

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