

ous state of the question, except in so far that he has added another microbe to the list of the possible specific germs of the disease."

This would seem to make it very doubtful whether Dr. Gibier of Paris has added any thing to our knowledge of the cause of yellow-fever.

ELECTRICAL SCIENCE.

Novel Current-Registering Instrument.

A NEW instrument for measuring the quantity of current supplied to consumers has been recently brought out by Prof. Elihu Thomson, although it seems probable that the principle on which it works was originally due to Tavenor. Two bulbs are connected by a U-shaped tube, and the whole is partly filled with liquid; alcohol, for instance. The arrangement is pivoted, so that, if more of the liquid is forced into one of the bulbs, the difference of weight will cant the apparatus, and its movement is communicated through a ratchet to the hands of a registering-dial. To make this measure the current, two spirals of wire are introduced into the liquid, one in each bulb. If we suppose the instrument has been canted, the spiral in the lower bulb has its circuit made, while that of the upper spiral is broken. The consequence is, that the liquid in the lower bulb is heated, its vapor-tension increases, and part of it is driven through the U-tube. The section of the latter is very small, so that the liquid passes slowly, but in a time, depending upon this section and on the rate of heating, the upper bulb becomes the heavier, and the apparatus cants, breaking the circuit of the spiral that was previously made, and making the other. By a suitable registering system the readings may be made proportional to the current which is flowing. The current, then, is measured by its heating effect, and the instrument may be used for both direct and alternating currents. In the latter case the readings would be fairly correct if lamps only were used; but, if motors were to be run, the readings would not be proportional to the power consumed. This objection holds with all of the instruments that have yet been proposed for the measurement of the consumption of alternating currents.

THE SHORT SERIES ELECTRIC RAILWAY SYSTEM.—The Short system of electric traction differs from those ordinarily used in that the current is distributed in series, the same current passing through all of the cars on the line. Both overhead and conduit wires are used. In the latter case the wires are contained in an iron conduit, from which they are insulated by porcelain brackets. The overhead wires are supported from iron bracket-poles that arch gracefully over the track. The motors and generators used are of the Brush system. The motor is usually in a front compartment, and is geared to the front car-axle. There is a pinion on the motor-shaft, a gear on the axle, and an intermediate gear and pinion that further reduces the number of revolutions. The gears are made of steel, the pinions of rawhide held between steel plates, making an efficient and noiseless transmitting system. The front compartment (in which the driver stands), with the motor and front truck, can be made separately, and attached to any ordinary car by removing the front platform. Taken altogether, the system seems a simple and efficient one.

AN IMPROVEMENT IN SECONDARY BATTERIES.—A seemingly slight improvement in the construction of secondary batteries, and yet one that in certain cases will be of considerable value, has recently been patented by Mr. J. S. Sellon. A great difficulty and expense in the use of accumulators arises from the fact that the plates cannot be separately and easily removed. Usually, if we wish to connect a number of cells in series, all of the positive plates in each cell are connected together by lead strips, which are taken to similar strips connecting the negative plates of the next cell. The terminals of each plate are burned to the connecting-strip; and when one of the plates gives out, and we wish to renew it, we must take out the complete set of plates, cut off the one we wish to renew, and solder on another. Besides being difficult, this takes a good deal of time, and increases the cost of maintenance of the battery; it is obvious, too, that it interrupts its use. Mr. Sellon's idea is to have plates made in pairs, a positive and negative, so connected that when one of them is in one cell the other will be in another. The first and last cells have one set of single plates con-

nected with the terminals of the external circuit. The advantages of this arrangement are, that plates can be removed and renewed without interfering with the action of the battery, and much more easily than if one of a number of connected plates had to be removed. Any improvement in storage-batteries is important at this time, when its advantages, especially for tramway-work, hang in the balance. A slight increase in efficiency will cause their adoption for street-car work, and the invention of Mr. Sellon is in the right direction.

INFLUENCE OF TEMPERATURE ON THE MAGNETIZATION OF IRON.—M. C. Ledebor has made some interesting experiments on the magnetic properties of iron at high temperatures. Many experiments have been made on the same subject; and it has been found that up to three or four hundred degrees there is no great change in the magnetic permeability of iron, while at a red heat its magnetic properties almost entirely disappear. The necessary temperature of the iron bar used in the experiment was obtained by a spiral of platinum wire wrapped around it, separated from it by a layer of mica. Between the platinum and the iron was a small thermo-electric couple, which was used to measure the temperature of the bar. A heavy electric current sent through the platinum spiral could be regulated to give any desired temperature. The bar used was thick as compared with its length, which fact prevented any useful results as to residual magnetism being obtained. M. Ledebor arrives at the following results: up to a temperature of about 680° the magnetic permeability remains nearly constant, after 680° the diminution is very rapid, and the iron ceases to be magnetic at 760°. This range of temperature is about that in which several curious phenomena occur,—an abrupt change in the specific heat, a change in the torsional co-efficient, etc.; and it is probable that a more complete study of iron in this region of temperature will help us to connect phenomena which seem now so different in character.

