Table 2. Vol. changes for the Bi_{I-II} *and* Bi_{II-III} *transitions at* 25°C. *The atmospheric vol. is taken as the reference vol. in calculating the per cent vol. changes*

	$-(\Delta V/V_0)\%$ I–II	$-(\Delta V/V_0)\%$ II–III	$-(\Delta V/V_0)\%$ I–II–III
Present work	5·8	3·6	9·6
BRIDGMAN[2]	—	—	8·6
BRIDGMAN[9]	4·6	3·0	—
LAMORI[10]	4·8	3·6	9·0

at the two transitions. It is unfortunate that the structure of phase II is still not known, for that might help to clarify this point.

The total compression of Bi II is $(0{\cdot}23 \pm 0{\cdot}10)\%$. The accuracy here is not too great since this value represents the difference between two large and nearly equal numbers.

There was no evidence in any of the experiments on either the up- or down-pressure cycles of the transition observed by Bridgman at $\sim$44 kbar. Similarly, many attempts up to 70 kbar failed to show any indication of a transition at $\sim$64 kbar. The reported vol. changes for these two transitions are 0·6% and 0·5%, respectively. The inductive coil technique has been demonstrated capable of quantitatively detecting sudden vol. changes of $< 0{\cdot}1\%$.[5] Thus, the transitions in question should have been clearly exhibited by the data. It might be mentioned here that a cursory study was made on the possible influence of selected contaminants in trace amounts of activating these transitions. Respective contaminants of Li, Mn, Ni, Zn, Ge, Sn, Sb, Te, Ir, Hg, Pb, Pr, Sm, Tb, and Yb in concentrations of approximately 1 at.% were investigated. All proved ineffective in bringing out the transitions.

One experiment was made at 170°C, and the results are shown in Fig. 3. The I–II transformation occurs at 18 kbar in agreement with BRIDGMAN's[9] observations. The sudden vol. changes at the transitions are 6·1% for I–II and 3·9% for II–III.* At 170°C Bi II has a stability range from 18 to 23 kbar. Its compression over this range is 1·00%.

* Based on the atmospheric vol. as reference.

Finally, it should be pointed out that no corrections were applied to the present data other than subtracting the inductance of the leads from the total measured inductance. This was a constant for each experiment and varied between 8% and 50% of the total inductance for the various runs. The principal source of error in the technique is the change in inductance caused by distortion of the coil and leads.[6] This contribution is well within the scatter of the data.

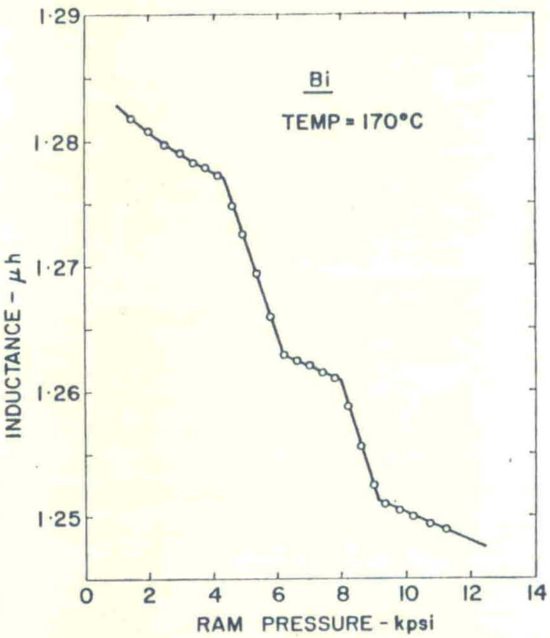

FIG. 3. Inductance of a coil wound on a threaded Bi core as a function of ram pressure at 170°C. Lead inductance was 0·6630 μH.

The resolution of the inductive coil technique, particularly in separating the first two transitions in Bi, is much superior to the piston displacement method, In over fifty runs, we never failed to see the sharp step separating the two transitions (see Figs. 1 and 3).

The Upper Bi Transition

At present, the highest reasonably well established "fixed" point used in pressure calibration is the 59 kbar Ba transition which is generally believed to be accurate to $\pm 3\%$. The next higher widely used "fixed" point is the upper Bi transition long believed to be at 88 kbar. On the basis