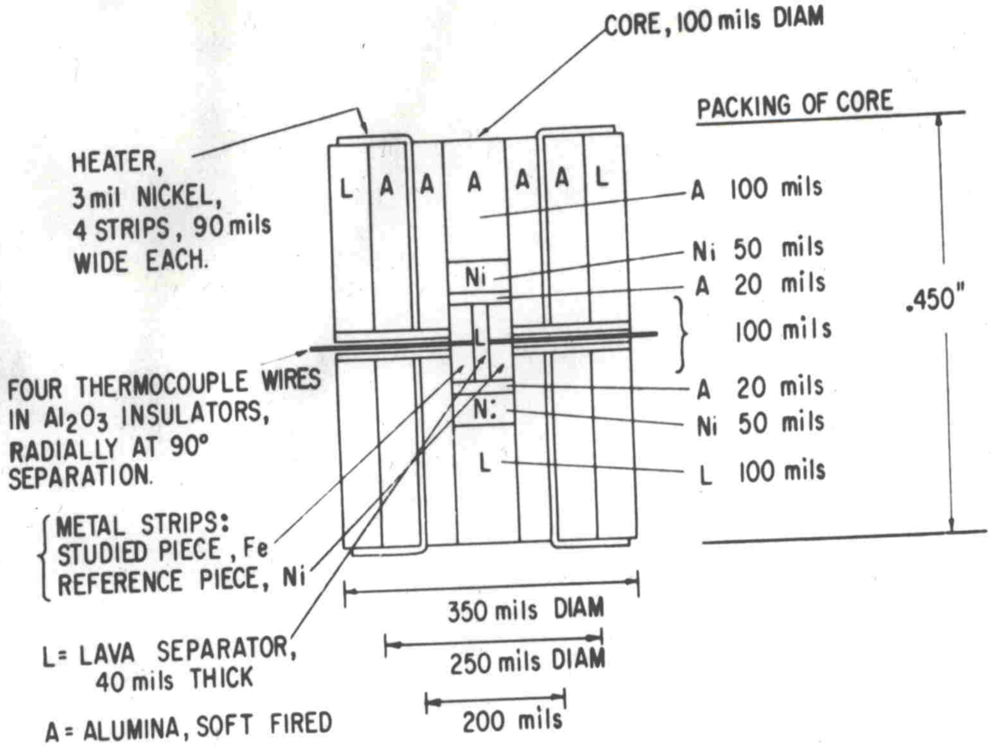

FIG. 2. Complete DTCA cell design.

one from each of the thermocouples, while the two companion Pt-10% Rh wires from the thermocouples were tied together outside the cell. The ΔT signal was amplified by a Beckman model 14 dc amplifier, and recorded on an L&N Speedomax recorder. Types of traces of the ΔT with time are given in Fig. 3. The ideal trace (curve 1) would be a straight vertical line when no transformation is taking place, with a deflection to one side, out and back, during a transformation. In practically all the cases, this ideal curve was only approached but never fully attained, the actual curves resembling 2, 3, or 4. In these actual cases, a spurious temperature gradient existed between the two metal strips, which gradient increased with the absolute temperature, giving the curve a slope to one side. Superimposed upon this slow change of ΔT with temperature was still another type of behavior, arising because of the transformation, which gave to the curve a decided shift instead of coming to a maximum and returning to the base line (curve 4). The cause of this behavior is probably related to the lack of ideality in the heat flow pattern around the metal samples. An explanation may utilize the following reasoning: The thermocouple junction for each metal strip was actually at the outer edge of each strip, at the boundary between the alumina bushing and the metal. If a large heat flux existed across this boundary from the heater to the metal strip, a change in the thermal conductivity accompanying a phase change would cause a decided change in the temperature at this point; this follows from reasoning similar to that used in the basic principle of the DTCA cell. The decided change in temperature would be reflected directly in a shift of the recorded ΔT. A perfectly insulated set of metal strips would not suffer from this fault, but of course this is impossible when pressure transmission requires intimately packed solids around the sample. However, the condition of zero heat flux can be approached by varying the amount of heat being produced at different points along the heater. This is a rationalization of the fact that more perfect maxima ΔT curves were obtained with cells containing nickel heaters than with Nichrome heaters. Nickel would tend to produce a hot spot, Nichrome would produce more even heat. What is apparently required is a hot spot at the hottest part of the cell, which would be at the metal disk on the hot side, along with a temperature gradient of equal magnitude in along with the alumina bushing. At points near the hot spot the heat generated must be sufficient only to compensate for the heat flow along the bushing. More heat

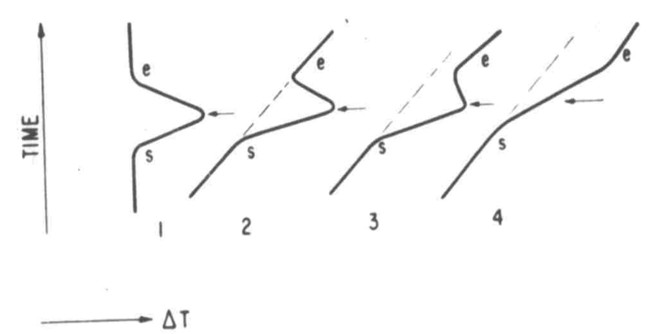

FIG. 3. Typical ΔT curves on recorder charts. s = Start of transformation. e = end of transformation. → = transformation half completed.