The experiments which we shall now describe were designed to measure the specific heat at constant volume of solid ^{3}He at temperatures from about 3 °K up to the melting point at different densities corresponding to pressures up to 2000 atm. The melting region at constant volume was also investigated and measurements were made in the fluid region up to 29 °K. The general scope of the experiments was similar to that of the experiments by Dugdale & Simon (1953) on solid ^{4}He. For comparison with these experiments and because the present apparatus is capable of higher accuracy than that of the earlier work, we have made some measurements on ^{4}He. The apparatus and experimental results will now be described.

2. Experimental

2·1. *The calorimeter*

The measurements were made with an adiabatic calorimeter of conventional design. Figure 2 gives a sketch of the calorimeter and the adiabatic shield. The calorimeter incorporates the high pressure cell *A* (which accommodates the helium sample), a gas thermometer bulb *B*, a vapour pressure chamber *C*, a heater *D*, and a thermometer *E*.

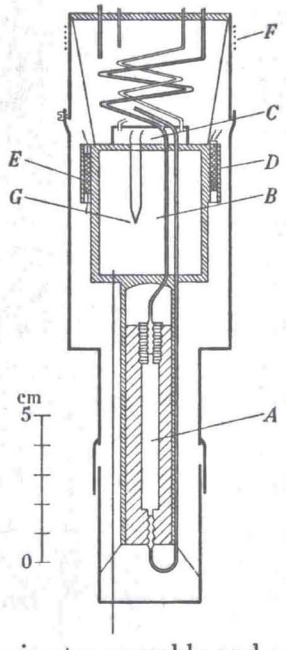

Figure 2. Calorimeter assembly and adiabatic shield.

The pressure cell was machined from a solid cylinder of drillrod steel of $\frac{5}{8}$ in. outer diameter. A hole of $\frac{1}{4}$ in. diameter was drilled to within $\frac{1}{2}$ in. of one end. The opposite end was closed with a threaded plug which was put into place with hard solder. At each end a high pressure steel capillary of 1 mm outside diameter and 0·1 mm bore joined the cell. The capillaries widened at the end to about $\frac{1}{8}$ in. outside diameter and were threaded along this part. The capillaries were then threaded with hard solder into the cell. This technique gives a perfect seal which withstands high pressures. One of the capillaries leads to the filling line whereas the second capillary leads to a small Bourdon gauge.

The gas thermometer bulb was made from copper of $\frac{1}{16}$ in. wall thickness and had a volume of about 33 cm^3. A split copper tube of $\frac{1}{16}$ in. wall thickness extended from the