along a line farther west should be added for South America. The agent for such results must be the earth in its entirety.

2. Location of the lateral pressure. - The surface layer of the globe in which the pressure acts has recently been shown to be thin. In the cooling and contraction of the crust, the lower part of the cooled portion, enveloping the uncooled nucleus that had not begun to lose its heat or contract, could not contract without breaking, and, therefore, the cooling would put it into a state of tension, which would result in the opening of fractures. For if a layer undergoing contraction is united to a non-contracting or less-contracting layer, the contraction would necessarily produce tension and fractures. Thus the cooling crust must be made up of an inner portion in a state of tension and an outer in a state of lateral pressure, and the two portions are separated by a level of no strain. The outer is the effective part in orogeny. The lateral pressure within it is greatest at the surface, and diminishes downward. The thickness of the effective layer depends on the length of the time that has elapsed since the solidification of the earth at surface - the time when the strain was initiated. It was estimated by Mellard Reade as only two miles (1886). It has been mathematically discussed first by C. Davison, and afterward by G. H. Darwin and M. P. Rudski, who sustain the contraction theory of mountain-making. Davison made the thickness (1887, '89) 2.17 miles, supposing the elapsed time to be 100,000,000 years; and Darwin (1887), two miles, for the same elapsed time, adding that "the depth is proportional to the time since consolidation." Davison, in a later "calculation (1894) based on the supposition that the coefficient of dilatation is not constant, as he before had assumed, but increases with the temperature," arrives at the more favorable conclusion that, after 100,000,000 years, "the depth of the surface of zero-strain would be 7.79 miles." He says further, that "if the material of the earth's interior be such that the conductivity and coefficient of dilatation are greater in it than in the surface rocks, or if initially the temperature increased with the depth, the above figure must be still further increased"; and adds, in conclusion, "that, consequently, calculations as to the alleged insufficiency of the contraction theory to produce mountain-ranges are at present inadmissible." It is therefore safe to assume, in view of the dependence of mountain plications on lateral pressure, that the thickness was fully sufficient for the orographic results; and even in late Archæan time great enough to make Archæan mountains of 8000 to 10,000 feet, such as the Adirondack and Black Mountains must have been before subjected to denudation.

Darwin states at the close of his paper (which follows Davison's in the Philosophical Transactions), after deducing that contraction vanishes at a depth of 2 or 3 miles: "Thus, in 10,000,000 years, 228,000 square miles of rock will be crumpled on the top of subjacent rocks. The numerical data with which we have to deal are all of them subject to wide limits of uncertainty, but the result just found, although rather small in amount, is such as to appear of the same order of magnitude as the crumpling observed geologically.