

tion of low temperatures and

work at low temperatures and its complications. As we add in addition where all changes are thermodynamic, criteria of energy become negligible). Experiment can reveal and reflect solid. Or again the mechanical simplicity in the absence

may itself require low temperature methods of determining transition electrons involved have implies the use of low temperatures.

ed mainly with the effect of metals, in particular at low temperatures. To understand these effects, we must also have as much information at their high-temperature behavior. The velocities of the condensed surface, the velocities of the condensed surface, therefore also be concerned with measurements of the change in being studied. The discussion to the effect of

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high pressures introduces its appreciable pressure become solid have to contend first with the pressures as good an approximation as possible. Various methods have been used. Some of these techniques are not suitable for using high pressure at low temperatures. Recently by Swenson (1964). We

therefore mention here only those that are of particular relevance to work on Fermi surfaces and electrical conductivity. (But see also Dugdale, 1965; Stewart, 1965; Levy and Olsen, 1965.)

A. LIQUID HELIUM

This is a straightforward method of producing pressure changes at low temperatures, used originally by Kamerlingh Onnes and his collaborators to study how pressure alters the superconducting transition temperature (Sizoo and Onnes, 1925; Sizoo *et al.*, 1925). The method is severely limited because helium solidifies under quite small pressures at low temperatures; at 1° K, the solidification pressure is about 25 b and at 4° K about 140 b (both pressures refer to ⁴He). The method has, however, found useful applications recently (see below) and is often valuable as a check against methods of transmitting pressure that involve a solid transmitting medium.

B. THE ICE-BOMB TECHNIQUE

This method was introduced by Lazarew and Kan (1944). It uses the pressure generated (up to about 1800 b) when water solidifies on cooling at constant volume.

C. DIRECT COMPRESSION IN PISTON-CYLINDER ARRANGEMENT

In this method as originally used at low temperatures, the pressure is transmitted by solid hydrogen, the hydrogen itself being first condensed into the working cylinder and then compressed by means of a piston. The method was first used by Hatton (1955) to measure changes in residual resistivity and superconducting transition temperature under pressure. This direct-compression method, but using solid helium as the medium, has also been used by Goree and Scott (1966) (see below). The original reason for using hydrogen rather than helium was that hydrogen, at low enough temperatures, condenses as a solid whereas helium does not, except under pressure. For this reason, hydrogen is rather easier to deal with.

Brandt and Ginzburg (1962) used a direct-compression method in which friction between the specimen and the piston and cylinder was