There can be little doubt that one main cause of these variations is to be sought in the different thermal conductivities of the rocks of the earth's crust. The first accurate measurements of the conducting powers of rocks were made by the late J. D. Forbes at Edinburgh (1837–1845). He selected three sites for his thermometers, one in "trap-rock" (a porphyrite of Lower Carboniferous age), one in loose sand, and one in sandstone, each set of instruments being sunk to depths of 3, 6, 12 and 24 French feet from the surface. He found that the wave of summer heat reached the bulb of the deepest instrument (24 feet) on 4th January in the trap-rock, on 25th December in the sand, and on 3d November in the sandstone, the trap-rock being the worst conductor and the solid sandstone by far the best.[43]

As a rule, the lighter and more porous rocks offer the greatest resistance to the passage of heat, while the more dense and crystalline offer the least resistance. The resistance of opaque white quartz is expressed by the number 114, that of basalt stands at 273, while that of cannel coal stands very much higher at 1538, or more than thirteen times that of quartz.[44]

It is evident also, from the texture and structure of most rocks, that the conductivity must vary in different directions through the same mass, heat being more easily conducted along than across the "grain," the bedding, and the other numerous divisional surfaces. Experiments have been made to determine these variations in a number of rocks. Thus the conductivity in a direction transverse to the divi-

[43] Trans. Roy. Soc. Edin. xvi. p. 211.

[44] Herschel and Lebour (British Association Committee on Thermal Conductivities of Rocks), Brit. Assoc. Rep. 1875, p. 59. The final Report is in the vol. for 1881.