the equation of state of the solid is known (Dugdale and Simon 1953); it shows that at constant density, the pressure in the solid is only weakly temperature dependent. This means (*a*) that, if the temperature and density are known, the pressure in the solid can be deduced and (*b*) that, after applying the pressure at such a temperature that the helium is fluid, the system can be cooled at constant volume to the working temperature without serious loss of pressure. To show this, we give in Table I the pressures applied in the fluid state at the solidification point and the corresponding pressure in the solid after it has been cooled at constant volume to 2° K. About one-quarter of the pressure is lost in each case.

TABLE I

Filling pressure, atm.	Solidification temperature, ° K.	Pressure in solid at 2° K.
3000	28.3	2300
2500	25.2	1900
2000	21.9	1500
1500	18.2	1100
1000	14.1	730
500	9.1	350

THE APPARATUS

The pressure bomb, *A* (see Fig. 1), made of beryllium copper hangs from its high pressure input tube, *B*, inside an evacuated vessel, which itself is immersed in either liquid helium or liquid nitrogen contained in a glass dewar. A copper braid (not shown) is soldered at one end to a point on the tube about 30 cm. from the bomb and at the other end to the wall of the vacuum space. This serves to divert some of the heat flux down *B* to the helium or nitrogen bath. Helium exchange gas may be introduced into the vacuum space, *C*, to provide thermal contact with the refrigerant liquid and so cool the bomb; the temperature of the bomb may be raised by means of a constantan heater wound on the outside.

The specimen temperature is determined by either a platinum or a carbon resistance thermometer (*D* and *E*) mounted on the top of the bomb cap and shielded from external radiation by a copper screen.

The pressure-seal between the bomb and cap is made with a hardened steel lens ring, *F*. A seal which is reliable down to helium temperatures, and to pressures of helium up to 4000 atm., is achieved by using a ring of tool steel (e.g., Vasco "Speedcut"), hardened to 45–50 Rockwell "C". The contacting surfaces of the ring are ground to be accurately conical with an included angle of 60° and bear against the slightly chamfered square edges of the bomb body and cap. The high pressure input tube, a length of Aminco chrome–molybdenum steel (o.d. 1/4 in., i.d. 1/16 in.), is screwed and soft-soldered into the cap of the bomb. Occasional failures of this seal were ended by the application of a soldered, perforated soft copper disk to the inside of the seal.*

*This method was originally due to Mr. C. Chase of the Jefferson Laboratory of Harvard University. We are indebted to Dr. W. Paul of that laboratory for drawing our attention to it.