is much to be hoped that when fully carried out it will not only annihilate the others but will lead up to the true theory. (4) The electric field theory.

The final theory must include the following points: (*a*) Storms and high areas are largely dependent upon each other, and are somewhat alike except with opposite signs.

(*b*) The velocity of the current varies at every level as one rises in the atmosphere.

(*c*) In this country at least, storms and high areas follow each other and have practically the same velocity.

(*d* The conditions producing our storms and high areas seem to extend far above our highest mountains, and may extend to the limits of the atmosphere.

(*e*) There is no motion or carrying of air or moisture particles in a horizontal or up-and-down direction, by pure air currents, to form storms or high areas.

(*f*) There is an enormous increase of moisture in the fore-front of storms, entirely independent of precipitation, wind, heat, evaporation, and every other ordinary element.

(*g*) There is a corresponding dryness in the fore-front of our high areas, which may be due in part to the descent by gravity of the cooler, denser, and drier air above.

(*h*) The precipitation, in the case of general storms, is, in this country at least, far (at times four hundred miles) in advance of the central point of the isobars, and very often none at all falls at the centre.

(*i*) In what may be called normal storms, the velocity may rise to forty or even more miles per hour, especially in the winter season.

(*k*) The temperature in normal storms most emphatically shows no reversal as we ascend in the atmosphere, but, if any thing, shows a greater relative rise at the upper station than occurs at the earth's surface.

(*l*) The temperature in normal high areas has, if any thing, a greater relative diminution at a high mountain station than at the earth's surface.

While the last two propositions are most abundantly borne out on Mount Washington, it should be noted that a study of the conditions at the highest regular station in Europe (Sonnblick, 10,000 feet) has shown no reversal. While there is a difference in the results at the two mountains, yet this is only in degree. Excepting a few anomalous cases, the conditions are practically the same at both stations (*Science*, Sept. 5, 1890).

The time for formulating a consistent theory of storm generation and motion is still a long way off. It seems to me that the most promising sign of recent discussions is the marked tendency on all hands to lay aside pure theoretic considerations and to demand rather the facts and causes which underlie all atmospheric disturbances.

H. A. HAZEN.

Washington, D.C., June 15.

BOOK-REVIEWS.

An Introduction to the Study of Metallurgy. By W. C. ROBERTS-AUSTEN. Philadelphia, Lippincott (London, Griffin). 292 p. 8°.

IN telling something about this book we cannot begin better than by quoting the first part of the preface, which runs as follows: "The literature of metallurgy is rich, but those who are beginning to study it need guidance to a knowledge of the principles on which the art is rightly practised. It depends, as is well known, on the application of chemistry, physics, and mechanics; but the methods of metallurgists vary greatly from those of chemists, who, however, frequently fail to appreciate the difference. Ten years' experience has convinced me that it is more important at the outset for the student to know what was the scope of mind of the early practisers of metallurgy, and to see what kind of aid the art may be expected to receive in future from the sciences, than to acquire familiarity with complicated details of processes and appliances."

In these few sentences the author has given not only the reason for the existence of his book but also an outline of what the student may expect to find in its pages. The first four chapters may be considered almost as a separate section, covering the subject generally as a whole, the other chapters going more into the details of the various processes employed in metallurgy.

The first chapter is devoted wholly to a consideration of the relation of metallurgy to chemistry. The second treats of the physical properties of metals,— molecular structure, density, fracture, malleability, ductility, tenacity, etc. The third chapter is the best brief treatise of the kind and for the purpose we know of in the literature of metallurgy, and might have been expanded into a separate volume without a suspicion of a resort to what is known as "padding." In its thirty-six pages the subject of alloys is presented, briefly, of necessity, but comprehensively and clearly; and the results of recent investigations and experiments are given, including those in which electricity plays a part. The fourth chapter deals with the thermal treatment of metals.

The remaining chapters are devoted respectively to fuel, materials and products of metallurgical processes, means of supplying air to furnaces, typical metallurgical processes, and economic considerations. The illustrations are as numerous as the purpose of the volume warrants; there is an abundance of diagrams and tables, and the table of contents and index are models of their kind.

AMONG THE PUBLISHERS.

THE first number of Vol. II. of the *Outing Weekly Tennis Record* for the season of 1891, was published on June 13. It is the official organ and bulletin of the United States National Lawn Tennis Association.

— G. P. Putnam's Son's have just ready a handsome volume entitled "Landscape Gardening," by Samuel Parsons, Jun., containing notes and suggestions on lawns and lawn planting, laying out and arrangement of country places, large and small parks, trees, shrubs, plants, rockwork, etc. They have also ready an American edition of Professor William Peck's "Popular Handbook and Atlas of Astronomy."

— J. G. Cupples of Boston will publish immediately "The Life-Romance of an Algebraist," by George Winslow Pierce, a distinguished pupil of the late Benjamin Peirce, the eminent professor of mathematics in Harvard University. This book opens with a discovery in algebra, addressed to students, and proceeds with the discussion of every subject of human interest, poetry, philosophy, constructive criticism, adventure, forms of truth, and mysteries of being, strung on the thread of a love story.

— The July number of *The Annals* of the American Academy of Policical and Social Science will contain a translation into English of the Constitution of Mexico, by Professor Bernard Moses of the University of California. Dr. G. Ritchie, instructor in Oxford University, has contributed to the same number an article on the teaching of political science in that institution. Professor J. W. Jenks of the University of Indiana discusses a reform of the system of land transfer, and advocates the adoption of a method which shall guarantee security to the purchaser, without the heavy expense and uncertainty which the existing system involves. "The Economic Basis of Prohibition," a paper read by Professor Simon N. Patten of the University of Pennsylvania at the May meeting of the American Academy of Political and Social Science, also appears in the same issue.

— Among its new and continued articles the *American Journal of Archæology* for the present year will contain the following: "A Series of Babylonian and Assyrian dated Cylinders," by Mr. T. G. Pinches of the British Museum; "Hittite Sculptures," and "Oriental Antiquities," by Dr. William Hayes Ward of New York; "Antiquities of Phrygia," by Professor William M. Ramsay of Aberdeen, Scotland; "Terracottas in American Collections," by Salomon Reinach of the Museum of Saint-Germain, France; "The Aphrodite of Melos," by Dr. A. Furtwangler of Berlin; "Three Heads of Zeus, Hades, and Poseidon, of the Hellenistic Period," by Professor Adolph Michaelis of Strassburg; "A New Fragment of the Edict of Diocletian, found at Plataia in 1890," by Professor Theodor Mommsen of Berlin; "The Mantineian Reliefs," by Dr. Charles Waldstein, director of the American School at Athens; "Terracottas from Southern Italy, now in Baltimore," by Professor Har-