When determining dense gas thermal conductivities, there are advantages to using a secondary cell. Such a cell may be of simple design; when calibrated against gases of known thermal conductivity, it can be used to make measurements at a fairly rapid rate. It should be possible with such a cell to obtain an accuracy of 2%, as compared to 1% obtained by investigators using primary cells. The cell suggested by Comings, Lee and Kramer (3) is of this type. It was used by Kramer (14) and others (6, 18) to measure dense gas thermal conductivities. In this investigation the cell used by Kramer was modified to increase the accuracy, decrease the measurement time, and simplify the calibration. It was then used to measure the thermal conductivity of binary mixtures of the three gases carbon dioxide, nitrogen and ethane at 75°C to 3,000 atm. with an estimated accuracy of 3%. The values of carbon dioxide and argon measured by Sengers (22, 23) were used for calibration. Measurements were also made on pure ethane and pure nitrogen.

EXPERIMENTAL APPARATUS

The thermal conductivity cell is shown in Figure 1. It is a modification of the Kramer-Comings cell (14) consisting of two horizontal concentric cylinders totally immersed in the sample fluid, and with a nominal gap of 0.006 inches. The cell, which has a total length of 6-1/4 inches, is made of copper. The center cylinder or emitter is 2-1/2 inches long with a diameter