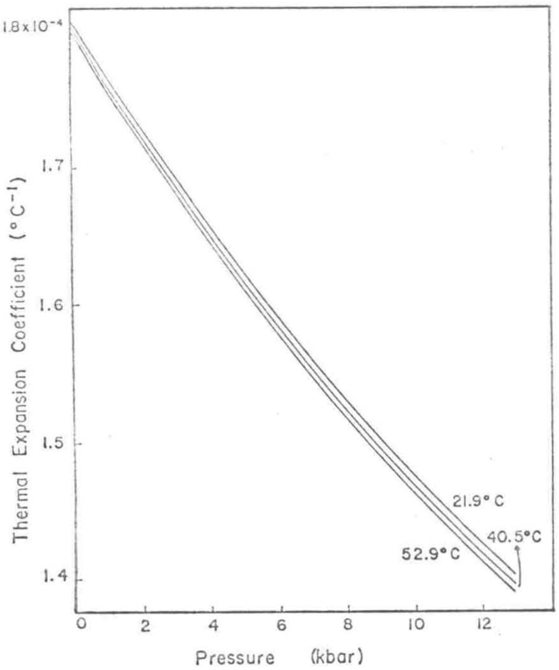

FIG. 5. The volume thermal-expansion coefficient α of liquid Hg vs pressure at several temperatures. Considering experimental error, the three curves are actually just barely distinguishable from one another.

greater than experimental error is detected, hence its calculated variation with pressure has not been shown in a table or graph.

The procedure adopted here for estimating the probable error associated with each of the calculated results is to place various perturbations on the input data for the calculation and to observe its effect on the results. Since the three major sources of uncertainty in the present work are the results of the experimental determination of sonic velocity as a function of pressure, the 1-atm velocity data of Hubbard and Loomis, and the C_P data of Douglas *et al.*, three perturbations, each involving only one of these variables, are investigated. The uncertainties in α and ρ at atmospheric pressure and in the temperature are negligible in comparison. The errors in β_T and β_{ad} at atmospheric pressure are taken into account automatically by considering the three major uncertainties.

To account for the errors in the velocity experiments, all the uncertainty may be assumed, for convenience, to be in the pressure scale. The possible systematic error in the scale itself is of the order of 0.4%. To this must be added a measure of the random uncertainty as indicated by the standard deviation σ of the velocity data from the least-squares curves. The equivalent of this σ on the pressure scale is about 17 bars. This uncertainty varies in percentage over the pressure scale, but a reasonable average is 0.3%. The total uncertainty on the pressure scale is therefore about 0.7%. In accordance with this, the least-squares velocity curve at 21.9°C was adjusted so that a given velocity would correspond to a pressure higher than the experimentally determined value by 0.7%, and the 52.9° data was adjusted to predict a pressure lower by 0.7%. This adjustment may be made by multiplying the coefficients of the least-squares curves by an appropriate constant. The curve at 40.5°C was unadjusted. This perturbation can also be viewed as an adjustment of the slope of c_T vs T at each pressure. Since the perturbation involves a change of slope rather than a uniform increase or decrease of the data, it will affect the results for the three temperatures differently at a given pressure. Choosing the maximum effect should give a reliable estimate of the largest likely error.

The effects on α, β_T, V, and C_P of performing the calculation with the perturbation on the pressure scale are shown in Table VI. They are shown only for 13 kbar for the sake of brevity. To a first approximation the effect of the perturbation on each quantity decreases linearly, with decreasing pressure, to its value at 1 atm. Since the calculated change in C_P for each temperature was about 0.25% at 13 kbar, it follows, according to the effect of the perturbation on C_P (about $\pm 0.75\%$), that no information can be gained from the present work regarding the sign of change or rate of change of C_P with pressure.

The second perturbation on the data was constructed by reducing the value of C_P at 1 atm and 21.9°C by 0.3% and by raising it 0.3% at 52.9°. The third perturbation was obtained by decreasing the sonic velocity at 21.9° and 1 atm by 0.02% and by raising it at 52.9°C by the same percentage. The effects on α, C_P, β_T, and V of carrying out the calculations with these perturbations are also shown in Table VI. An estimate of the uncertainty of each quantity is then obtained by taking the sum of the perturbation effects, and it amounts to $\pm 0.4\%$ for β_T, $\pm 1.0\%$ for α, $\pm 1.3\%$ for C_P, and $\pm 0.0094\%$ for V. Once again, to a first approximation,

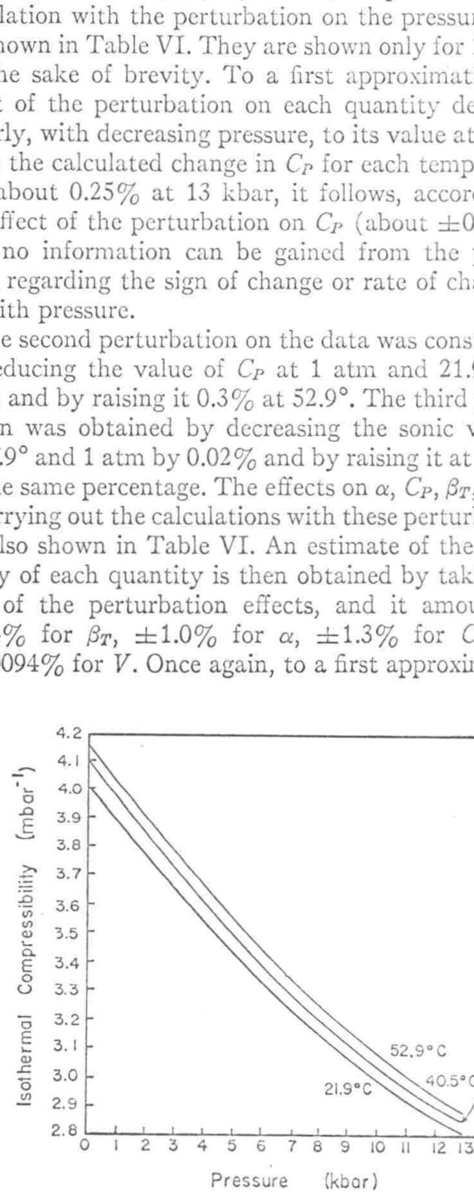

FIG. 6. The isothermal compressibility β_T of liquid Hg as a function of pressure at several temperatures.