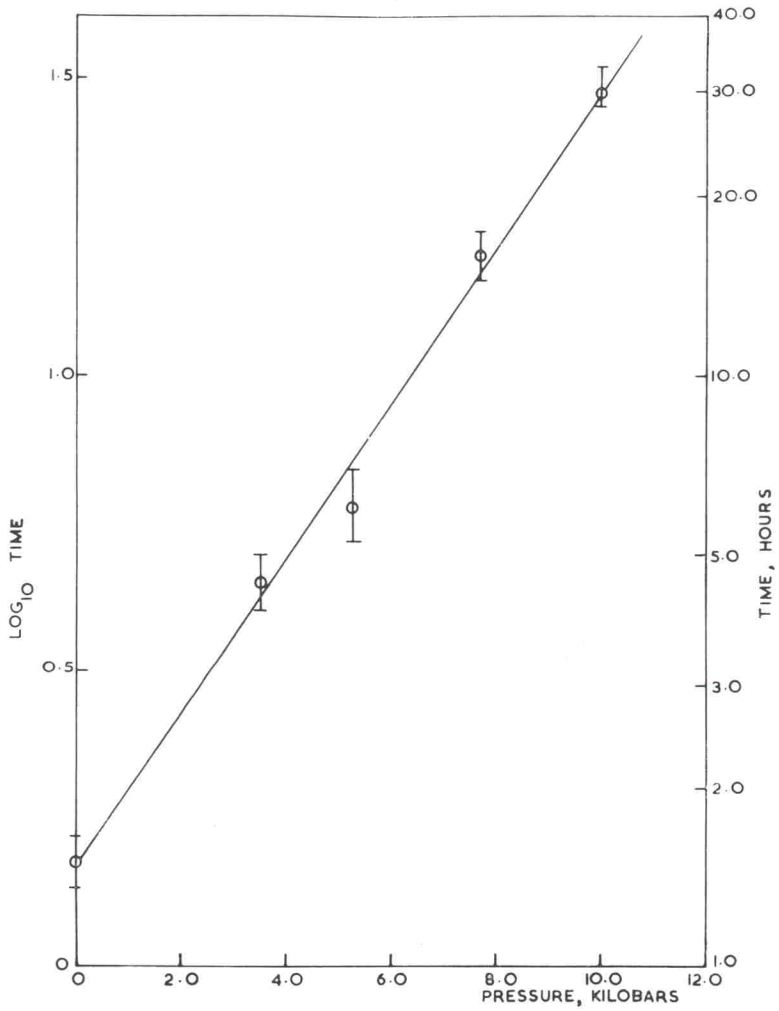
3.4. *Formation of θ′ under Hydrostatic Pressure at 220°C*

Specimens which had been homogenized, quenched and aged at room temperature and atmospheric pressure for 24 hr were further aged at 220°C under various pressures such that the standard θ' result was obtained. The Student's t test was again used. The results are shown in fig. 8 which gives an activation volume for diffusion of copper in aluminium of $12{\cdot}3 \pm 0{\cdot}6$ cm^3 $mole^{-1}$ for the formation of θ' precipitates, which is effectively the same activation volume as for the θ'' formation.

To obtain the apparent activation energy for the formation of θ' precipitates, the standard θ' result was obtained by ageing specimens in the

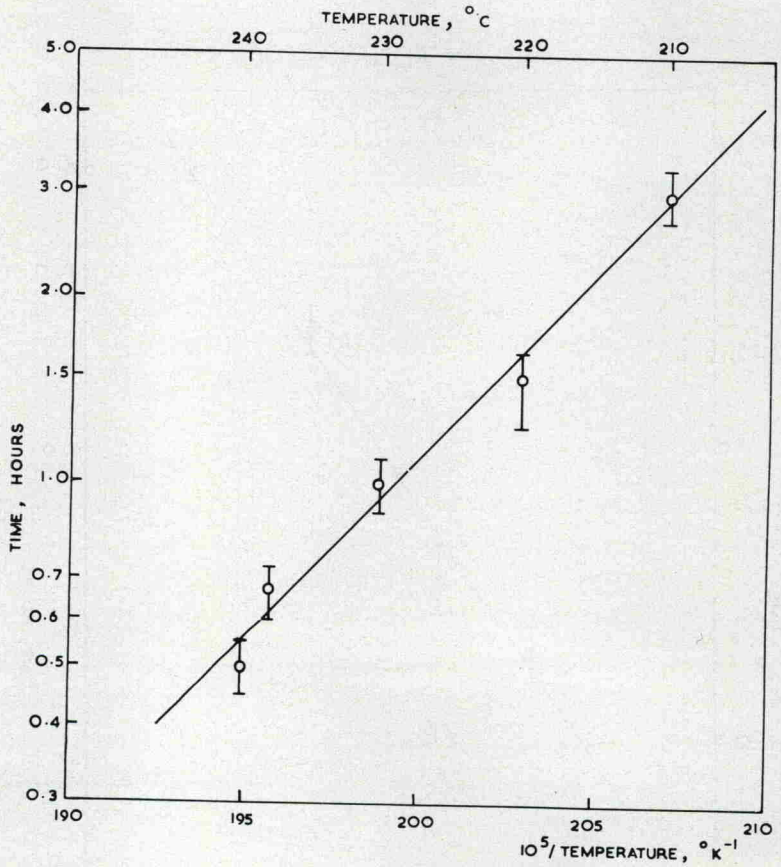
Fig. 8



Variation with pressure of the time required to obtain the standard θ' result.

temperature range of 210°C to 240°C at atmospheric pressure for various times. Temperatures of less than 210°C could not be used as some θ'' precipitates were also formed and ageing temperatures above 240°C produced such a rapid growth of θ' precipitates that the times to obtain the standard θ' result could not be accurately measured. The results are shown graphically in fig. 9 from which an activation energy of $27{\cdot}45 \pm 1{\cdot}85$ kcal mole^{-1} ($1{\cdot}19 \pm 0{\cdot}08$ ev) was obtained. This value is the same as was obtained for the activation energy for θ'' formation at 170°C.

Fig. 9



Variation with temperature of the time required to obtain the standard θ' result

§ 4. Conclusions

The conclusions of this work are:

1. Because the activation energies and activation volumes for the formation of both θ'' and θ' precipitates are the same, the formation of the two types of precipitate is controlled by the same diffusion process.