SCIENCE ABSTRACTS.

SECTION A.—PHYSICS.

VOL. XII.
1909.

Issued by the
INSTITUTION OF ELECTRICAL ENGINEERS,
92, VICTORIA STREET, LONDON, S.W.;
Compiled and Edited by the Institution, in association with
THE PHYSICAL SOCIETY OF LONDON;
With the Co-operation of
THE AMERICAN PHYSICAL SOCIETY,
THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, and the
ASSOCIAZIONE ELETTROTECNICA ITALIANA.

LONDON:
E. & F. N. SPON, LIMITED, 57, HAYMARKET, S.W.
NEW YORK:
SPON & CHAMBERLAIN, 123, LIBERTY STREET.

SCIENCE ABSTRACTS.

Section A.—PHYSICS.

JUNE 1909.

CONTENTS.

GENERAL PHYSICS.

* Asterisk means Author of paper or remarks.

SCIENCE ABSTRACTS.

Section A.—PHYSICS.

JUNE 1909.

GENERAL PHYSICS.

962. *Camera for Recording Scale-readings.* **J. R. Milne.** (Roy. Soc. Edinburgh, Proc. **29**. pp. 176–181, 1908–1909.)—Describes a camera designed to take a series of photographs of the scale and vernier of a polarimeter or other instrument, which, on subsequent examination, will show the relative position of the scale and vernier at the time of each exposure. The camera is focussed on the scale and vernier, which must be made so that the scale moves, the vernier remaining stationary, and the scale is illuminated in any convenient manner. A simple mechanism is used to make the exposure and to cause the plate to move on to a new position after the exposure is made. In this way 60 photographs, in rows of 10 each, can be obtained on a 5 × 4 in. plate. In order to identify individual photographs, or to indicate the commencement of a new series of records, a means is provided whereby a single or a double wedge-shaped mark can be produced on the photographs, and, to save counting, a bell rings at each tenth exposure. The advantages claimed for this method of making photographic records of the readings of an instrument are: (1) The saving of labour and strain to the eye of the observer, which is left in a better condition for its principal work. (2) The elimination of the possibility of errors of reading on the part of the observer. (3) The great saving of time which is effected. (4) The elimination of all personal bias due to a knowledge of the results that are being obtained. (5) The securing of a permanent record of the readings. A. W.

963. *Analytical Machine.* **P. E. Ludgate.** (Roy. Dublin Soc., Proc. **12**. 9. pp. 77–91, April, 1909.)—The author here gives a short account of the result of six years' work undertaken with the object of designing machinery capable of performing calculations, however intricate or laborious, without the immediate guidance of the human intellect. In some respects the proposed machine resembles Babbage's analytical engine, but in others differs considerably, for while Babbage designed two sets of Jacquard-cards, one set to govern the operations and the other set to select the numbers to be operated on, the author uses one sheet or roll of perforated paper to perform both these functions in the order and manner necessary to solve the formula

***Science Abstracts: Section A.—Physics**, Institution of Electrical Engineers, in association with The Physical Society of London, The American Physical Society, The American Institute of Electrical Engineers, and the Associazione Elettrotecnica Italiana, London, Vol.XII, E. & F. N. Spon, London, 1909.*

to which the particular paper is assigned. Each row of perforations across the formula-paper directs the machine in some definite step of calculation—such as, for instance, a complete multiplication, including the selection of the numbers to be multiplied together. The machine prints all results, and, if required, the data, and any noteworthy values which transpire during the calculation. The mechanical details are too complex to deal with briefly. A. W.

964. *Testing-machine for Combined Bending and Torsion.* **E. G. Coker.** (Phil. Mag. 17. pp. 496–502, April, 1909. Paper read before the Physical Soc., Feb. 26, 1909.)—The specimen bar is suspended at two points which it overhangs equally at each end. Equal weights hang at the ends, so that there is a uniform bending moment between the points of suspension. The rod is also twisted by two equal weights hanging from two equal levers, one standing out from each side, placed at the points of suspension. (In the machine one of these levers is replaced by a worm and worm-wheel torsion head mounted in trunnions.) An instrument is also described which can be used to measure either the elastic torsion or elastic bending strain. It consists in principle of a reading microscope attached to one end of the length under observation, by means of which the movements of a wire carried by the other end can be measured. F. R.

965. *Recent Experiments on Elasticity.* **G. Ercolini.** (N. Cimento, 17. pp. 85–94, Jan.–Feb., 1909.)—The paper is a review of recent work on elasticity, in particular that of Cantone for small deformations and of Bouasse [see Abstract No. 1225 (1908)] for large deformations. Extension, flexure, and torsional strain are all considered, and the results are extremely complex. Amongst other conclusions it is pointed out that the damping of vibrations is due to the dissipation of energy corresponding to the hysteresis effect on taking the specimen through a cycle of strain, and not to "molecular friction." Also it is pointed out that the metals are only rendered isotropic to a very approximate extent by annealing. S. G. S.

966. *Shear Strength and Elasticity.* **M. Grübler.** (Zeitschr. Vereines Deutsch. Ing. 58. pp. 449–455, March 20, 1909.)—Shear stress was applied to short hollow cylinders of 1 : 3 cement mortar mounted upon a shaft and surrounded by a clamp to which levers were attached. The shear stress would thus be uniform at all points at the same distance from the axis. The modulus of elasticity in shear, G, rapidly fell with increasing load to about 2,000 atmos. Failure did not occur in shear in any case, although a max. shear stress, S, of 39·56 atmos. was applied, so that the shear strength must be higher than this figure. Failure occurred by tension in each test. From former experiments [see Abstract No. 578 (1907)] it is known that Young's modulus E is at least 60,000 atmos. and the tensile strength T less than 27 atmos., so that in both respects this material disagrees with the elastic theory of isotropic materials which requires $G > \frac{1}{4} E$ and $S < T$. F. R.

967. *Test of Large Pipe.* (Eng. News, 61. p. 420, April 15, 1909.)—Describes the test of a 42-in. diam. pipe, about 20 ft. long, $\frac{7}{8}$ in. thick, in connection with the contract for the 12-mile main of Springfield waterworks. The max. head in service would be about 150 lbs. per sq. in. The test was abandoned at 1,050 lbs. per sq. in., the stress then being about 50,400 lbs. per sq. in. The circumference had then increased by about 4 in., and the "lock-bar" joints

For the **Explanation** of this Index see p. 755.