

3.43 miles (5.53 km.) at a depth of 400 miles, and 4.25 miles (6.84 km.) at depths greater than 1000 miles.—Prof. W. H. Metzler: A determinantal equation the roots of which are the products of the roots of given equations.—Prof. R. A. Sampson: Studies in clocks and timekeeping. (1) The theory of maintenance. This paper, the first of a series of studies which are in course of execution at the Royal Observatory, Edinburgh, describes in outline the arrangements of the thermostat chamber, etc., and the construction of the three clocks, Riefler 258, Synchrone, and Cottingham, upon which most of the studies are made. Its direct occupation is, however, chiefly theoretical, considering with sufficient detail various dynamical points which arise from the suspension and different maintenances of the clocks and the derivation of a satisfactory differential equation of the motion when the internal resistance is taken into account. The solution of this equation presents some novelty, showing that the frequency in maintained motion is dependent upon the first power of friction, not the second, as has hitherto been held. The discontinuous maintenance is resolved into a Fourier series, and expressions are found for calculating the escapement error and the arc described in each case. In the case of the three clocks above the calculated arcs are numerically verified by comparison with their actual performance.

BOOKS RECEIVED.

Laboratory Glassware Economy. By Prof. H. B. Dunningcliff. Pp. x+92. (London: Macmillan and Co., Ltd.) 4s. net.
 Hand Grenades. By Major G. M. Ainslie. Pp. v+59. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 6s. net.
 Text-Book of Ordnance and Gunnery. By Lt.-Col. W. H. Tschappat. Pp. x+705. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 30s. net.
 A Text-book in the Principles of Science Teaching. By Prof. G. R. Twiss. Pp. xxvi+486. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 7s. 6d. net.
 A Short History of Science. By Prof. W. T. Sedgwick and Prof. H. W. Tyler. Pp. xv+474. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 12s. 6d. net.
 A Text-Book of Physics for the Use of Students of Science and Engineering. By J. Duncan and S. G. Starling. Pp. xxiii+1081. (London: Macmillan and Co., Ltd.) 15s.
 Applied Mechanics. Second Year. By H. Aughtie. Pp. 227. (London: G. Routledge and Sons, Ltd.) 2s. 6d. net.
 Airfare of To-day and of the Future. By E. C. Middleton. Pp. xv+192. (London: Constable and Co., Ltd.) 3s. 6d. net.
 The Edinburgh School of Surgery before Lister. By A. Miles. Pp. viii+220. (London: A. and C. Black, Ltd.) 5s. net.

DIARY OF SOCIETIES.

THURSDAY, FEBRUARY 21.
 ROYAL SOCIETY, at 4.30.—The Scattering of Light by Spherical Shells, and by Complete Spheres of Periodic Structure, when the Refractivity is Small: Lord Rayleigh.—The Nature of Heat as Directly Deducible from the Postulate of Carnot: Sir Joseph Larmor.—Curved Beams: J. J. Guest.—(1) Monoclinic Double Selenates of the Iron Group; (2) Selenic Acid and Iron. Reduction of Selenic Acid by Nascent Hydrogen and Hydrogen Sulphide. Preparation of Ferrous Selenate and Double Selenates of Iron Group: Dr. A. E. H. Tutton.
 INSTITUTION OF ELECTRICAL ENGINEERS, at 6.—Switchgear Standardisation: Dr. C. C. Garrard.
 INSTITUTION OF MINING AND METALLURGY, at 5.30.

NO. 2521, VOL. 100]

CHEMICAL SOCIETY, at 8.—Recent Studies on Active Nitrogen: Hon. R. J. Strutt.
 LINNEAN SOCIETY, at 5.—Notes on the Bionomics, Embryology, and Anatomy of Certain Hymenoptera Parasitica, with Special Reference to *Micragaster connexus*. Nees: J. Bronté Gatenby.—Experimental Studies in the Specific Value of Morphological Characters in the Fungi: W. B. Brierley.
 FRIDAY, FEBRUARY 22.
 PHYSICAL SOCIETY, at 5.—Note on the Use of Approximate Methods in Obtaining Constructional Data for Telescopic Objectives: T. Smith.—A Suggestion as to the Origin of Spectral Series: Dr. H. Stanley Allen.
 SATURDAY, FEBRUARY 23.
 ROYAL INSTITUTION, at 3.—Problems in Atomic Structure: Sir J. J. Thomson.
 MONDAY, FEBRUARY 25.
 ROYAL SOCIETY OF ARTS, at 4.30.—The Economic Condition of the United Kingdom Before the War; the Real Cost of the War, and Economic Reconstruction: E. Crammond.
 ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—A Recent Journey in East Africa: Comte Renauld de Briey.
 TUESDAY, FEBRUARY 26.
 ROYAL INSTITUTION, at 3.—A National Laboratory of Industrial Research: Sir R. T. Glazebrook.
 ILLUMINATING ENGINEERING SOCIETY, at 5.—A Survey of Methods of Directing and Concentrating Light: Lieut.-Commander H. T. Harrison.
 WEDNESDAY, FEBRUARY 27.
 ROYAL SOCIETY OF ARTS, at 4.30.—Organisation of Commercial Intelligence: Sir W. H. Clarke.
 THURSDAY, FEBRUARY 28.
 ROYAL SOCIETY, at 4.30.—*Probable Papers*: Scattering of Light by Dust-free Air, with Artificial Reproduction of the Blue Sky. Preliminary Note: The Hon. R. J. Strutt.—The Lommel-Weber Ω Function and its Application to the Problem of Electric Waves on a Thin Anchor Ring: Dr. J. R. Airey.—Investigations on Textile Fibres: W. Harrison.—Critical Loading of Struts and Structure: W. L. Cowley and H. Levy.
 FRIDAY, MARCH 1.
 ROYAL INSTITUTION, at 5.30.—The Modern Dye-stuff Industry: Prof. A. G. Green.
 SATURDAY, MARCH 2.
 ROYAL INSTITUTION, at 3.—Problems in Atomic Structure: Sir J. J. Thomson.

CONTENTS.

	PAGE
Heat-drop Tables. By Sir J. A. Ewing, K.C.B., F.R.S.	481
The Ethnological Value of Shells. By Dr. A. C. Haddon, F.R.S.	482
Marine Biology and Fish Culture	482
Our Bookshelf	483
Patents and Scientific Research	484
Precious Stones and Platinum in 1916	486
Prof. G. A. Lebour. By J. A. S.	487
Dr. John McCrae	487
Notes	488
Our Astronomical Column:—	
Relativity and Gravitation	492
The System of κ Pegasi	492
Forthcoming Books of Science	492
Primitive Cults	494
Sulphur in the United States	494
Science as a Vehicle of Education. By Prof. T. Brailsford Robertson	495
University and Educational Intelligence	497
Societies and Academies	498
Books Received	500
Diary of Societies	500

Editorial and Publishing Offices:

MACMILLAN AND CO., LTD.,

ST. MARTIN'S STREET, LONDON, W.C.2.

Advertisements and business letters to be addressed to the Publishers.

Editorial Communications to the Editor

Telegraphic Address: PHUSIS, LONDON

Telephone Number: GERRARD 8830.