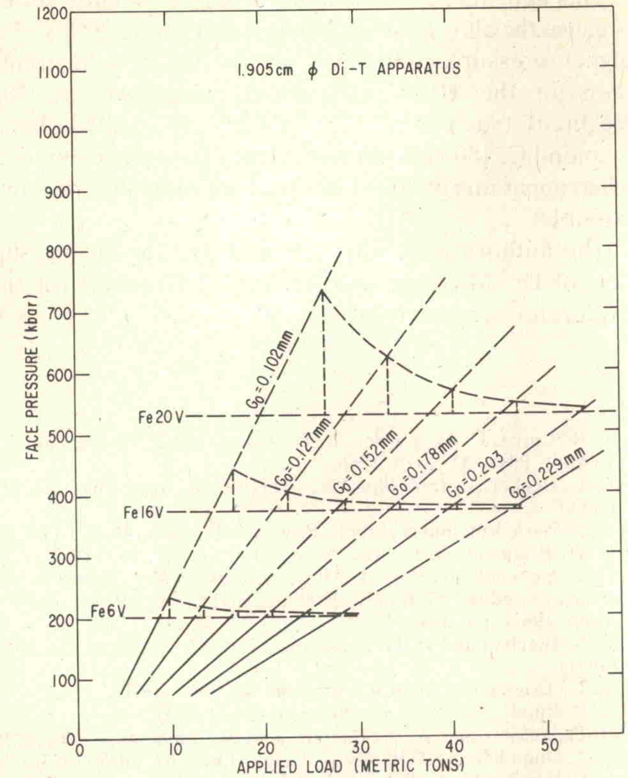

FIG. 10. P vs L construction diagram for the Fe–V alloy transitions as observed in the 1.905-cm-diam apparatus.

lines correspond to pressures actually reached in the test while the dashed parts indicate extrapolations beyond that.

A program of calibration tests of the same type was carried out for the 1.905-cm-diam apparatus with the results shown in Figs. 9–11. Although the pressure face diameters were the same in the 1.37- and the 1.903-cm-diam apparatus the loading forces to produce given face pressures are greater in the larger diameter apparatus because of its larger gasket area. Also the asymptotic values of the transition pressures for the Fe–V alloys come out slightly different in the two apparatus, but the differences are certainly well within the basic reproducibility and accuracy of the techniques involved.

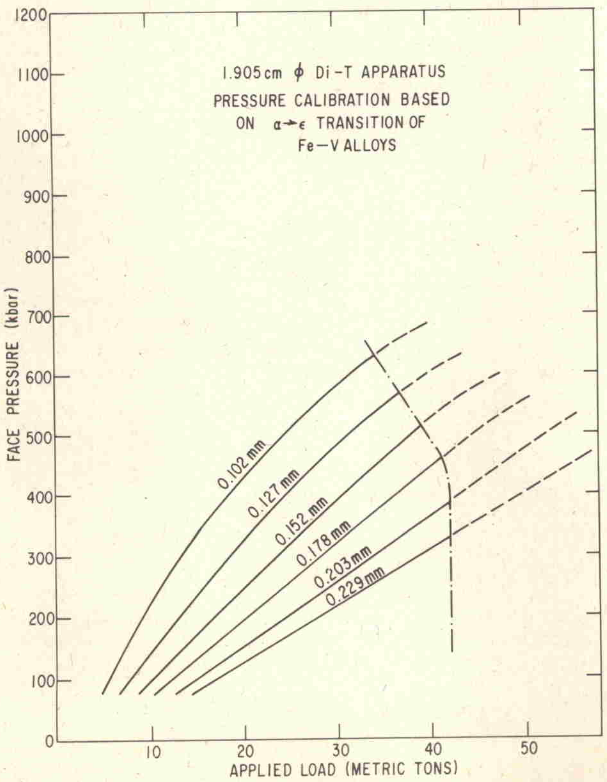

FIG. 11. Final P vs (L, G_0) calibration diagram for the 1.905-cm-diam apparatus based on all calibrants including that from Fig. 10.

