ART. VII.—*The Relation of Melting Point to Pressure in Case of Igneous rock fusion;* by C. BARUS.

To determine this important constant for diabase, I made use of the thermodynamic principle (Clausius, I, chap. vii, § 2). From my last note* the fusion specific volumes, solid and liquid, are known. Hence it is merely necessary to determine the latent heat of fusion.

Two series of measurements of the thermal capacity of diabase, containing 27 independent measurements, were made between 700° and 1400°. The first series gave me, in gram calories, for the mean specific heat, solid, between 800° and 1100°, ·304; for the mean specific heat, liquid, between 1200° and 1400° ·350; for the latent heat of fusion (1200°), 24; and for the heat set free on solidification (1100°), 16. Similarly the second series gave me, ·290, ·360, 24, and 16, respectively. The last series is much the more trustworthy and its accuracy may be inferred from the following pairs of values of temperature and thermal capacity: (solid) 781°, 180; 873°, 202; 948°, 227; 993°, 238; 1096°, 268; 1171° (incipient fusion?), 302; (liquid) 1166°, 310; 1194°, 318; 1197°, 319; 1215°, 327; 1218° 330; 1248°, 339; 1251°, 340 and 342; etc. Now whereas in my last note (l. c.), solidification did not set in above 1100°, evidences of fusion do not here show themselves until 1170° is reached. Rock fusion is therefore accompanied by hysteresis,† the lag being apparantly as much as 70°. It is this property which makes it possible to obtain sharp values of latent heat, for the rock can be operated on, either solid or liquid, at nearly the same temperature. In view of the great difficulty of obtaining the value of the melting point, however, I shall in the following state the conditions for 1100°

* This Journal, December, 1891.
† This Journal, xlii, p. 140, 1891.

and 1200° respectively, the latter being very near the melting point.

Combining the present series I with the former series III, I obtain for the relation of melting point and pressure, dT/dp, at 1200°, since $T=1470°$, $\sigma—\tau=\cdot 0394/2\cdot 72$, $r'=24$, $dT/dp=\cdot 021$; and at 1100°, since $T=1370°$, $\sigma-\tau=\cdot 0385/2\cdot 72$, $r'=16$, $d\mathrm{T}/dp=\cdot 029$. Similarly combining the present series II with the former series IV, at 1200°, since $\sigma-\tau=\cdot 0352/2\cdot 72$, $r'=24$, $dT/dp=\cdot 019$; and at 1100°, since $\sigma-\tau=\cdot 0341/2\cdot 72$ and $r'=16$, $dT/dp=\cdot 026$.

Hence the probable *silicate* value of $dT/dp=\cdot 025$ at 1170°, falls nicely within the margin (·020 to ·036) of corresponding data for organic substances (wax, spermaceti, paraffin, naphthalin, thymol). I may therefore infer that the relation of melting point to pressure in case of the normal type of fusion, is nearly constant, irrespective of the substance operated on, and in spite of enormous differences of thermal expansibility and (probably) of compressibility. A portion, in a given substance changed only as to temperature and pressure, the relation of melting point and pressure is linear.

The immediate bearing of all of this on Mr. Clarence King's geological hypothesis is now ripe for enunciation.