THE MORDEY ALTERNATING-CURRENT DYNAMO.—This dynamo has revolving magnets and a fixed armature. The latter consists of a number of coils of narrow copper ribbon wound on insulating-cores: they are fixed to project from the inner circumference of a metal ring which is fastened firmly to the bed-plate of the dynamo. The magnet consists of a short iron core, whose axis is the axle of the machine, and which is wound with wire supplied with current from the small dynamo used as an exciter. From each end of the magnet extend arms, which are bent until they are opposite one another, leaving only enough space between for the flat coils of the armature to pass. We thus have a number of poles of the same sign, opposite to which are poles of the opposite sign, while between the poles are vacant spaces. The action of the machine is now easily understood: as the magnet revolves, the armature coils are first opposite pole-pieces, where a number of lines of force pass through them; then in vacant spaces, where there are no lines of force. The variation, of course, produces the electro-motive force of the machine.

INCANDESCENT LAMPS IN EXPLOSIVE GASES.—Lieutenant Hutchins, U.S.N., has been experimenting on the effect of breaking incandescent lamps in explosive gases. The filament of the lamp breaks almost immediately that the glass is broken, and as soon as it breaks, of course, and cools down, the danger is over. The question was whether the breaking and cooling were so rapid that the gases would not be brought to a sufficiently high temperature to explode. With a Swan 16-candle power lamp, in a mixture of hydrogen and oxygen, the gas exploded immediately the bulb was pierced: the filament was not broken. The same result was obtained with marsh-gas. A Maxim lamp was tried in a mixture of coal-gas and air, with a similar result. Lieutenant Hutchins concludes, that, where explosive gases are allowed to collect on board ship, incandescent electric lights are dangerous.

BOOK—REVIEWS.

A Text-Book of Biology. By J. R. AINSWORTH DAVIS. Philadelphia, Blakiston. \$4.

THE number of text-books of biology which have been published within recent years has been, it would seem, sufficiently great to meet all reasonable demands; and yet, after perusing this new one

by Mr. Davis, we are satisfied that it supplies deficiencies which exist in all the text-books which have up to this time appeared. While the others have been largely practical, this one is more theoretical, and, as is indicated on the titlepage, is especially designed to prepare students for their scientific examinations. This design is further elaborated in an appendix, which contains a full bibliography of the works referred to in the text, a series of examination-questions, and an index-glossary. The volume is divided into two parts, — a botanical and a zoölogical, — each of which deals with a number of types morphologically and physiologically, then briefly draws out the points of comparison between them, and ends with an outline of classification.

In Part I., which treats of vegetable morphology and physiology, fungi are first considered; *Saccharomyces*, *Bacteria*, *Mucor mucedo*, and *Penicillium glaucum* being selected as types. Of *Algæ*, the author describes *Protococcus pluvialis*, *Spirogyra*, *Fucus*, *Chara*, and *Nitella*. *Funaria* and *Polytrichum* are selected as representing the mosses. *Pteris aquilina* and *Nephrodium filix-mas*, the ferns; *Pinus*, the gymnosperms. The consideration of the angiosperms follows.

In Part II., which is devoted to animal morphology and physiology, the *Protozoa* are first dealt with through their representatives the *Amæba* and *Vorticella*. The *Hydra* represents *Cœlenterata*; *Distoma* and *Lumbricus*, *Vermes*; *Astacus*, *Arthropoda*; *Anodonta* and *Unio*, and *Helix*, *Mollusca*; *Rana*, *Amphibia*; *Columba livia*, *Aves*; *Lepus cuniculus*, *Mammalia*.

No less than one hundred and fifty-eight well-executed illustrations add to the attractiveness of the book, as well as elucidate the text. We recommend the work not only to those for whom it was originally designed, but to all students and readers who desire to obtain within a small compass the most recent reliable information on the subjects of vegetable and animal morphology and physiology.

Ethics of Boxing and Manly Sport. By JOHN BOYLE O'REILLY. Boston, Ticknor. 12°. \$1.50.

THE main purpose of this book, as stated by its author, is to bring into consideration the high value, moral and intellectual as well as physical, of those exercises that develop healthy constitutions, cheerful minds, manly self-confidence, and appreciation of the beauties of nature and natural enjoyment. He further says, that so long as large numbers of our young people of both sexes are narrow-chested, thin-limbed, their muscles growing soft as their fat grows hard, timid in the face of danger, and ignorant of the great and varied exercises that are as needful to the strong body as letters to the informed mind, such books as this need no excuse for their publication.