III. DISCUSSION

It now appears that there are available resistance-jump pressure calibrants which cover the pressure range to slightly over 500 kilobars. These can be used to calibrate any apparatus amenable to electric resistance monitoring of the specimen. The pressure values have been cross-checked against the "NaCl scale" up to nearly 300 kilobars, and against shock compression values up to over 500 kilobars. The values of the pressure numbers assigned to the various resistance-jump transitions can be debated in terms of the correctness of the model (such as NaCl) or the shock pressure derivations and temperature corrections.

One feature of the methodology we have presented is that it can also be applied to the establishing of more reliable values for some other pressure-dependent phenomena. For example, Fig. 12 shows a G_0 vs L plot for the 1.37-cm-diam apparatus with the lines corresponding

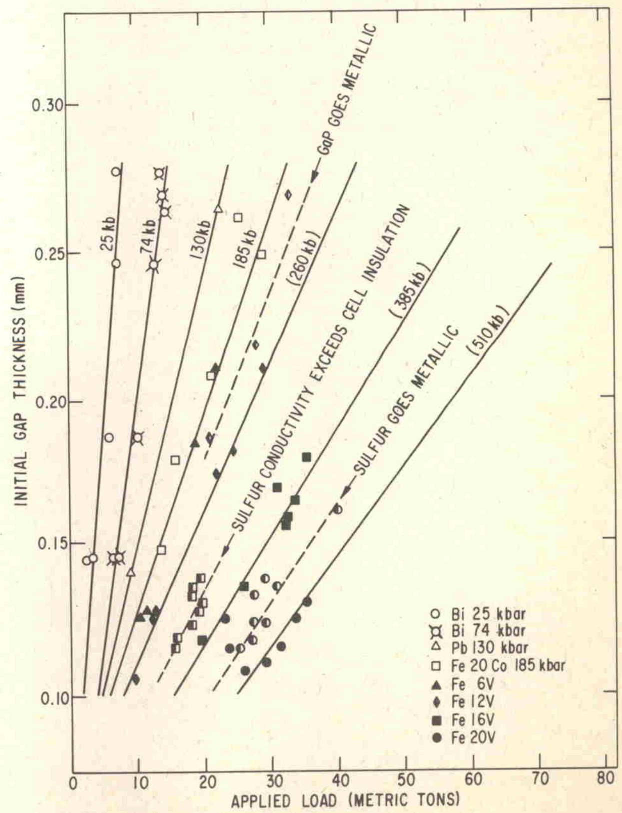

FIG. 12. G_0 vs L plot showing location of characteristic points for sulfur in comparison to the transition points for various calibrating materials.

to the various resistance-jump calibration transitions as a back-ground. Also plotted are eight points corresponding to sulfur going into the semimetallic state,[10] eight points at which the conduction of a sulfur specimen begins to exceed the leakage conduction of the cell and apparatus insulation ($\sim 10^8\ \Omega$), and three points corresponding to the transformation of GaP from diamond-cubic to the β-tin metallic form. The scatter of these points can be averaged out in a rational way on this diagram to yield pressure values of about 470, 300, and 220 kilobars, respectively.

A proposed, up-to-date, list of resistance-jump transitions which may be used for calibration of apparatus is as follows:

Bi (1-2)	25 kilobars
Ba (1-2)	53
Bi (5-6, Homan notation)	74
Fe (α-ϵ)	112
Ba (2-3)	120
Pb (1-2)	130
Fe–20Co and Fe–6V (α-ϵ)	~190
GaP (metallic transition)	~225
Fe–12V (α-ϵ)	~250
Fe–16V (α-ϵ)	~385
Fe–20V (α-ϵ)	~510

This appears to be the limit for the Fe–V alloy series, because the alloy solubility limit is just above 20% V. For higher pressure calibration points the metallic transitions in the III–V compounds suggested by Van Vechten[11] (such as BP, 420 kilobars; SiC, 660 kilobars); diamond C, 1800 kilobars; etc.) may have to be explored when apparatus of 600–1200 kilobars capability becomes possible.

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