

The Nation

A WEEKLY JOURNAL



DEVOTED TO

POLITICS, LITERATURE, SCIENCE & ART

P 1153

VOLUME LXXXIV

84

FROM JANUARY 1, 1907, TO JUNE 30, 1907

NEW YORK

NEW YORK EVENING POST COMPANY

1907

had hardly died down when Vesuvius opened a new chapter in its history and closed it with the outbreak of April, 1906, which in violence and destructive effect is thought to have surpassed all other eruptions of that volcano, with the exception of those of the years 79 and 1631. Then, nearer to our own hearts and homes, the tragedy of San Francisco was enacted—followed in almost exactly four months by the still greater tragedy of Valparaiso, in Chili. Before the close of 1906—a year which had also witnessed in its early days the minor disturbances of Esmeraldas in Ecuador, of Buenaventura in Colombia, and of Castries in the island of St. Lucia—a great part of the city of Arica lay in ruins. And now, with the beginning of the year 1907, the seismo-volcanic registry records the eruptions of Mauna Loa and Etna, the continuing vast flows of lava from the Savai volcano in the Samoan Islands, and the appalling disaster which has converted the capital of the island of Jamaica into a mass of débris.

In all these events we see the earth in the making—a process now, as ever, destructive. Within this quarter-century the population of the globe has been diminished by not less than 125,000 or 150,000 as the result of terrestrial catastrophism. Possibly the figures should be even larger, for the records are incomplete.

ANGELO HEILPRIN.

Philadelphia, January 18.

The Scientific Papers of J. Willard Gibbs. 2 vols. New York: Longmans, Green & Co. \$9 net.

That Josiah Willard Gibbs advanced science the world over more than it has ever been given to any other American researcher to do, can hardly be questioned. He published but one separate book, his "Elementary Principles in Statistical Mechanics" (Charles Scribner's Sons), which appeared in the Yale Bicentennial Series in 1902, the year before his death. Another volume in the same series, written by his pupil, Edwin B. Wilson, was founded on his lectures. His only other printed remains are the papers now collected, which are few but fundamental. They are substantially limited to three, not counting an unusually small number of preliminary and supplementary outputs.

Of the earliest, relating to diagrams and models representing the effects of temperature and pressure on all sorts of substances, Clerk Maxwell once spoke to the present reviewer in terms of warm laudation, before Gibbs had produced anything else, and when he was all but unknown in this country. His second work, on the equilibrium of heterogeneous substances, taught chemists how to reason about the final results of reactions (without reference to the processes by which they were reached), and it stands to-day the stone at the head of the corner of dynamical chemistry. The memoir itself (in which, by the way, was first given the now celebrated "phase rule") occupies three hundred pages of the first of these two volumes, a good many more pages being substantially parts of the same whole.

The second volume is mainly occupied with Gibbs's peculiar calculus called "vector analysis," which was designed to super-

sede quaternions and Grassmann's *Ausdehnungslehre*. It is now taught in sundry European universities; but its vogue was prevented or hindered by a trait of its author's character that struck everybody that ever met him, and that we know not how otherwise to designate than as diffidence. Yet this is not a fit name for it. It certainly was not that diffidence which consists in timidity; nor can we assent to his brilliant scholar Prof. Bumstead's apparent view that he was unconscious of his own superiority, which would come too near to making him a gifted idiot, rooting up his mathematical trifles like a Périgord pig, and as oblivious of being deprived of them. We should rather conceive of it as an exaggerated estimate of the possibility of any opinion of his being erroneous that might concern a difficult question not susceptible of a demonstrative solution. He thought his method ought to be left to make its own way in the world; but he overlooked the fact that he was not giving the offspring of his brain the fair start to which it was entitled. For he limited himself to printing and privately circulating a fifty-page syllabus of that method, with no illustrations of its application. The industry of a man of great parts and attainments would not more than have sufficed to construct any decided opinion upon such a question from such a basis. If Gibbs himself, after devoting his own surpassing genius for some years to the matter, was not prepared to put forth a categorical decision as to the merits of the method, pray who else could be expected to undertake the office? We can only say that the ease and mastery with which his scholars have handled some of the most thorny problems of physics, as contrasted with the infertility of the quaternionists, incline us to put our trust in "vector analysis."

