of any great-circle track previously laid down, just as the rhumb course and distance are measured on the Mercator chart. These principles were recognized in the construction of the great-circle charts issued by the Hydrographic Office. The maturing of them, and their publication in the form of the present excellent sailing-charts, have been due to that office. They are now issued for the North and South Atlantic Oceans, and Indian Ocean. The plate for the latter was used to reproduce, by electrotyping, plates for the North and South Pacific Oceans. It is expected that this series of sailing-charts will be completed before July 1, 1889. Those already published have been received with great favor, and have undergone severe tests for accuracy and utility; and numerous reports have been received testifying to their usefulness in lessening the labor of computations on the great-circle route.

The general lack of the practical application of the principles of great-circle sailing in the past seems to have resulted, not from the want of recognition of the fact that the shortest distance between any two points on the earth's surface is the arc of the great circle passing through them, nor that the great-circle course is the only true course, but from the tedious operations which have been necessary, and from the want of concise methods for rendering these benefits readily available.

Sanitation in India.

Mr. B. F. Bonham, United States consul-general at Calcutta, has sent to the State Department an abstract of a lecture by Mr. Justice Cunningham, at the Parkes Museum, on 'Sanitation in India,' from which the following interesting extracts are made: —

"The views of the sanitary parties in India might be summarized in the following proportions: that the mortality of the population is vastly in excess of that of civilized countries, and in particular cannot be calculated at less than 10 to 15 per thousand in excess of the English rates, an excess making at least 2,500,000 of deaths and 50,000,000 cases of severe diseases; that this excess, or a large portion of it, is preventable by practical means fairly within human competence; that the existing administrative machinery is powerless to make any impression on this excessive mortality, but that its tendency is rather to intensify it; that there are reforms which materially affect it, which might be adopted without grievance to the people or detriment to the government finances, and that it is the duty of the government to adopt such reforms. As to the excessive mortality, the lecturer pointed out that wherever registration approached completeness there were high ratios of 30 per thousand and more, the central provinces ratio being 34 and the north-western provinces 32; that many large areas with populations of a million and upwards showed ratios of 40 and 50 per thousand, and many towns and municipalities showed ratios of 40, 60, 70, 80, and even higher. Such ratios showed that the laws of health were being contravened on an enormous scale. A curious instance of the extreme prevalence of disease was shown in Calcutta, where, out of a population of 445,000 persons, no less than 325,000 were treated annually in public medical institutions. Coming next to preventability, experience proved, that, wherever effective sanitation was carried out, the ratios of Indian mortality sunk at once to that of England.

"The great mass of Indian mortality was occasioned by epidemic diseases, which are preventable or mitigable, and in England have either disappeared or sunk to insignificant proportions. The Army Sanitary Commission gave what they call a 'deplorable record' of 38,000,000 of victims within a single decade to such diseases. Coming to particular instances, the extraordinary reduction in the mortality of the European army from 69 per thousand to 12 or 14, and the invaliding ratio from 43 to 23, the cholera mortality from 9.24 to 1.17, showed what sanitation could do in the case of men newly exposed to a tropical climate. The reduction of the mortality in jails was equally remarkable: it is now about one-third of the former rate. In Madras the extraordinarily low ratio of 17.80 per thousand had been attained. The high ratio of over 100 per thousand in some Bengal jails pointed to active insanitary conditions of soil, structure, or mismanagement. Another striking instance is that afforded by those parts of Calcutta which have been properly sanitated, which would compare favorably with the best parts of London for healthiness, while the insanitary wards of the city are scourged with epidemics, — are the perennial home of cholera, — and the suburbs of Calcutta have long been a scandal, not only to the Bengal Government, but to English civilization."

BOOK-REVIEWS.

A Text-Book of Physiology. By JOHN GRAY M'KENDRICK. Including Histology, by Philip Stöhr. In two volumes. Vol. I. General Physiology. New York, Macmillan. 8°. $4.

THE book before us, which is but the first volume of M'Kendrick's 'Text-Book of Physiology,' is modelled to some extent on his 'Outlines of Physiology,' although it has been so greatly extended in every direction as to make it an entirely new book. This volume treats of the general physiology of the tissues; while the second, not yet published, but in the printer's hands, deals with the special physiology of organs.

In the introductory section the author discusses the nature and objects of physiology, matter and energy, and the general principles of biology, including the organic form and mode of growth, the evolutional history of living beings, and the theories of life. In the second section the chemistry of the body is treated; the nature and properties of the chemical substances found in the body, and the nature of the chemical re-actions with which the phenomena of life are associated, being considered fully. The true value which should be given to chemical formulæ by the physiological student is specially explained by the author. The chapter on pigments is an exceedingly valuable one, the subject being treated more fully than in any other text-book of physiology.

Dr. M'Kendrick has been especially fortunate in being able to incorporate into his text-book Professor Stöhr's 'Lehrbuch der Histologie,' which, so far as we know, had not, up to this time, been translated. The illustrations of this portion of the work are not diagrams, but drawings of real preparations, and remarkably true to nature.

The closing section treats of the contractile tissues. In it the electrical apparatus employed in the study of muscle is described and illustrated. The author believes, and we think rightly, that the importance of the uses of electricity in practical medicine and surgery justifies him in describing electrical apparatus. We are somewhat surprised to find the statement that "the teacher has usually to deal with students who know little or nothing about physics." We had supposed that the student, before being permitted to begin the study of medicine in the United Kingdom, must be well prepared in physics, and are therefore surprised to hear one who is undoubtedly in a position to know, say that he knows "little or nothing" about it. It appears, however, from our author's preface, that an examination in mechanics is required as a preliminary; but this, he says, is of no use, being just sufficient to worry the student and exhaust his energies, without conferring any real benefit in the shape of a knowledge of the principles of physical science. It is on account of this ignorance on the part of students that certain details as to physics are introduced into this text-book. Taken as a whole, the first volume of Dr. M'Kendrick's book is a most valuable one, and we shall look for the second with great interest. If he succeeds as well in his treatment of special as he has succeeded with general physiology, his text-book will be entitled to a prominent place among the best text-books of physiology.

Electrical Instrument Making for Amateurs. By S. R. BOTTONE. 2d ed. New York, Van Nostrand. $1.20.

IN the preface to this work Mr. Bottone says, "Nearly all the really useful inventions and discoveries which have rendered the nineteenth century so remarkable as a season of progress must be attributed to amateurs. For this reason, if for no other, we should render every assistance in our power to the *bona fide* amateur." Mr. Bottone's idea of a *bona fide* amateur is difficult to conceive. He would claim a wide meaning for the word if he included Faraday, Maxwell, Joule, Thomson, and Rayleigh, in his own country. Still there is no need of quarrelling about a definition, or of asking by whom the useful work of this century has been done. Mr. Bottone's book is a helpful and a needed one, and has much to com-