

ELONGATION AND CONTRACTION OF METALS IN MAGNETIC FIELDS.—The first experiments made by Joule on the effect of magnetization on the length of iron showed that the iron always elongated. Mr. Bidwell has investigated the effects of very much more intense magnetic forces than were used by Joule. At first the iron expanded, but, after reaching a magnetic force of about 90 C.G.S. units, the iron began to contract, reaching its original length at about 280 C.G.S. units, and contracting continuously until the force reached 800 C.G.S. units, the limit of the experiment. Cobalt, nickel, manganese, steel, and bismuth were also experimented on. The two latter were practically uninfluenced in length by the application of any magnetic force. Nickel and cobalt began to contract from the first: nickel continued to contract to the limit of the experiment; cobalt contracted until the value of the force was about 400 C.G.S. units, when it expanded again; not, however, reaching its original value at a force of 800 C.G.S. units.

A NEW ALTERNATING-CURRENT ELECTRO-MOTOR.—Patents have recently been issued to Nickola Tesla for an alternating-current transformer and a motor which embody some novel features. The motor is especially interesting: it is really a modification of a plan proposed by Prof. Elihu Thomson, although the arrangement is different. The armature consists of two coils wound at right angles to each other on an iron core. The coils are short-circuited on themselves, and are not in any way connected with the external circuit of the dynamo supplying the current. The field-magnet consists of an iron ring, the four quadrants being wound with coils, of which the two opposite are connected. The dynamo used to supply the currents has two sets of coils, giving alternating currents of exactly opposite phases. These currents are taken to the motor by separate circuits, and are connected to alternate quadrants of the field-magnet. The action of the motor consists in inducing, by the alternating currents in the field, currents in the closed circuit armature coils, and in alternately attracting and repelling the coils. This motor, then, has no commutator nor brushes, and, if it works, will be the simplest possible means of transforming energy. As to the efficiency and output of this motor, we will have more to say later.

HEATING EFFECT OF ELECTRIC CURRENTS.—M. Cailletet has experimented on the heating of wires by an electric current when the pressure of the air around the wire is increased. He finds that the heating effect is decreased as the pressure increases. A current that would fuse a wire under ordinary pressures, will only raise it to a dull redness when the pressure is increased. This shows the importance of convection in incandescent lamps, and the desirability of the highest attainable vacuum.

VARIATION OF CO-EFFICIENTS OF INDUCTION.—Mr. W. E. Sumpner has experimented on the co-efficients of self-induction of transformers under various conditions. He finds that the co-efficient varies greatly with different conditions of current, etc., and plots curves representing the values for different currents, defining the co-efficient as the rate at which magnetism changes with the current. The results of Mr. Sumpner's work show, perhaps, for the first time, the very great variation in a co-efficient that has been taken as constant in a large number of solutions of problems bearing on the subject of alternating currents. In this connection a series of papers on induction-coils, that is now being published in the *Electrical World*, is important. Heretofore the subject of alternating currents has not been experimented upon in a way to show whether the assumptions that have been made are approximately correct. These 'Experiments on Induction-Coils' show that many of the solutions that have been given are altogether wrong. So far, however, the most important papers of the series have not been published: their appearance is awaited with interest.

NEW METHOD OF READING REFLECTING-INSTRUMENTS.—The following is an abstract from a paper by M. F. Drouin, in the *Lumière Electrique*: "The usual mirror is replaced by a thin disk of glass. The scale being behind the instrument, the observer in front sees the scale directly through the glass; while he sees reflected from the front surface of the glass the image of an object, such as a black line on a white background, placed in front of the instrument and to one side. When the glass disk is deflected through an angle α , the virtual image of the mark is displaced

through a distance $d \cdot \tan 2\alpha$ (d =distance from glass to scale). The method can be used in a well-lighted room, and does away with all the trouble of lamps and shades."

BOOK-REVIEWS.

Tenth Annual Report of the Connecticut State Board of Health for the Year ending Nov. 1, 1887, with the Registration Report for 1886. New Haven, State.

IN addition to the usual official reports and tables of vital statistics, this volume contains a report on river-pollution by Prof. S. W. Williston, M.D., Ph.D., with reports on water-analyses by Prof. H. E. Smith, M.D., and William G. Daggett, M.D. This report is a very valuable and thorough one, and covers nearly one hundred pages. It is the outcome of an act of the Legislature authorizing the State board to investigate and ascertain, as far as practicable, all facts in relation to the pollution of streams and natural waters of the State by artificial causes, in order to determine the sanitary and economic effects of such pollution. In the report are described the chemical processes employed in the manufacture of brass, iron, paper, woollen, cotton, and silk goods, hats, and rubber goods, and the impurities which are cast into the streams of the State from these manufactories. In the analyses of the water, both the biological and chemical methods were employed.

