

of the house both as to temperature and moisture. The amount of air is inexhaustible, the quantity in sight being sufficient to fill 40,000 rooms 16×18×10 feet. The opinions of many prominent scientists have been obtained concerning the use of this air for sanitary purposes, a few of which are here given.

Major J. W. Powell, director of the United States Geological Survey, in speaking of the utilization of cave-air currents for regulating the temperature of buildings, says, "The phase of the problem in which you are specially interested is of so great practical importance as to demand not only a special but a general solution. It would afford me pleasure to either take up the general problem or assign it to some competent authority for investigation, were the data adequate; but there are not accessible in this office a sufficient number of records concerning air-movements at natural openings of caverns to render the investigation useful; and, moreover, a final solution could not be reached without consideration of just such data as you are to seek,—data which are not now available. In response to your request to make suggestions concerning methods to be pursued and results to be expected, I can say but little. Indeed, I hope that you will soon be in a position to convey information to me and to the world at large upon the subject."

Dr. Billings of the Surgeon-General's Office, Washington, D. C., after making several suggestions, says, "Hoping that these suggestions will be useful to you, and assuring you that if the experiments indicated are properly carried out they will give some very interesting and valuable information, I remain yours sincerely," etc.

Dr. Henry Henry O. Marcy, Boston, Mass., after consulting Dr. H. I. Bowditch, says, "Such air must be of the highest value for respiratory use in diseased organs. Of course, sunshine is important, and this is the chief drawback to establishing the sanitarium within the cave. To drive it by means of a fan through a house would certainly seem of much value. An aseptic atmosphere is the gain from the long sea-voyage or living on mountains or in wooded districts. Here we ever have fluctuations in temperature, and other conditions, beside moisture. It has recently been considered as of practical importance to furnish air to a great city, as London, from high towers: why not, and much easier for many reasons, from caves? The air freed from bacteria is, as you are well aware, one of the secrets of success in modern surgery."

Burton, in his "Anatomy of Melancholy," under the head of "Air Rectified" (p. 306), says, "In some parts of Italy they have wind-mills to draw a cooling air out of hollow caves, and disperse the same through all the chambers of the palaces, to refresh them, as at Castoga, the house of Cæsareo Trento, a gentleman of Vicenza, and elsewhere."

The only modern instance with which I am acquainted is the hall of the Palace of the Trocadéro, in Paris. This building is erected over a portion of the old stone quarries. In the course of construction all the openings were closed, with a few exceptions. When it was found that a strong, cool current came from the underground chambers, all the openings save one were closed. This one was walled up to keep out the surface water, and shrubbery was planted around it. The chambers were carefully cleansed and dried, and the air is permitted to enter through this opening, which is never closed. The old quarries act as an immense cooling chamber. Mr. C. H. Blackall, in a letter, says, "At the rear of the stage, on the left, is a large room, the floor of which is only a little below that of the auditorium, and at its lowest point. In this room are the fans which draw the cool air from the quarries through a large opening in the floor, and force it either directly to the hall, as in summer-time, or first to a heating-chamber, where the air is warmed by passing over heated pipes. The fans, air-ducts, etc., are so placed that the fresh air may be introduced at the top of the hall, and foul air drawn out at the bottom, or *vice versa*. The air ascends, or rather is forced up, a large brick shaft behind the stage, and carried across to the centre opening of the dome through galvanized iron ducts about 5×8 feet.

The architect of the palace, after saying that nothing has been printed on the subject, writes thus: "I have the honor to inform you that the hall of the Trocadéro has a capacity of about 1,620,-

000 cubic feet; that ventilation, which furnishes 3,240,000 cubic feet per hour, is obtained by means of two engines, each of 15-horse power, operating two inhaling and two exhaling ventilators (one of each kind for each half of the hall). These ventilators are perfectly alike, they are about 8.4 feet in diameter, and consist of helices of a thickness of half an inch, with eight wings at an inclination of forty-five degrees. The engines are horizontal stationary ones, with two cylinders on the principle of restraint and condensation. Two boilers furnish the steam. Each of these has a heating surface of about 189 square feet, and a capacity of 54 cubic feet. They are gauged to a pressure of 10 pounds. The entire machinery has given excellent results. One may say it works too well, inasmuch as under full power there is a great excess of air. Usually only one-fourth of the total possible power is applied, and this is very amply sufficient."

Taking into consideration the unlimited supply of pure, cool, and, as far as investigations go, aseptic air, together with high altitude (nearly 900 feet above sea-level), its situation in the midst of a virgin forest of oak and hickory, with a sandy soil (resulting from the wear of the Chester sandstone) and splendid drainage—indeed, every thing seems to conspire to make this a favored spot for sanitary purposes.

M. H. CRUMP.

Frankfort, Ky., May 3.

Sunspots, Tornadoes, and Magnetic Storms.

IN my letter regarding sunspots and tornadoes, printed in *Science* on May 2, 1890, reference was made to magnetic storms observed at Toronto near the maximum stage of the last sunspot cycle. From that memorandum, by a clerical error, were omitted the words "September, 1883," after "November, 1883."

JAMES P. HALL.

Brooklyn, N. Y., May 3.

Gorse or Furze

EUROPEAN furze grows in one spot in the island of Nantucket, where it has maintained itself for fifty years. It was introduced by an Irishman, who was homesick because it did not grow about his cabin, as in the Old Country. I have never seen the plant growing, but have seen branches gathered from it. I believe it has not spread to any great extent. It may be interesting to some that the Scotch heath also is found in one spot in the island, where it has continued for a long time.

GEO. W. PERRY.

Rutland, Vt., May 5.

YOUR correspondent, Mr. J. R. McGinnis, may be interested to learn that the gorse or furze (*Ulex Europæus*) has for many years been fully naturalized in the southern part of Vancouver Island, where, along roadsides and in waste places in the vicinity of Victoria, it is very common. The broom (*Sarothamnus Scoparices*), is also abundant in similar situations in the same locality, and both plants appear to be as much at home as in their native soil.

GEORGE M. DAWSON.

Geological Survey of Canada, May 5.

BOOK-REVIEWS.

Stanley's Emin Pasha Expedition. By A. J. WAUTERS. Philadelphia, Lippincott. 12°. \$2.

IF any one besides the great explorer himself is able to describe the progress of Stanley's eventful journey, which led to the complete overthrow of European influence in Equatorial Africa and to the return of the indefatigable Emin Pasha, it is Mr. Wauters, who has closely watched the progress of the expedition from the beginning to the end, and, being closely connected with the Belgian enterprises on the Kongo, had access to all the material bearing on the expedition. The author begins his graphic descriptions with a history of the conquest of the Soudan and the revolt of the Mahdi, which was the immediate cause of the difficulties with which the governor of the Equatorial Province was beset. The first half of the book is taken up by descriptions of the state of affairs in the Soudan, Dr. Junker's important expeditions and his