tions. It seems not unlikely that the greater part of the meteorological perturbations of our globe will be found closely connected with such transient inequalities in the sun's activity.

Some of the factors concerned seem, however, more adapted to produce secular oscillations in the sun's evolution of heat, extending through periods like the thousands of years probably occupied by the glacial age, and by the antecedent age of arctic warmth.

The one impossible thing would seem to be that the conflict of all those struggling and discordant forces should generate such an equalized and perfected balance in their resultant, that the sun's emission of light and heat should continue uniform and undisturbed from age to age; that it should not, indeed, from time to time be subject to very great fluctuations. In this view of the question, it seems not unreasonable to claim at least a place of high consideration for this hypothesis among other unverified hypotheses of the cause of the glacial period.

It may be claimed in favor of this hypothesis that it serves to account for the antecedent age of arctic warmth, as well as for the glacial age. Dr. Croll's hypothesis wholly failed in this respect. Nor, as it occurred not earlier than the pliocene, can it be attributed to conditions belonging to the carboniferous period.

As an objection to the solar hypothesis, it has been alleged that a diminution of solar heat would forbid the evaporation required to supply a precipitation of snow adequate to form glaciers. To this it may be replied that existing glaciers, like that of Greenland, are by no means supplied from the copious evaporation of the tropics, which is all precipitated in the neighboring latitudes. They are fed from the far lesser evaporation of the neighboring open seas, including the extremities of the Gulf and Kurasiwo currents. It is estimated that a general reduction of temperature of 18° to 20° F. over the earth's surface would produce the glacial period. Even with such a reduction in the sun's supply of heat, a large evaporation would continue, as well as air and ocean currents distributing the reduced warmth. The necessarily resulting changes would not involve a suspension of evaporation and precipitation, but rather a transfer of the areas of glaciation from the arctic to the temperate zone, such as actually took place in the glacial age.

SERENO E. BISHOP.

THE CULTIVATION OF THE SUGAR-BEET IN OHIO.

"FARMERS' BULLETIN No. 3" of the United States Department of Agriculture is an abridgment of a monograph on the sugar-beet, recently compiled by Professor H. W. Wiley, chemist of the department.

Judging from European experience, it seems probable that the culture of the sugar-beet in America will be most successful within the limits of a belt of about one hundred miles on each side of the summer isotherm of 70°; that is, a line marking an average temperature of 70° for the months of June, July, and August. In Ohio this line follows approximately the southern shore of Lake Erie, so that the northern third of the State is included within the belt named.

The summer temperature is not the only climatic question that must be considered, however; as, for instance, the mild winters of southern California permit the piling of the beets in immense heaps, requiring no protection, or, at most, but a slight covering of straw, and thus extending the working season throughout the winter; whereas in northern Ohio the beets would have to be pitted or housed in expensive cellars or silos. Again, the California winter gives a season of three or four months during which planting may be done, or three times as long as in northern Ohio.

The soil most favorable to the culture of sugar-beets is one that is easily worked, and is fertile enough to produce rapid growth. The moderately sandy soils, and especially the black sands of northern Ohio, will probably be found well adapted to beet-culture. The fertile bottom-lands of the farm occupied by the experiment station at Columbus produce large crops of beets. Stiff, heavy clays will not be found satisfactory, as a rule, unless thoroughly underdrained and brought up to a high state of fertility by previous manuring and the growth of clover.

The variety of beet is an important point, but a yet more important one is the care with which the seed has been selected. In France and Germany the percentage of sugar in the beet has been very greatly increased by improvements in the production of seed.

The manufacture of sugar from beets involves the use of very expensive apparatus, and requires great technical skill. In 113 German factories the mean capital invested in each factory is nearly two hundred thousand dollars; and the total expense of manufacture is nearly eight dollars per ton, counting the beets at a little less than five dollars per long ton. The experience of the Ohio Experiment Station is, that, on suitable soils, beets can be raised at this price with a very wide margin for profit.

The bulletin referred to contains illustrations of machinery used in beet-culture, and many other interesting items which cannot be condensed into a brief abstract. The station has received a few copies of this bulletin for distribution in Ohio, and will take pleasure in sending them free of all costs to all applicants, while the supply lasts. Address Experiment Station, Columbus, O.

NOTES AND NEWS.

AN exhibition of all the means of advertising will be held at the Palais des Beaux-Arts, Champ-de-Mars, Paris, from May 17 to Sept. 15.

— For a year past, the crater of Halemaumau, in the volcano of Kilauea, Hawaii, has been in a state of high activity, the lava frequently pouring out through ducts upon the main floor of Kilauea. On March 5 sinking began, attended with slight earthquakes, extending into the neighboring district of Kau. By the 8th the collapse was complete. The interior cone, with the adjacent fire-lakes, had sunk out of sight; and the entire area of Halemaumau, over half a mile in diameter, is now occupied by a pit estimated at five hundred feet in depth. It was just five years after the last and similar collapse. As then, no fire is now in sight. Some fissure has opened in the side of the main column of lava, and discharged the contents under ground. It is perhaps not a mere coincidence that on March 4 the mercury in Honolulu reached the lowest point on record, 48°. The extreme cold of March 10 in England will be noted in this connection. A full report of the condition of Kilauea is expected from Professor Brigham, who is now on the ground.

— The forthcoming May number of the *Review of Reviews* contains, under the title "Three Empire Builders," some timely character sketches. One deals with Sir Henry Parkes, prime minister of New South Wales, the father of Australian federation, and chairman of the great constitutional convention which has just concluded its labors at Melbourne. Another deals with Sir John Macdonald. The third sketch has the Hon. Cecil Rhodes for its subject, Mr. Rhodes being the gifted young Englishman who, a few years ago, went out as a consumptive student from Oxford to regain his health in Africa, and who has been conquering a new empire for Great Britain with Capetown as its capital. Among the special features of the May number will be found an article entitled "Workingmen's Clubs vs. The Bar-Room." "The Progress of the World," an editorial department of the *Review of Reviews*, contains in the May number a map of Australia showing the newly federated provinces, several maps showing the course of the new Nicaragua Canal, and various portraits.

— At a meeting of the trustees of the Johns Hopkins University, held April 6, 1891, the president of the university stated that a lady in New England had authorized him to offer the university the sum of five hundred dollars, to be bestowed in annual prizes during the next ten years, under the following conditions: the