

fear; its bodily effects and expression; its relation to health (the weak are more subject), to intellectual development (no relation), and to development of imagination (active imaginations are more subject); the proportion of children subject to it (all, in some degree; exceptionally, about 10 per cent. of boys and 30 per cent. of girls, by rough estimate); the influence of contagion, over-excited imagination, ill-treatment, in its production; and the best method of cure. As to cure, the method must vary; in some cases the best means is attention to the state of health; in others, the naturally curative effect of time; in others, moral treatment. For the latter the most important precepts are: Avoid corporal punishment, threats and mockery; suppress the circumstances which produce fear; guard against over-excitement of imagination; give the child self-confidence; train him gradually and progressively in acts of courage.

C. General Reviews.

(1) DR. AZOULAY: *Recent theories, histological and mechanical, of the functioning of the central nervous system.* (Pp. 255-294.) A resumé of the present state of knowledge in regard to the structure of the nervous system, followed by a detailed exposition and criticism of the theories as to its mechanism recently advanced by Rückardt, Lepine, Duval and Cajal.

(2) V. HENRI: *The sense of locality of the skin.* (Pp. 295-362.) Reviews the literature of the subject and the results of experiment, from the time of Weber (1834) to the present; and gives a bibliography of 156 titles.

(3) J. PASSY: *Olfactory sensations.* (Pp. 363-410.) An account of the as yet very incomplete researches in this field.

(4) BINET and HENRI: *Individual Psychology.* (Pp. 411-465.) Insists on substituting for the a priori classifications of characters which have heretofore prevailed, deductions from actual measurements of individual differences in fundamental mental processes. Gives a brief historic summary of the questions thus far studied in individual psychology; and maintains that investigations in this field have confined themselves largely to sensations, whose individual differences are slight and insignificant compared with those of the higher mental processes. A series of more fundamental tests is recommended

which include: memory—for geometrical forms, for paragraphs, for music, colors, series of figures nature of mental images; imagination, passive and constructive; attention, its duration, extent, concentration; power of understanding, observing, defining and distinguishing; suggestibility; æsthetic feeling; moral feeling; muscular force and force of will; motor ability and accuracy of estimates made by the eye. Explicit directions are given for each of these.

(5) V. HENRI: *The calculation of probabilities in psychology.* An able paper, developing formulæ for the calculation of such probabilities as have importance for psychology: determination of averages, of the possibility, nature and laws of variations from the average, of probable errors, of the existence of causes other than pure chance in certain results, etc. The author criticises current interpretations of veridical death-coincidences, and of 'thought-reading' experiments, and more at length the methods of calculation used for many psychological investigations.

E. B. DELABARRE.

BROWN UNIVERSITY.

The Gas and Oil Engine: By DUGALD CLERK.

Sixth Edition, revised and enlarged. New York, John Wiley & Sons. 1896.

This important work was first issued ten years ago by its author, who was at once recognized as an authority on the subject chosen for his study. Mr. Clerk is an engineer of large experience in this field, an inventor of great talent, and a builder of steam and gas-engines of reputation and success. He has, in this work, given to his profession and to the public an admirable account, historical, scientific and practical, of this remarkable and increasingly important class of heat-engines which is at once one of the most complete, accurate and detailed yet published. It has found a large sale in this country as well as in Europe, and constitutes one of the most generally satisfactory and useful of all existing treatises on the subject in any language. While not as complete in its collection of working drawings for use in the engine-builder's establishment as is the work of Mon. Richard, and while in some respects less elaborate in some portions of its purely scientific discussion of the theory of the

machine than others, it is, on the whole, unexcelled by any.

Since the issue of the first edition many inventions and improvements in this class of engine have been made, and the oil-engine, particularly, has been enormously perfected and widely introduced. The author has introduced into this edition two additional parts, has discussed the modern gas-engine more fully in the second part, and has devoted the third part entirely to the now well-established forms of oil-engine. He has drawn largely from his personal experience in this work, and has given a very thorough and remarkably judicial discussion of the merits, absolute and relative, of existing and commercially successful types and forms. Appended to the text is a complete list of British patents, from 1791 to its date, which will be found by the professional reader an exceeding valuable feature of the book.

The illustrations have been reproduced from working drawings and by expert draughtsmen. The originals have been obtained from many prominent makers as well as from the author's own portfolios.

The practical value of the work is, perhaps, best indicated by the fact that it has been translated into foreign languages and is adopted as a reference and text-book by many technical schools and colleges. For this latter use it is particularly well-adapted by its thoroughly logical form and exceptionally scientific methods. The author is entitled to the hearty thanks of all who are interested in his subject, and the publishers are no less deserving of credit for their admirable and conscientious work in making up the book. It is well-written and well-published, and will be found a real accession to every engineer's library in which it may find a place. It may well be questioned if any other work on this subject will prove more generally useful. R. H. THURSTON.

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SCIENTIFIC JOURNALS.

PHYSICAL REVIEW, VOL. IV., NO. 2, SEPT.-OCT.

The Velocity of Electric Waves: By C. A. SAUNDERS. In this article Dr. Saunders describes experiments by which the velocity of

electric waves traveling along wires was directly determined. The method involved the measurement of the length of stationary waves developed on long copper wires, and at the same time the determination of the frequency of these waves. The latter determination was made by photographing the oscillatory spark from which the waves in question originated. The method used seems quite similar to that employed by Prof. Trowbridge and Mr. Duane, and the results indicate about the same value for the velocity, viz., from 2.954×10^{10} cm. per sec. to 2.998×10^{10} cm. per sec. The method used is seen to be a *direct* one, and does not depend upon any assumption regarding the manner in which the oscillations are set up. The close agreement obtained between the velocity of electric waves and velocity of light is for this reason especially satisfactory.

On the Measurement of the Expansion of Metals by the Interferential Method, II.: By E. W. MORLEY and W. A. ROGERS. In the first part of this paper the general outline of the method used, as well as many of the important practical details, were discussed. In the present article the numerical data are given for a test of the method, and the computations of the results are presented. Using a bar of Jessop's steel, the authors find for the coefficient of expansion between the temperatures of 0 and 65° a value of 10.45 μ . This result compares quite favorably with the values 10.58 and 10.51 obtained by other methods. The authors do not consider, however, that the method has been given a fair trial, since a series of accidents caused the temperature measurements to be far less accurate than was to be desired.

An Experimental Study of Induction Phenomena in Alternating Current Circuits: By F. E. MILLIS. In the present article Dr. Millis has devoted his attention especially to the phenomena of charge and discharge in condenser circuits, making use of the alternating current galvanometer previously described by himself and Mr. Hotchkiss. The current curves for charge and discharge, under a variety of conditions, have been photographed. The needle used, which was so light as to follow the variations in cur-

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R. H. THURSTON

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