The book is clothed in all dignity and beauty of paper and type, carries a noble photograph of the master, and in every way (except by an index) recommends itself to the liking of friends of American science.

There is a good, but restrained, notice of this most genuine of high intelligences by a worthy interpreter, Prof. H. A. Bumstead, who has taken Dr. Ralph Gibbs Van Name as his collaborating editor.

The following scientific books are included in Macmillan's list of spring publications: "Cyclopedia of American Agriculture," vol. 1, edited by Prof. L. H. Bailey; "Experimental Zoology," by Thomas Hunt Morgan; "Economic Geology of the United States," by Heinrich Ries; "Forage Corps," by Edward B. Voorhees; "The Storage Battery," by Augustus Treadwell; "Practical Text-Book of Plant Pathology," by D. F. MacDougal; "Introduction to Zoology," new edition, by Charles Benedict Davenport and Gertrude Crotty Davenport; "Elements of Electro-Chemistry," by M. Leblanc; "Types of Farming," by L. H. Bailey; "Meteorology, Weather, and Methods of Forecasting," new edition, by Thomas Russell; "Principles of Inorganic Chemistry," new edition, by H. C. Jones; "Studies in Physiology, Anatomy, and Hygiene," new edition, by J. E. Peabody; "The Common Bacterial Infections of the Digestive Tract," by C. A. Herter; "Lectures on the General Properties of Immunity," by Svante Arrhenius; "System

of Medicine and Gynecology," vol. II, Part I, edited by Thomas Clifford Allbutt; "Clinical Psychiatry," new edition, by A. Ross Diefendorf.

The ascent of Mt. Ruwenzori, the ancient Mountains of the Moon, last summer was described in a lecture delivered at Rome on January 7 by the Duke of the Abruzzi. In a little over a month he climbed the sixteen highest peaks, made a survey of the range, determined heights, fixed the watersheds, and mapped and photographed the whole region. The principal scientific results are the fact that the range consists of six principal groups, 16,810 feet being the altitude of the highest peak. The limit of perpetual snow was about 14,600 feet, and of the lowest glacier 13,677. None of the glaciers were of the first order, and they showed signs of receding.

Finance.

THE BREAK IN THE STOCK MARKET.

About the middle of last December, after having held obstinately strong in the face of extremely tight money, repeated deficits in New York bank reserves, and prohibitory rates charged in London for "carrying" American securities, Stock Exchange prices suddenly began to give way. Since then, the decline has been almost continuous, up to the present week. During the five-week period, such striking declines in the price of important railway stocks have been scored as 20 points in Chicago, Milwaukee and St. Paul, 23 in Union Pacific, 34 in New York Central, 39 in Reading, 63 in Northern Pacific, and 80 in Great Northern. People, learning of such a fall in prices, might easily infer either that a serious disaster had befallen the world of investors, or else that the Stock Exchange movement was foreshadowing a highly unfavorable turn in our tide of prosperity.

And, in fact, the violent fall in prices last week and at the opening of this week, had so far cut the ground from under the feet of speculators—who had been holding huge lines of stocks with money borrowed on collateral of these very stocks—as to force liquidation and some signals of real distress. This, however, was pretty much restricted to that class of people known in Wall Street as "Stock Exchange professionals." No one else seems to have been badly hurt. The outside public, which lost millions in the Wall Street collapse of May, 1901, and which was probably hard hit in the two-day crash of December, 1904, has on the present occasion made little complaint. At the same time, no signs of trade reaction, or of alarm in business circles, is anywhere manifest. Instead, one hears the general comment, that legitimate industry is in a far safer position, now that Stock Exchange speculation has collapsed and Stock Exchange prices have come down.

Nevertheless, there still exists, even in Wall Street itself, a good deal of perplexity as to why the stock market should have fallen at just this time. Two months ago, every one on Wall Street had a word

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