large, the snows may be permanent far below the line even if the summers are warm. In accordance with this principle the snow-line in *wet* southern Chile is 6000 feet lower than it is in corresponding latitudes in North America, and 3000 feet lower than in Europe; and in *dry* northern Chile, in latitude 33° S., it is as high as it is 15 degrees farther north (Buchan).

But exceptionally snowy winters followed by a succession of two or more cool summers may make accumulating deposits of snow in some shaded valleys of high mountains that are much below the normal limit of perpetual snow, and produce temporary accumulations of ice that have incipient flow — a fact observed in the White Mountains, N.H.

The height of the line of perpetual snow is 18,500′ in the western Cordillera of the Bolivian Andes near the equator, and 15,920′ in the *less dry* eastern; 12,980′ on the south side and 16,680′ on the *drier* north side of the Himalayas; 12,780′ in the Chilean Andes, near Santiago; 14,760′ in Mexico; about 13,000′ in Teneriffe; 8400′ on the northern and 8800′ on the sunnier southern or Italian slope of the Alps; 5000′ in Norway; 3000′ in Lapland; 5500′ in Alaska; about 2000′ to 2200′ in Danish Greenland, where the mean annual temperature at the sea level is between 13° and 33° F., it being, according to Rink, at Upernavik, in 72° 48′ N., 13·3 F.; at Jakobshavn, in 69° 14′ N., 22·6 F.; at Godthaab, in 64° 8′ N., 27·8 F.; at Lichtenau, in 60° 31′ N., 33·2 F.; the annual range of monthly means, at Jakobshavn, being 0·3 F. to 45·3 F., and at Godthaab, 11·8 F. to 48·4 F. The temperature of the soil 4 feet under ground at Godthaab varies during the year between 31·5 F. (in March) and 40·1 F. (September).

Lowering the mean temperature of a place, by cooling the summers, lowers the glacier-limit. Great Britain and Fuegia (Tierra del Fuego) are in nearly the same latitude; and yet, in Fuegia, the snow-line is only 3000′ above the sea. If, by any means, the climate of Great Britain could be reduced to that of Fuegia, it would cover the Welsh and Irish mountains with glaciers that would reach the sea, the snow-line being but 1000′ to 2000′ above it; and the same cause would place the snow-line in the Alps at 5000′ to 6000′ above the sea, instead of 8400′. This change of temperature involves a removal of tropical sources of heat, or an increase of arctic sources of cold.

The length of flow of a glacier before it melts away depends mainly, as stated above, on the thickness of the ice-mass, and largely because ice cannot melt without absorbing an amount of heat sufficient to raise the temperature of a like quantity of water 143° F., the latent heat of water. As a consequence of this, an ice-mass has a thin layer of cold air about it; and if also covered by earth, to shut off the winds that aid evaporation and also to protect it from the sun, the permanence is greatly increased. An ice-house affords a familiar example; and others are the dirt-covered masses of ice only a foot or two thick that linger on the north side of houses at times from winter into April in the middle latitudes of eastern North America.

In the Alps the glaciers extend down 4500 to 5300 feet below the snow-line. The snows of the glacier-source in the mountains take the half-compacted condition of the *névé* for a distance above the snow-line as far as there are seasonal or other alternations in temperature sufficient to produce occasional meltings. Over the snow-fields, the extreme cold of winter is followed by months of less stringent weather, and by meltings that send water down through the mass and make it coarsely granular and more or less