the conclusion that the thermal expansion of cerium II is many times that of cerium I. This phenomenon has been reported by BEECROFT and SWENSON[23] who found that at 20,000 atm the thermal expansion of the phase present (presumably cerium II) is a factor of 10 greater than at zero pressure, certainly an anomalous behavior in comparison with most other metals.

The primary purpose for this investigation was to try to obtain sufficiently definitive diffraction records to see if the strong 111 peaks of both high- and low-pressure phases would coalesce as the

In order to show more clearly the convergence of the two 111 peaks, all of the data collected by this method have been schematically reproduced in Fig. 6. The separation of the triangles equidistant from the P–t point are accurately drawn to represent the peak separation at that point. Note that there is not a gradual decrease in Δd_{111} along the boundary but a more or less sudden decrease at or above 200°C. This is qualitatively in agreement with the findings of Beecroft and Swenson who noted an approximately constant value for ΔH (and therefore for Δv) up to 500°K (227°C).

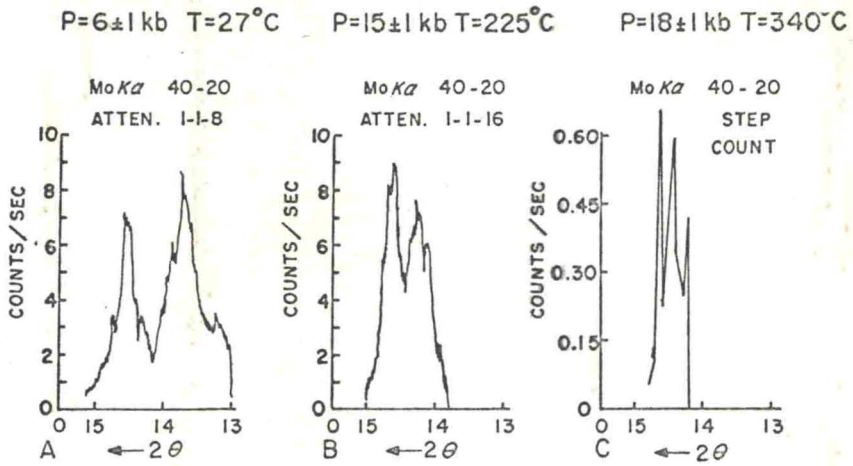

FIG. 5. Records of peak separation for the 111 spacing of phases I and II of cerium for various pressures and temperatures close to the phase boundary. The power values for the X-ray tube given are in kV and mA. The attenuation given is in the order; scale factor, multiplier, and time constant. For diagram C the step counting interval was 132 sec/step.

reported critical end point along the phase boundary was approached. The diffraction charts taken at the higher temperatures and pressures of the boundary indeed show this coalescence; portions of three actual records are reproduced here in Fig. 5, and were taken at roughly equidistant intervals along the phase boundary. The peaks of Fig. 5(C) were obtained from step counting at intervals of 0·05 deg (2θ) with a counting time of 132 sec/step. These peaks might actually be one, although their positions and resolution were reproduced twice. The peak separation is much too great to be a $K\alpha_1$–$K\alpha_2$ separation. Because of the weak diffraction count superimposed on high background scatter, the records obtained by scanning did not give consistent results.

Extrapolation of Δd_{111} along the boundary could be accomplished by using only those points lying close to the boundary. However, in order to help eliminate the effects of experimental error and inconsistencies in results due to sample history, the following procedure was undertaken. The approximate slopes Δd/°C and Δd/kb were established from the data of Fig. 4, a and b. These slopes show that for every kilobar increase in pressure there must be a decrease of 10° in order to maintain constancy of volume. With the assumption that this relationship does not change significantly with temperature and pressure, the data points of Fig. 6 were extrapolated into the phase boundary. This allows a plot of Δd_{111} as a function of distance along the phase boundary; the results are thus given in