The contents of the volume are subdivided into four sections: 1. The ethics and evolution of boxing; 2. The training of athletes tested by every-day life; 3. Ancient Irish athletic games, exercises, and weapons; 4. Canoeing sketches. Under the first the author discusses the question whether boxing has a real value. He believes that it has, and in support of his belief quotes the opinions of Sir Robert Peel, Mr. Evelyn Denison, Lord Althorp, Dr. Oliver Wendell Holmes, and others. Lord Althorp, the minister who led the British Commons when the Reform Bill was passed, was evidently an enthusiast on this subject. He said that his conviction of the advantages of pugilism was so strong that he had seriously been considering whether it was not a duty that he owed to the public to attend every prize-fight which took place, and thus to encourage the noble science to the extent of his power. In speaking of the improvement in modern boxing, the author believes that the English practice of prize-fighting with bare hands and under improper rules has brought boxing into disrepute. He praises Sullivan for having made a manly effort to establish the practice not only of sparring, but of fighting, with large gloves, and for insisting that contests should be ruled by three-minute rounds of fair boxing. The Grecian athletes, their training and skill, and the gladiators of Rome, are referred to and described. Feudalism suppressed popular athletic exercises. With the advent of chivalry, the art of boxing waned and became unfashionable. With the advance of feudalism came the growth of iron armor, until at last a fighting man resembled an armadillo: he was iron-clad from top to toe.

The first modern champion boxer was James Figg, who was considered, in 1729, as the national champion. The first rules for the government of 'the ring' were prepared by Broughton, and were in force from 1743 to 1838.

In discussing the training of athletes as tested by every-day life, the author considers the question from two different standpoints, — that of the professional athlete, and that of the average person who wants to get into lasting 'good condition.' He thinks that the mass of those who live in cities, and whose occupations involve little manual or physical exercise, allow their bodies, at an early age of manhood, to sink out of all trained and athletic strength and shapeliness. He says that it is only necessary to visit a Turkish bath to find abundant evidence of the muscular collapse which has overtaken the modern city-dweller, — bodies 'developed' everywhere in the wrong direction, arms like pipe-stems, while the beautiful muscles of the shoulders and back are smothered in layers of vile fat, and spindle thighs and straight calves weakly support bellies like Bacchus. Excellent hints are given on training and the ways of promoting good health. A large number of illustrations make the volume very attractive, and accounts of canoeing on the Connecticut, Delaware, and Susquehanna Rivers add to the interest which its perusal has excited. The book, taken as a whole, is unique, and treats of questions which have seldom been so well and so thoroughly handled.

Medical Nursing: Lectures delivered in the Royal Infirmary, Glasgow. By J. WALLACE ANDERSON, M.D. 3d ed. Glasgow, James Maclehose & Sons. 16°. \$1.

FOR many years the nurses at this Royal Infirmary of Glasgow have been practically trained in the duties pertaining to their profession. About ten years ago the managers resolved that a course of systematic lectures on nursing should be added to the practical training; and Dr. Anderson was selected to deliver the medical lectures, which are contained in the volume before us. In ten lectures the author has succeeded in condensing a vast amount of information. Modern nursing dates from the year 1836, when Theodore Fliedner, a German-Protestant clergyman, established the Deaconess Institution at Kaiserwerth on the Rhine. There, under the superintendence of himself and his wife, a training-school for female nurses was begun. The labors of Florence Nightingale, with her staff of thirty-seven nurses, in the Crimea, in 1854, are too well-known to need more than a reference. It was from such work as this of Fliedner and Florence Nightingale that all the training-schools for nurses have come. There is now hardly a hospital in the United States that has not such a school in connection with it. The lectures of Dr. Anderson deal with subjects which are essential for every nurse to know: how to obtain and record a patient's temperature, pulse, and respiration; how to prepare food for the invalid so as to make it both nutritious and palatable; how to prevent bed-sores; how to prepare fomentations and poultices. These and many other practical lessons are thoroughly taught in this little volume. In an appendix the author gives valuable recipes for the preparation of food for the sick, and a list of poisons with their antidotes. One feature of the book which we regard as of considerable worth is a list of questions at the end of each lecture. These questions bring out the salient points of the lectures, and direct attention to the most important subjects for study. There have been published other and more pretentious text-books on nursing, but we know of none that in so compact a form contains so many essentials as 'Medical Nursing.'

Bradley's Atlas of the World, for Commercial and Library Reference. Philadelphia, WILLIAM M. BRADLEY & BROTHER, 1887. f°. \$25.

THIS atlas has received high praise from Dr. McCosh, Professor Libbey, Dr. Vincent, General Hazen, and others. The intention of the work is to provide a complete American and foreign atlas, full and detailed, for both hemispheres. Following a somewhat novel plan for an American atlas, the eastern hemisphere is given first. But it is the belief of the publishers that every portion of the world is equally treated. The maps contain the results of recent investigations, so far as this is possible in any atlas of this size, and each map is accompanied with an isometric index. By means of this index the