The rate of increase of pressure was the same in all experiments. The increase in pressure from 4000 to 13,000 kg/cm^2 (in experiments where the hydraulic pressure was generated by pentane) was reached within 11 minutes. The pressure was measured by a manganin resistance manometer 2, accurate within ± 30 kg/cm^2. The rate of increase in pressure increased somewhat during compression as a result of a decrease in the compressibility of the medium which transmitted the pressure. This could account for error in the measurements of heat effects due to changes in the heat transfer conditions. In order to determine the magnitude of such a possible error we carried out experiments on the solidification of mercury under gas pressure (nitrogen) and pentane. The differential area between the thermogram recordings for identical weighed portions of mercury in these experiments was practically the same (3% divergence). Further experiments were carried out with the intensifier canal filled with pentane.

In order to determine the accuracy of this method we also carried out 15 experiments in which both cups held an equal amount of mercury; the increase in temperature on solidification was measured by means of two differential thermocouples attached to two mirror galvanometers photo-recording one drum. Each thermocouple was attached first to one then to the other galvanometer. On the basis of these experiments we have calculated at ± 5% the maximum possible error in the phase transition heat.

In order to determine the phase transition heat in cerium the latter was prefused in a vacuum in a quartz tube and was then turned down to the exact dimensions of the cup. The thermocouple was securely placed in the opening which was drilled in the center of the sample. The experiments were carried out with one differential thermocouple, the junctions of which were placed in the mercury and cerium samples. The weighed portion of the mercury in all of the experiments was equal to 2.00 g and of the cerium to 1.15 g.

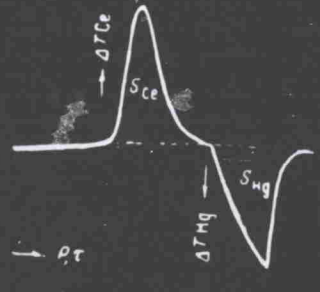

Fig. 2. Typical thermogram taken at constant temperature and increasing pressure.

A typical thermogram is shown in Figure 2. The first temperature discontinuity (on the left) corresponds to the cerium phase transition; the second (to the right) corresponds to the solidification of mercury.

The results of three experimental series are shown in the table.

In the last column are given the values of the heat of transition for cerium calculated according to the