

sea bottom while rock-bearing ice-masses floated on the surface till they deposited their lading.

Sir R. Murchison has pointed out another operation of ice in producing mounds of rocky masses; namely, the effects of rivers and lakes, in climates where, as in Russia, the waters carry rocky fragments entangled in the winter ice, and leave them in heaps at the highest level which the waters attain.

The extent to which the effects of glaciers, now vanished, are apparent in many places, especially in Switzerland and in England, and other phenomena of the like tendency, have led some of the most eminent geologists to the conviction that, anterior to the period of our present temperature, there was a *Glacial Period*, at which the temperature of Europe was lower than it now is.]

Although the study of the common operations of water may give the geologist such an acquaintance with the laws of his subject as may much aid his judgment respecting the extent to which such effects may proceed, a long course of observation and thought must be requisite before such operations can be analysed into their fundamental principles, and become the subjects of calculation, or of rigorous reasoning in any manner which is as precise and certain as calculation. Various portions of Hydraulics have an important bearing upon these subjects, including some researches which have been pursued with no small labor by engineers and mathematicians; as the effects of currents and waves, the laws of tides and of rivers, and many similar problems. In truth, however, such subjects have not hitherto been treated by mathematicians with much success; and probably several generations must elapse before this portion of geological dynamics can become an exact science.

*Sect. 3.—Igneous Causes of Change.—Motions of the Earth's Surface.*

THE effects of volcanoes have long been noted as important and striking features in the physical history of our globe; and the probability of their connexion with many geological phenomena, had not escaped notice at an early period. But it was not till more recent times, that the full import of these phenomena was apprehended. The person who first looked at such operations with that commanding general view which showed their extensive connexion with physical geology, was Alexander von Humboldt, who explored the volcanic phenomena