flexures. The facts prove that the beds were laid down horizontally over large continental areas, and that denudation in Archæan time, making sediment, was carried on by the ocean along its margins or over partly emerged rocks, and by streams over the land, as it is now. The streams were short in that time of contracted lands, yet well supplied with water



under the hot climate. The thickness of the rocks indicates that the amount of deposition and rock-making was enormous. The waters of the small streams and of the ocean owed much of their efficiency to the carbonic acid they contained, this gas being everywhere in excess. Moreover, under these conditions, the formation of beds of iron ore along the shallow margins of the sea and in the shallow waters of the land would have been necessarily one of the great features of the later part of Archæan time; for the decomposing iron-bearing rocks would have readily yielded their iron to the attacking carbonic acid. Moreover, organic deposits of silica may have accompanied the ore-beds in the basin.

A thickness of 30,000, 50,000, and 80,000 feet has been attributed to the formations piled up in one series or region. If this means 50,000 feet or more in a single geosynclinal area before an upturning, the estimate is to be doubted, for the difficulties of correct measurement of flexed rocks are great. In most cases the facts as to the faults and flexures present cannot be ascertained. A thickness of 50,000 feet of uncrystalline sediments in a geosyncline, during even the later part of Archæan time, militates against all calculations as to the Archæan rate of increase downward in the earth's temperature; for if the rate were 1° F. for 10 feet of depth, as Thomson has calculated, the bottom of such a geosyncline would have had a temperature of  $5000^{\circ}$  F.; or if 1° F. for 25 feet, it would still have had a temperature sufficient nearly for the fusion of basalt.

## ARCHÆAN MOUNTAIN-MAKING.

The stratified rocks of the Archæan are almost everywhere upturned, and generally at high angles, the dip usually being between 30° and 90°. Only portions of the Huronian are nearly horizontal. Moreover, as represented in Fig. 501, they are commonly in flexures, from a few yards to miles in span. Such flexures, whenever they occur, are evidence that great upturnings had taken place of the Appalachian kind. The crystallization of the rocks, or their metamorphism, was an accompanying result. The rocks of the *earliest* Paleozoic often lie over them nearly or quite horizontally, as illustrated in the accompanying figure (Fig. 502) from Logan, representing a section from the northern or Canadian side of the Adirondacks. Upon the flexed Archæan rocks lie (2) the Potsdam sandstone of the Cambrian,