

The Nautic-Astronomical and Universal Calculator. The Mechanical Solving of all Arithmetical Problems, Plane and Spherical Trigonometry, including Terrestrial and Astronomical Navigation. By R. Nelting. Pp. 67. (Hamburg: R. Nelting, 1909.) Price 4 marks.

IN many numerical processes there has been too great a tendency on the part of computers to employ more decimal places than are necessary, and to use logarithms where more direct methods would be effective. The introduction of mechanical contrivances for the performance of arithmetical operations has brought the problem of a possibly greater simplification of calculation more to the front, with the result that some neglected resources have been made available. One outcome has been the improvement in accuracy and ingenuity in construction of sliding scales for obtaining an approximate solution of many simple problems. With increased usefulness, however, comes a tendency to increase the number of moving parts and to give greater variety to the system of dividing, but this more complicated mechanism often destroys the simplicity of construction which is one great merit in the sliding scale. Certainly, the invention described by Mr. Nelting does not err on the side of simplicity. The inventor claims for his calculator that it will give the logs. of numbers, with their squares and square roots; the values of trigonometrical functions of sine, tangent, cosecant and cotangent of angles, whether expressed in time or in arc; tables of reciprocals with their squares and square roots. In addition to many other combinations, the scales can be used for facilitating or completely solving problems required in nautical astronomy connected with altitude, longitude, and latitude, with an accuracy sufficient for the purposes of navigation. Unfortunately, we have not had an opportunity of studying the mechanism, and the rules that are given for its use are not easily followed when the necessary constructions cannot be made. Moreover, the description is obscure in many parts.

The Theory of Electric Cables and Networks. By Dr. Alexander Russell. Pp. x+269. (London: A. Constable and Co., Ltd., 1908.) Price 8s. net.

WE opened this book expecting to find it filled with the solutions of rather unpractical problems, the solutions, however, being of considerable importance in higher mathematics. We find that it is a very practical treatise which will prove useful to the increasingly numerous class of electrical engineers who deal with distributing networks, their insulation and faults. The last two chapters, on electrical safety valves and lightning conductors, are particularly good. J. P.

LETTERS TO THE EDITOR.

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On the Relation of "Recoil" Phenomena to the Final Radio-active Product of Radium.

IN the course of some experiments made by Miss Brooks (NATURE, July 21, 1904, vol. lxx., p. 270) on the active deposits from radium, it was found that the active product, radium B, escaped in some manner from a body which had been rendered active in the presence of radium emanation, and was carried at low pressures to the walls of the containing vessel. In his interpretation of this result, Rutherford ("Radio-activity," p. 392) suggests the possibility of the phenomenon being due to a recoil effect rather than to a volatility possessed by the product radium B.

Radium A atoms, in breaking up, are known to emit α particles with a velocity of 1.7×10^9 cm. per sec., and as the mass of the α particle is 4 ($H=1$) and that of the radium B atom approximately 200, it is clear from the explosive nature of the disintegration of the radium A atoms that the radium B atoms must be hurled away with a considerable velocity in directions opposite to those in which the α particles are projected.

Recent papers by Otto Hahn and Lise Meitner (*Verh. der deut. phys. Ges.*, xi., Jahr No. 3, and *Phys. Zeit.*, 10 Jahr, p. 81) and by Russ and Makower (*Proc. Roy. Soc.*, No. 5, 553, p. 205, May 6) contain descriptions of experiments which confirm the truth of Rutherford's explanation, and also show that it is possible to isolate the radio-active products, radium A, B, and C, thorium D and actinium X and C, through the agency of this recoil action alone.

Other examples of this recoil phenomenon are also contained in the recent experiments of Debierne (*Le Radium*, April) and in those of Kennedy on the active deposit from actinium (*Physical Review*, May).

In considering these examples of the recoil effect, the question naturally arises of a possible connection between this phenomenon and the final transmutation product of radium. Radium G (polonium) is known to emit α rays, and when deposited on plates of copper, as Logeman and others have shown, to emit also a feeble δ radiation. From the illustrations which have been cited above it seems clear that here also the recoil phenomenon should manifest itself in the projecting from such radium G coated plates of atoms of the final radio-active product.

Evidence of such projection has recently been obtained in the physical laboratory at Toronto by Mr. V. E. Pound. In his experiments an insulated plate of copper, A, approximately 3 sq. cm. in area, which was coated with a deposit of radium G, was placed in a highly exhausted chamber facing a second insulated plate of copper, B. The plate B was joined to an electrometer, and the electrical charges which it acquired under various electric and magnetic fields were observed.

With moderate electric and magnetic fields results similar to those of Logeman, Ewers, Aschkinass, and others were obtained, and from the form of the charging curves which were obtained in such circumstances it was clear that at least three types of radiation were present and exerted an effect of greater or less degree on the charge acquired by the plate B, viz.:—(1) the α rays emitted by plate A; (2) easily absorbed δ rays emitted by plate A; and (3) an easily absorbed secondary radiation emitted by plate B, consisting of negatively charged particles.

With higher magnetic fields, however, an entirely new phenomenon appeared. With such fields, especially when the plate A was charged to an increasingly high positive potential, it was found possible gradually to increase the positive charge acquired by the plate B. As such higher magnetic fields were sufficient to prevent the secondary radiation from leaving the plate B, and the high positive potentials were sufficient to retain the δ radiation on the plate A without affecting the α radiation, it seems evident that the rise in the positive charge acquired by the plate B was due to the existence of a radiation of negatively charged particles from the plate A which had hitherto escaped detection, but which in these experiments were deflected by the magnetic field. When the plate A was neutral or negatively charged, the application of the magnetic field failed to give any indication of the presence of this radiation, but with the application of a potential of 160 or 240 volts (positive) to the plate A it could be readily brought into evidence. It is of interest to see, therefore, that in this case a positive electric field united with a magnetic field was the means by which the radiation was isolated.

The experiments are being continued, and it is too early at present to write more definitely regarding the new radiation. It seems, however, highly probable that this radiation can be attributed to the "rest-atoms" of the active product radium G. The expulsion of an α particle would leave this rest-atom negatively charged. Such rest-atoms would leave the plate in all directions as a stream of negatively charged particles. They would be less pene-