In order to compare the theoretical calculations with the actual stresses, strain gages were mounted on the outermost ring of the assembly. As each ring was assembled, the stresses were recorded and compared to the theoretical results. As indicated in the appendix, a 7.63-percent difference exists between the actual stresses and the calculated values on the average. These values are within specifications. On completion of the assembly of the apparatus, it was installed in the 400-ton press. Figure 2 shows the apparatus in place.

C. EXPERIMENTAL PROCEDURES

1. Pressure Calibration

The actual pressure in the apparatus had to be determined before any pressure runs could be made. The pressure calibration of the apparatus was accomplished by measuring the load required to convert Bi-I to Bi-II and Bi-II to BI-III. The bismuth wire in this instance was enclosed by previously melted and cast AgCl. The AgCl acted as a nearly hydrostatic pressure transmitting medium.

The mean transition pressure for Bi I→Bi II is 24, 410±95 bars (1 bar= 14.5 psi) and for Bi II→Bi III is 26,975±100 bars as determined by Kennedy and Lamori[15]. These transitions were determined by observing the discontinuity in resistance of the bismuth wire when it was placed in a sample of AgCl, as shown in Figure 3. A typical calibration curve is given in Figure 4 which shows a sharp change at the transition point when E/I is plotted versus load. At the point where Bi I→Bi II the pressure required is 25,410±95 bars.

2. Temperature Measurement

After the apparatus was calibrated for pressure versus load, it was necessary to measure the temperature of the sample versus electrical power input. This was accomplished by placing a thermocouple in the sample as shown in Figure 5. The couple was placed in the center of the sample and insulated from the resistance heater with Al_2O_3 tubes which extended out to the pyrophyllite gasket material. The couples were connected to a strip chart recorder.*

There were various types of thermocouples that could be used for these temperature measurements. H.M. Strong and R.E. Hanneman[16] have shown, however, that at low pressures one could use Pt-Pt+10 percent Rh couples without any large temperature correction.

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*Leeds and Northrop type G, Speedomax.

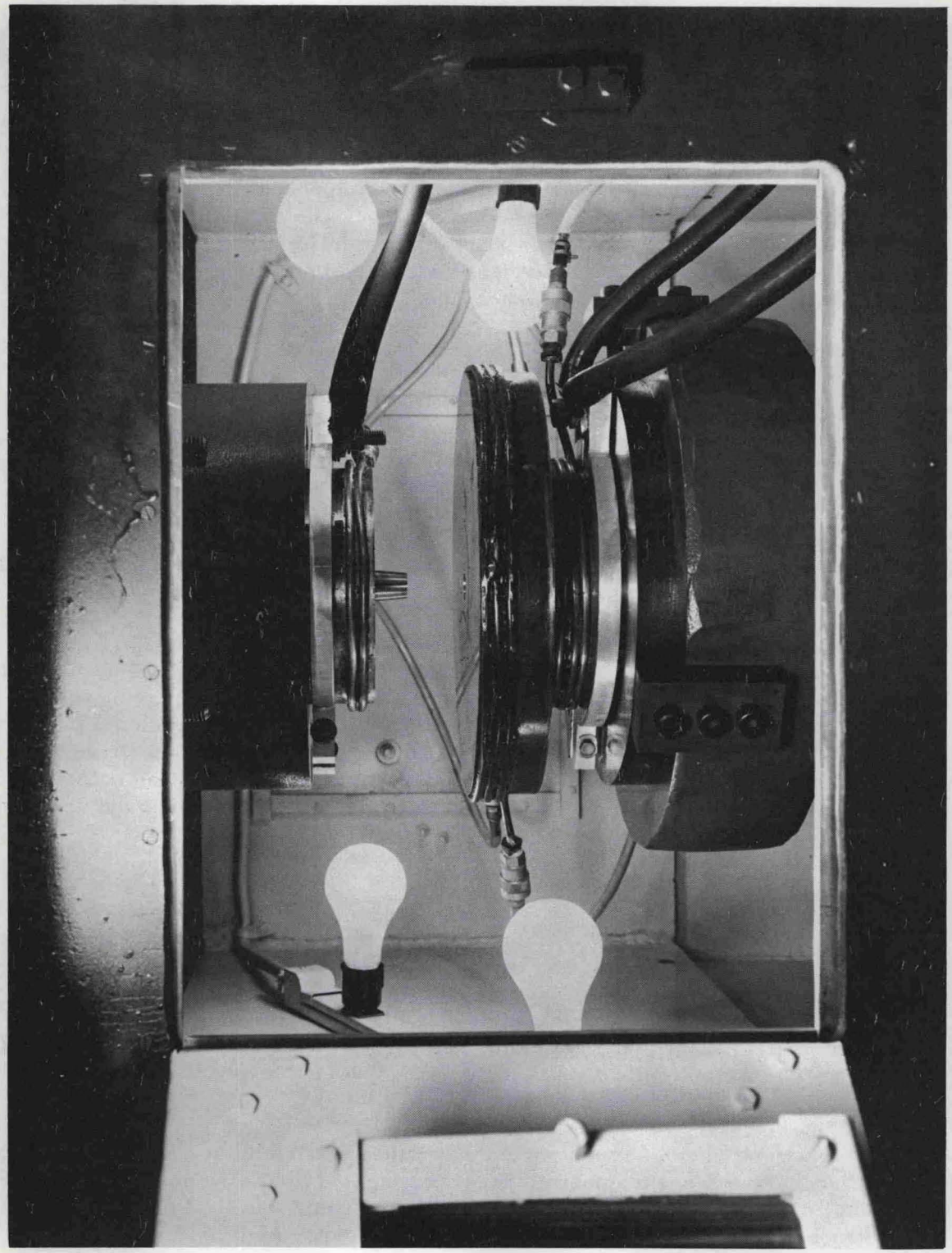

Figure 2 APPARATUS AND PLACE