Comparison with other Isothermal Data and Discussion.

The "base isotherm" is shown in Fig. 4 along with Decker's, that calculated by Perez-Albuerne and Drickamer, and Bridgman's data. The agreement between our isotherm and that of Perez-Albuerne and Drickamer's is well within the experimental error of both methods. The latter isotherm is slightly lower (1-2 kb) than ours in the pressure range from 40 to 100 kb. Bridgman's isotherm is still lower by again this pressure difference in this region. The lower portion of our isotherm is chiefly determined by using Haussühl's sound speed. The initial slope of the u_s-u_p Hugoniot could be changed from 1.542 to 1.512 to agree with Bartels and Schuele, but this would decrease the computed isotherm by only 1/4 kb at 40 kb. At 60 kb, the shock-wave measurements are slightly above the fit used. Above this, where the shock wave measurements should be relatively free of elastic-plastic flow effects because of the low Hugoniot elastic limit of NaCl, the fit and the data are consistent. Decker's isotherm falls below ours, with the spread in pressure being about 5 kb at 100 kb, 12 kb at 200 kb, and remaining approximately the same thereafter. As he noted, Decker's isotherm is most sensitive to the value of the bulk modulus used. A choice of bulk modulus equivalent to the sound speed we have used would bring the two isotherms into essential agreement. It is perhaps worthwhile to emphasize at this point that at and above 80 kb, and to a lesser extent at 60 kb, our isotherm does not particularly depend on on the precise value of the bulk modulus used, because the shock-wave data then determines the Hugoniot used to calculate the isotherms.

Jeffrey, et. al.[23] have given the pressures of various phase transitions by determining a/a_0 of NaCl used as an internal standard. Using their values of a/a_0 and Decker's pressure scale they obtain 24.8 ± 0.8 kb for the Bi I-II transition, 53.3 ± 1.2 kb for the Ba I-II transition, and 73.8 ± 1.3 kb for the Bi III-V transition. Using our isotherm and their a/a_0 values these numbers become 25.8 ± .8, 56.3 ± 1.2 and 78.2 ± 1.3. Bridgman's volume scale as reported by Jeffrey, et al., has 25.4, 58.8 and 88 kb for these transitions. McWhan[24] also measured the Bi III-V transition with NaCl as an internal standard. He took his values on the increasing pressure cycle, whereas Jeffrey, et. al, averaged increasing and decreasing pressure readings. McWhan's V/V_0 = 0.816 ± .006 corresponds to 81.7 ± 4.5 kb on our isotherm. The Birch-Murnaghan equation and the input parameters as used by McWhan for his pressure value is consistent with our isotherm up to a pressure of 100 kb. Beyond that, the Birch-Murnaghan value for the pressure increases more rapidly than our isotherm by 6 kb at 150 kb and 13 kb at 200 kb.

The highest measured pressure on our Hugoniot for the B1 phase is 264 kb. The offset down to the isotherm is about 16 kb at this volume. Our isotherm above 250 kb is then a consequence of an extrapolation of the Hugoniot data. The downward curvature of the quadratic u_s-u_p fit is a relic of trying to fit the ultrasonic data and