The annual report also contains reports on an epidemic of dysentery in Thomaston, by R. S. Goodwin, M.D. In this report the author presents the following conclusions as a result of his study of the epidemic: "that the outbreak of dysentery at Thomaston, and at every other town on the Naugatuck River, occurred in consequence of the co-operation of several favorable influences. These were a certain season, a certain high temperature, a certain favorable location, unsanitary modes of living, and the use of impure drinking-water. Nevertheless, infection with a certain specific poison was the sole cause of this disease, and the rôle played by these influences in its etiology was only to increase the predisposition to the affection by rendering the human organism more sensitive to the action of this unknown poison."

Dr. C. W. S. Frost contributes a sanitary report of the city of Waterbury, from which it appears that small-pox, diphtheria, measles, and dysentery prevailed during the year.

Dr. F. E. Beckwith has contributed remarks on the recent outbreak of typhoid or enteric fever at Southampton, L.I. Just why this report is printed in the 'Annual Report of the Connecticut State Board of Health,' does not appear, unless the explanation is to be found in the following paragraph: "The sanitary suggestions which close the paper apply not only to Southampton, but to every small seaside resort in a developing state, where there are similar conditions of soil, surface of country, and water-supply." The remarks are instructive and to the point, and are worthy a place in the report.

Eleventh Annual Report of the Board of Health of the State of New Jersey, and Report of the Bureau of Vital Statistics, 1887. Trenton, State.

In this report are the following papers: 'The Legal Aspect of the Pollution of Streams,' by E. S. Atwater; 'Air, Water, and Food,' by Ezra M. Hunt, M.D.; 'Outlines of Representative Sewer Systems,' by J. J. Croes, C.E., F. S. Odell, C.E., George P. Olcott, C.E., C. P. Bassett, C.E., and Charles McMillan, C.E.; 'Exposure and Diseases of Operatives,' by D. Warman, M.D.; 'Typhoid-Fever at Mount Holly,' by E. M. Hunt, M.D.; abstracts from papers and discussions of the New Jersey Sanitary Association; 'Report on the Water-Supply from the Passaic Watershed,' by Prof. A. R. Leeds, Ph.D.; and reports from the health-inspectors. The board's report also contains a list of persons practising medicine in the State.

In his paper on air, water, and food, Dr. Hunt discusses the influence of impure air on the death-rate, and refers to the investigations of this subject by Messrs. Carnelly and Haldane of University College, Dundee; and also those of Dr. Anderson, the health-officer of that city. Several experiments showed that the average of carbonic acid and organic matter was uniformly higher in town than in suburban or country air, and that in open places the carbonic acid

during the night was less than during the day, as also the organic matter. Micro-organisms were less at night than in the day. In examining the air of the rooms of houses, it was found that carbonic acid, organic matter, and micro-organisms diminished in quantity as the cubic space per person increased from one hundred to one thousand cubic feet. The death-rate from phthisis was highest in three-roomed houses, which is accounted for by the fact that pulmonary consumption is seldom in the form of tubercular disease in young life; and in one and two roomed houses much fewer live to the consumption age, so as to diminish the material, and so make the actual death-rate lower. In reference to the purification of air independent of mechanical methods, the following recommendations are made: cleanliness of person and dwelling, and open-air spaces; frequent change of the air of the room; windows should be made to open above and below, and both sashes should be used as much as possible; the practice of having a lamp burning all night in bedrooms in small houses is greatly to be deprecated, as the heat, the organic matter, and the carbonic acid aid in the reduction and deterioration of the air. Dr. Hunt discusses schoolroom ventilation, and gives a large number of results of tests of the air in the schools of Hoboken. In speaking of water-analysis, he refers to the biological tests, and says that it would be premature as yet to claim any very determinate results, although much has been found that is valuable for comparison with chemical analyses. Dr. Hunt does not think it to be an important function of a health board to deal with the question of adulterated mustard or spices, nor with the sale of oleomargarine, inasmuch as it has never been shown that there is any serious risk to health in their use. He appreciates the desirability of preventing commercial frauds, but does not regard this as a function of health laws.

In the paper on sewer systems, descriptions are given of the drainage and sewerage of the Lawrenceville School, Mercer County, N.J., and of the systems of Long Branch, East Orange, and Morris Plains.

