Once $\bar{\mathbf{q}}$ is determined as above, the solution may be used directly in the numerical integration of Eq. (27) for the fountain pressure P_f. To obtain P_f in mm Hg, (27) is multiplied by the factor 7500 when the following units are used: $\rho(\text{gm/cm}^3)$, $s(\text{joule/gm-deg})$, A (watt/cm^3-deg), and $\alpha(\text{cm}^2/\text{watt}^2)$.

We have integrated (26) and (27) on an IBM 704 calculator for the three slits discussed in I and II. The following input data were used in addition to the dimensional values of the slits: $\eta_n(T)$ was determined from the low power heat conduction measurements (see Fig. 6 of I); values of s were taken from the tables of van Dijk and Durieux (*11*); below 1.7°K ρ_n/ρ was obtained from second sound (*12*) data and the thermodynamic calculations of Bendt *et al.* (*13*)—which are in good agreement up to 1.7°K—whereas above 1.7°K ρ_n/ρ was determined as a smoothed average of these two sets of data plus those of Dash and Taylor (*14*).

Values of the total heat flow $\dot{\mathbf{Q}}$ (rather than $\bar{\mathbf{q}}$) were computed as well as the fountain pressure P_f. In order to compare the computed values of $\dot{\mathbf{Q}}$ with the experimentally measured heat flow it is necessary to include the heat flow through the stainless steel of which the slit is constructed. At low heat flows where the nonlinear Gorter-Mellink term is unimportant, flow of heat across the boundary between the helium and the stainless steel does not affect the total heat conductivity since the flow equations are linear and additivity of the two solutions is rigorously correct (as discussed in I). At higher heat currents where the nonlinear terms in the heat conduction equation are important additivity is certainly not correct. The solution to the simultaneous equations becomes exceedingly complicated even in lower approximations. However, looking at the solutions to the two equations separately (assuming a perfectly insulating wall) we find that in the region where the nonlinear term for the flow in helium is large the contribution from the flow in the stainless steel is small. There is therefore probably very little error in using additivity even in this range, for the stainless steel slit cannot perturb the temperature gradient in the helium very much.

Computed values of the fountain pressure and the heat flow including the stainless steel contribution were presented in printed tabular form and also on punched cards. An automatic point plotter was then used to present the calculations in graphical form for comparison with experiment.

IV. COMPARISON OF EXPERIMENTAL RESULTS WITH CALCULATIONS

Using the results of Sections II and III it is possible to extend beyond the linear region the comparison of the experimental results obtained in papers I and II with theoretical calculations. The objects of such a comparison are first to ascertain whether the data are capable of distinguishing between several theories; then, if so, to determine which theory best fits the data; and finally to