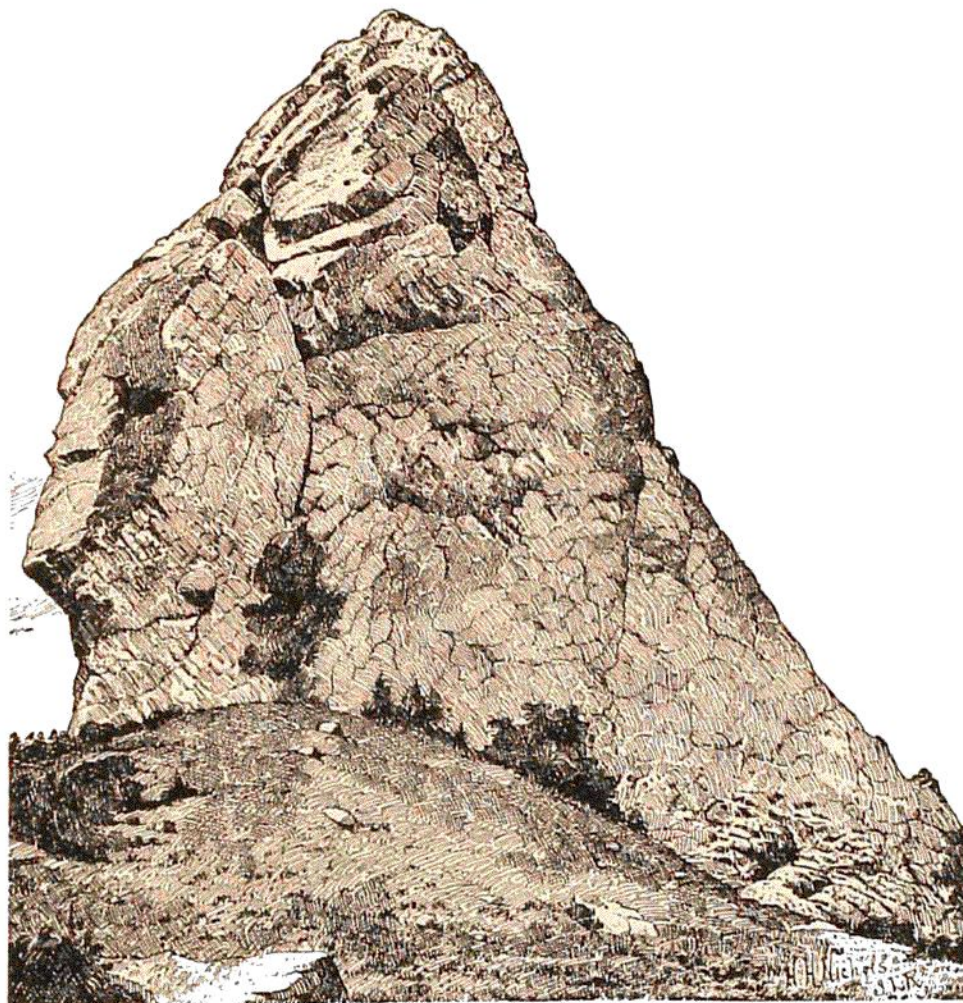


abruptly diverse in positions and size, as shown above. The diameters vary from four feet to six or eight inches; and some groups are much curved. Iddings refers the abrupt changes to irregular cooling after the surface had crusted over, different rates proceeding from the lower and upper surfaces. To this may be added that the upward flow or thrust of the liquid rock was probably more or less intermittent, as it is a common fact in modern flows about volcanoes.

Basaltic rocks are much more generally columnar than other kinds of igneous rocks. Figs. 222 and 224 show the same structure in phonolyte,

222.



The Phonolyte Peak, 1000 feet high, on Fernando de Noronha. J. C. Branner, '89.

and in half-stony volcanic glass. The first, representing a peak, 1000 feet high, on the island of Fernando de Noronha, is from a paper by J. C. Branner. The second shows the well-developed columns of "Obsidian Cliff" (a noted locality in the Yellowstone Park). The columns are 50 to 60 feet high; above the columns for 50 feet, or so, the obsidian is massive. (Iddings, 1886.) The cross-lining in the figure represents shading and not the thin laminated structure that characterizes much of the obsidian.

In a cooling layer of fused rock, the smallest number of fractures that