I. Apparatus.

In finding the preferred temperature (Bodenheimer and Schenkin 1928; Gunn 1931) of an insect, the insect is put into an apparatus where there is a temperature gradient and the temperature at which the insect comes to rest is recorded. The whole theory of the reaction depends on an accurate knowledge of the conditions at the point of rest, and in no apparatus hitherto described (Graber 1887; Herter 1924) has such knowledge been available. Herter's apparatus consisted essentially of an iron bar (61 x 3 x 0,6 cm.) which formed the floor of the experimental cage. The walls were made of thin glass, 10 cm. high, and the roof of cardboard. Thermometers projected through the roof and their bulbs were in contact with the bar. The bar was heated with a small gas flame at one end and heat loss to the colder room caused a temperature gradient to be set up along the bar. Fig. 1 shows that in Herter's apparatus the air is at a considerably lower temperature than the floor just below it. This difference of temperature is due to air convection currents from the upper, cooler parts of the apparatus. The thermometer reading ($H$) depends on the temperature of both floor and air,
and, with a given floor temperature, the air temperature and the thermometer reading ($H$) will be lower in a cold room than in a hot one. A very small insect, if it reacts to the floor temperature rather than to the air temperature, will consequently appear to vary its preferred temperature in correlation with room temperature. Such a result, obtained by HEWITT for ants (1924), can thus be explained without supposing that the preferred temperature of the insect actually does vary.

The apparatus used by me was made from thick bars of copper, screwed and soldered together to form a rectangular box or trough (Fig. 2, D in Fig. 3) 122 cm. long. The outer of two sheets of plate glass forming the roof fitted accurately on to the top of the trough and, when vaselined, made an air-tight joint. Massive cylindrical copper plugs ($a, b$, Fig. 3) were screwed into the ends of the trough, through each of which there was an air entry ($c$). Around one plug ($a$) was wound an electric heating coil, and around the other ($b$) a cooling circulation of alcohol ($d$) was maintained (Fig. 3). One side wall of the trough was bored at intervals of 26.7 cm. for