changes in the elastic deformation of the pressing assembly, but it was a simple matter to correct the displacement readings to eliminate these discontinuities, and thence to calculate pellet densities throughout the experiment.

Figure 3 shows $(\rho/P)^{2/3}$ plotted against time. The plot is seen to consist of three straight-line regions, corresponding to the three applied stresses. The gradients of the three regions are plotted against the applied stress on the smaller graph in Figure 3, and it is seen that a straight line through the origin is obtained, so confirming the relationship predicted in Equation (4). For the purpose of comparing the two methods of plotting data, the same results are plotted as $(\mathrm{d}V/\mathrm{d}t)/V_s$ *versus* $(P/\rho)^{2/3}$ in Figure 4. Again, the gradients of the three regions vary in the ratio 2:3:5.

A further stress-dependence experiment was conducted at 1400°C, the various applied pressures being 2000, 3000, 4000 and 5000 lb.in^{-2}. The data are plotted in Figure 5, and again it is seen that the gradient of the plot of $(\rho/P)^{2/3}$ *versus* time is proportional to the applied pressure, confirming the prediction of Equation (4).

6. EFFECT ON DENSIFICATION OF VARIATIONS IN MEAN PORE SEPARATION

Equation (4) predicts that the shrinkage rate of a compact during pressure-sintering should be inversely proportional to the square of the mean pore separation. To check this prediction, it was necessary to press a number of samples under the same conditions of temperature and pressure, so that any differences in shrinkage rate amongst the samples would be known to be caused by differences in mean pore separation.

A series of nine pressing experiments was conducted at 1300°C with an applied pressure of 5000 lb.in^{-2}. Details of all these experiments are set out in Table 1, and

Table 1

Expt No. (*cf Fig.* 6)	*Relative density at termination*	*Pressing time (h)*	$\frac{d}{dt}\left(\frac{\rho}{P}\right)^{2/3}$	*Pore count*
1	0·997	44	1·65	35
2	0·965	1·75	1·95	55
3	0·976	3·5	2·15	60
4	0·954	1·25	2·20	62
5	0·990	9·5	2·15	48
6	0·998	68	1·55	31
7	0·999	56	1·08	18
8	0·989	26	0·88	18
9	0·988	20	0·85	21

the shrinkage data are plotted as $(\rho/P)^{2/3}$ *versus* time in Figure 6. It can be seen that a range of gradients was obtained, although the same temperature and pressure were used for all the experiments.

Those plots ending in arrows (Figure 6) were continued to higher densities but, for convenience in plotting, only the first few hours are shown: for instance, a plot of results extending to a relative density of 0·997 would require a $(\rho/P)^{2/3}$ axis extending to 48 and a time axis extending to several tens of hours. Occasionally plots

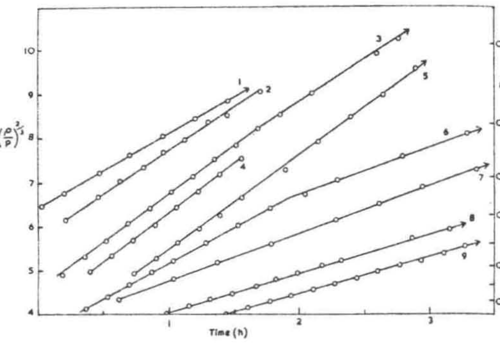

FIGURE 6
Densification data: 9 experiments at 1300°C, pressure 5000 lb.in^{-2}.

would be divided into two straight-line portions with slightly different gradients: examples are Plots 3 and 6 in Figure 6. Usually the change of gradient occurred at a relative density of about 0·96, and a possible explanation may be that a proportion of the pore population ceases to shrink, resulting in an increase in the effective mean pore separation. The gradients for Plots 3 and 6 (Figure 6) recorded in Table 1 are those of the first parts of the plots.

All nine specimens were sectioned and polished, using 6 μm and 1 μm diamond paste on successive lead laps, and examined by optical microscopy. The remaining porosity could be seen clearly when the specimens were examined in reflected light using a $\times 140$ oil immersion objective, when the pores appeared as bright spots of light. Even pores which were too small to be optically resolved, and which were quite invisible under oblique illumination, could be detected in this way: for such pores the bright spots were actually diffraction patterns. Photographs were obtained of the pore pattern below the polished surface of each of the specimens: Figure 7 is an example of the type of photograph obtained.

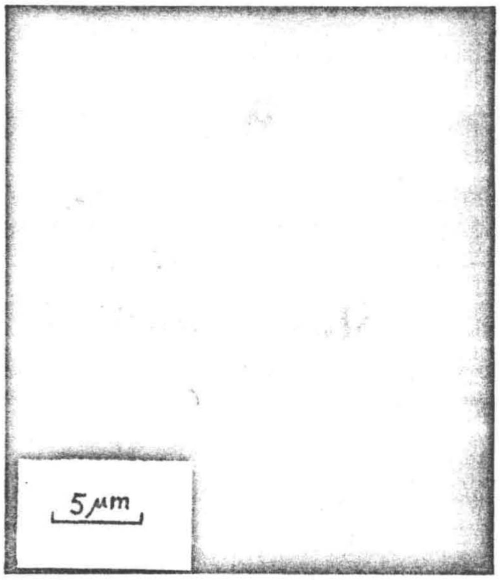

FIGURE 7
Pore traces below polished surface of a pressed specimen ($\rho = 0·999$).