The article on exposures and diseases of operatives is in the line of valuable work which the State board has been pursuing for some time; namely, an inquiry into the condition of workshops and factories, and as to the influence of the various trades and occupations upon the lives and health of operatives. The chief report this year is upon the pottery industry. Dr. Warman gives the results of his investigation of this industry in the following recapitulation: (1) that dust, and the liability to inhale it, is the principal cause of potters' asthma and potters' consumption; that the greatest number of sufferers from the above-named diseases occurs among 'china scourers'; (2) the greatest sufferers from lead-poisoning are dippers, and those assisting them, — glost-placers, mixers of colors, ground-layers, majolica and other painters, and those who 'fettle' ware after it is dipped; (3) that the pottery workmen most liable to rheumatic affections are ovenmen and kilnmen, who are greatly exposed to heat and strong draughts; they also suffer much from colds contracted from the sudden checking of the perspiration, which often terminates in acute inflammations of the chest; (4) that those engaged in sedentary occupations suffer most from disorders of the digestive organs, liver, and stomach, followed by general debility, defective blood-making, and hence bloodlessness, sensitiveness to cold, constipation, and a tendency to internal congestions; (5) the auxiliary causes are neglect of cleanliness, in work, in shops, in dress and in personal habits, inattention to ventilation and to the heat and moisture of the workshop, intemperance, and irregular living; that a large majority of workers do not remain continuously at the work for more than from fifteen to twenty years; finally, that the removal of the exciting cause or causes is the only rational means of preventing or interrupting the diseases of potters. Statistics show that pottery operatives in this country are in better health than those in the Old World.

Evolution and its Relation to Religious Thought. By JOSEPH LECONTE. New York, Appleton. 12°. \$1.50.

It is always with a deep sentiment of respect that we take up a book in which an earnest thinker expresses his views which embody a life's work, — the work of the author's mind in settling the puzzling questions that offer themselves at one time or another to every man; and the work of the subjects that have occupied him for

years and years upon the evolution of his mind. For it cannot be but that the latter influence makes certain points of view more important to one man's mind than to that of another, and accordingly their final conclusions will differ either fundamentally, or at least to a certain extent. It is therefore not with the expectation that we will find *the* truth in a book setting forth the opinions of a man — for we doubt whether such truth exists — that we read a book of this kind, but it is the æsthetical and ethical pleasure we look for in listening to opinions that are true to one principle, and therefore consistent. It is with this feeling that we read Professor LeConte's book with the greatest interest and gratification.

His explanation of evolution in the introductory chapter opens a clear view to his thoughts: "Every system of correlated parts may be studied from two points of view, which give rise to two departments of science. The one concerns changes within the system by action and re-action between the parts, producing equilibrium and stability; the other concerns the progressive movement of the system, as a whole, to higher and higher conditions. . . . The one concerns things as they are, the other the process by which they become so." This idea has been expressed by other writers by the words, 'evolution is part of the science of history as opposed to the science of physics.' The author then proceeds to define evolution, which he calls "a progressive change according to certain laws by means of resident forces." It is not the object of this review to follow the author in his argument for proving the truth of evolution in the sense as here described. Neither is this argument the principal object of the book, which is an explanation of the relation of evolution to religious thought. The author emphasizes justly that by accepting the law of evolution we do not become materialists any more than by accepting the law of gravitation. In setting forth his views as to the relation of man to nature, he assumes physical and psychical phenomena as equally true, but their connection as only intelligible to an intelligence superior to that of man. He believes that in man physical changes may be produced by psychical changes, while in animals only the reverse is the case. His views on the relation of God to man are an attempt to reconcile the theological and positivistic views — as we should say, instead of LeConte's materialistic — from the standpoint that both contain some truth, and that God is immanent in nature. These conclusions are as much dictated by feeling as by reasoning, and therefore they will be convincing and satisfactory to some men, while they cannot claim to be as firmly founded as the results of scientific investigations.

Accidents and Emergencies. By CHARLES W. DULLES, M.D. 3d ed. Philadelphia, Blakiston. 16°. 75 cents.

IN the preface to this edition the author says that whoever has seen how invaluable, in the presence of accident, is the man or woman with a cool head, a steady hand, and some knowledge of what is best to be done, will not fail to appreciate the desirability of possessing these qualifications. To have them in an emergency, one must acquire them before it arises, and it is with the hope of aiding any who wish to prepare themselves for such demands upon their own resources that the suggestions contained in the book have been put together. They cannot take the place of calling a physician or surgeon, but may fill up with helpful action what might otherwise be a period of inaction and despair before skilled assistance arrives.

Among the many topics treated are drowning, suffocation, choking, foreign bodies in the eye, nose, and ear, fits, sunstroke, sprains, dislocations, fractures, wounds, hemorrhage, poisons, etc. The book also contains a list of the supplies which are necessary to meet such emergencies as are liable to arise in every family, and gives the doses and uses of the medicines commonly found in the family medicine-chest. The illustrations are good and sufficiently numerous. In order to make this little treatise available for sudden necessity, pains have been taken to make the index as complete as possible, and the typography has been so arranged that leading words may catch the eye on every page. The language is simple, being entirely devoid of technicalities, and the methods of treatment recommended are trustworthy and reliable. The manual is one of the best of this class of books, and should be in the library of every householder, ready for reference at a moment's notice.