

the rock-flour, which often makes the water discharged by under-glacier streams look milky. The coarser earth within the glacier is added to the bottom deposits, making thereby the unstratified mixture of earth, stones, and clayey rock-flour, which is called *boulder-clay* or *till*.

The retreats of a glacier, during which depositions of a large amount of moraine material take place, afford an opportunity for the growth of plants, and sometimes even forests, over the deserted moraines, and for the spreading out of stratified gravel and earth by the sub-glacial river and other means, so that, whenever the advance takes place, stumps, trunks of trees, and stratified beds become again under the ice and new deposits of boulder-clay are made. The Muir Glacier, according to Wright and others, affords remarkable examples of such intercalations of dismantled forests and gravel-beds, and Russell's account and map of the St. Elias Glacier (page 238) illustrate the process.

4. Denudation and Transportation by Glacier-made Rivers.

The greater part of the excavation of valleys carried on in glacier regions is due to the glacier-made rivers. They swell by the summer melting, and become violent, plunging torrents, and thus produce great and rapid work, while the glacier is slowly creeping along, and as they bear the material down stream, it becomes deposited and stratified like other fluvial deposits. Violent effects come from the damming of streams by the snow and ice of Alpine valleys; for in no other way can barriers be thrown so readily across profound valleys. The deluges caused by the accumulated waters, when they break loose, are often very destructive. The Alps are full of examples. Again, the valleys are sometimes dammed up by great moraines, making lakes; and such lakes sometimes break through their barriers, and flood the valley below with tearing waters. The lakes of the glacier's surface may add suddenly to the sub-glacial waters, and produce great destruction and widespread stratified deposits.

The amount of rock-flour and coarser sediment discharged daily by the Aar Glacier in August has been estimated to be 280 tons; from the Justedal Glacier, in Norway, in July, about $3\frac{1}{2}$ times as much; from some Greenland glaciers, varying up to 75 times as much as the Aar.

ICEBERGS.

A glacier on a seacoast often stretches out its icy foot into the ocean; and, when this part is finally broken off, by the movement of the sea or otherwise, it becomes an iceberg. The break takes place usually in the fiords, where the glaciers extend out into the deep water and are largely submerged. The icebergs carry away the stones and earth which the glacier may have gathered, and transport them often to distant regions, whither they are borne by the polar oceanic currents. Most of those of Greenland, how-