

inorganic nature; and the chief source of climatal conditions through all time since life began; which, further, in conjunction with the moon's attraction, is the origin of the energy-distributing tidal wave, and also, incidentally to the tidal movement, of tidal friction, with far-reaching, adverse, and fatal results in the retarding of the earth's rotation.

3. THE EARTH'S INTERIOR HEAT.

Dynamical Geology is discussed beyond under the following heads:—

- I. CHEMICAL WORK, as a means of superficial changes.
- II. LIFE, as a geological agent.
- III. THE ATMOSPHERE, as a mechanical agent.
- IV. WATER, as a mechanical agent: under the subordinate heads of Water in general; Fresh waters; Oceanic waters; Glaciers and Icebergs.
- V. HEAT: under the heads of Sources of heat and their direct climatal effects; Expansion and contraction; Igneous action; Metamorphism; Veins and ore-deposits.
- VI. HYPOGEIC WORK, or earth-shaping, mountain-making, and the attendant phenomena.

I. CHEMICAL WORK.

Chemical work is given the first place, because superficial chemical changes have been a prominent cause of the decomposition of rocks, and thereby one of the producers of the earth, clay, and other fragmental materials which are worked into beds by the mechanically acting air and waters. It is also a source of superficial rock formations of different kinds. Chemical changes carried on at temperatures above the ordinary, as those of metamorphism, are not here considered.

The following is the order of subjects: 1, Solution; 2, Oxidation and Deoxidation; 3, Hydration, or the chemical absorption of water; 4, Carbonic acid (CO_2) and humus acids as geological agents; 5, Action of siliceous solutions; 6, Chemical work of living organisms; 7, Mechanical work of chemical products; 8, Concretionary consolidation.

Of this large subject only a brief review of the more prominent facts is possible in this place.

SOLUTION.

The water descending in rains takes from the atmosphere its elements (in the ratio of about two parts of nitrogen to one of oxygen); carbonic acid; some sulphates and ammonium nitrates, especially about cities where there are coal fires; and three or four parts in 10,000 of sodium chloride or common salt in the vicinity of the ocean; besides atmospheric dust, enough of which is from organic sources to make the waters offensive after standing a few