mometer, accurate to only ±0.25 K due to magnetoresistance effects. The quench current vs temperature data are shown in Fig. 1. The warmup times from 4.2 K to quench varied from about 1 min at 152 A to 20 min at 55 A. It can be seen that at 10 K the magnet could be operated at 50 A or about 30% of the quench current when submerged in normal boiling liquid.

In the high pressure studies the coil was welded inside a stainless steel bomb. The bomb was a 10.2 cm diam cylinder with end caps and communicated with room temperature through a 2.5 cm×0.8 mm wall stainless tube. A ball valve closed the system and allowed insertion of the LHe transfer tube. A Bourdon tube measured gauge pressure. The bomb was precooled by a surrounding LHe bath, filled with LHe, the coil charged, the system closed, and the bomb lifted out of the bath to start a temperature increase. The pressures just before quench were 4–7 atm at the lower temperatures and above 20 atm at 14.8 K. The resulting data are shown in Fig. 1. The effect of the high pressure is to increase the quench or operating current at any given temperature. Specifically, the operating current at 10 K and 7 atm is about 120 A or 70% of the quench current when refrigerated by normal boiling liquid. This improved performance is thought to be due to increased heat transfer characteristics of supercritical helium.

The attainment of high current density will enable us to choose a more advantageous trade-off between the hoop minor diameter, the value of the confining field, and the cost of superconductive material.

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Pressure Dependence of the Electrical Resistance of Strain Gauges

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ELECTRICAL resistance foil and wire strain gauges are often used for measuring forces in mechanical testing of solids in a hydrostatic pressure environment. Some effort has been expended in determining the effect of hydrostatic pressure on load cells made up of these gauges, and this has been reviewed by Hanafee and Radcliffe.[1] A large portion of the work has involved studies of the geometrical and mechanical problems of the foil, backing, cement, and shape of the material upon which the gauges are mounted. A critical factor is usually ignored, viz., the pressure dependence of the resistivity of the metal used for the foil and wire. Since there are differences in the behavior of load cells under hydrostatic pressure, as determined by calibration under hydrostatic pressure by dead weight loading,[1] spring loading,[2] Bridgman or split tensile specimen method,[3,4] and a differential pressure chamber technique,[4] it would be important to ascertain the effect of hydrostatic pressure on the resistivity of the alloys used for strain gauges.

It is the purpose of this letter to describe such a study on two alloys widely used in strain gauges. The first alloy, Constantan,[5] was in the form of a 350 Ω foil gauge with epoxy backing. The second alloy, Nichrome V,[6] was in the form of a 120 Ω wire strain gauge with no backing. A 50/50 mixture of *n*-pentane/iso-pentane was used as the pressure transmitting fluid in a piston–cylinder pressure unit which was fitted with eight electrical leads exiting from the pressure chamber. The large number of electrical leads permitted the four lead method for resistance measurement and the specimen potential was continuously recorded. The hydrostatic pressure was continuously monitored by a calibrated manganin coil incorporated in an ac bridge; the rate of pressure application and release was between 0.17–0.22 kilobars/min.

The results are shown in Table I. For the Constantan alloy the experimental accuracy of the R/R_0 values was estimated to be ±0.002. The change in resistance for Constantan was essentially a continuous decrease up to 1.2% at the maximum test pressure of 10 kilobars and a return to the original room pressure value upon pressure release. For Nichrome V, upon increasing pressure up to 5 kilobars there were small fluctuations in specimen resistance introducing uncertainty in R/R_0 values of $_{-0.008}{}^{+0.000}$. However, as pressure was increased above 5 kilobars up to the maximum pressure of 10 kilobars and during the decrease of pressure from 10 kilobars to room pressure, these fluctuations disappeared. Because of the very small

Table I. Pressure dependence of electrical resistance of two strain gauges.

	R/R_0			
	Constantan		Nichrome V	
Pressure (kilobars)	Increase pressure	Decrease pressure	Increase pressure	Decrease pressure
Room pressure	1.000	1.000	1.000	0.999
1.0	0.999	0.999	...	0.999
2.0	0.998	0.998	...	0.999
3.0	0.998	0.998	...	0.999
4.0	0.997	0.997	...	0.999
5.0	0.997	0.997	...	0.999
6.0	0.993	0.993	0.998	0.999
7.0	0.992	0.992	0.998	0.999
8.0	0.990	0.990	0.998	0.999
9.0	0.990	0.988	0.998	0.999
10.0	0.988	0.988	0.999	0.999