

Cynosurus cristatus is included. This latter species is of limited value, and in permanent pasture only.

Genera are given pp. 4-11, and the following fifty pages are occupied by an account of those species which have up to the present been found in Great Britain or Ireland. The rest of the book is devoted to the sedges. The derivations of the names of genera are mostly given, as well as the French and German synonyms of the different species discussed. The illustrations are satisfactory, and are in general given for those species which are most common. That of *Triticum repens*, on p. 32, is perhaps exceptional. The beginner very often confuses the spike of this grass with that of some varieties of rye-grass. The spikelets of the latter are set edgewise to the rachis, whilst those of the former have their flat sides to the rachis; if the beginner is still in doubt the rootstock can be examined; this is stoloniferous in the case of couch-grass.

Elementary Plane Trigonometry. Clarendon Press Series. By R. C. J. Nixon, M.A. (Clarendon Press, Oxford, 1892.)

THE author in his preface informs us that in writing this book he has tried to free his mind as far as possible from all current text-books, and to base this one solely on his experience of twenty-five years. That he has done this is soon seen when glancing through the pages, for the order of arrangement and general basis differ very considerably from those usually adopted. The line of demarcation he draws between elementary and higher works lies in the use and non-use of the symbol $\sqrt{-1}$, thus avoiding here altogether the use of imaginaries. An omission which may seem rather questionable is that of the theory of logarithms, which is here excluded as it does not appertain to trigonometry proper; the beginner is not left entirely without logarithms themselves, for there are two chapters in which he can make a slight acquaintance with them, together with one on the adaptation of formulæ to logarithmic calculation. Throughout the work the author has made a strong point of giving in their fulness and generality all definitions and proofs, while he has added also numerous examples, some of which are worked out to serve as specimens, while others are accompanied with hints as to their solution.

If any fault be found in the book it is perhaps that it has been expanded to too great dimensions: excluding the answers at the end there are no less than 364 pages, which, for an elementary work of this kind, is undoubtedly a large number. At any rate the error is made on the right side. In all other respects the book can be decidedly recommended, for the propositions are all neatly proved, and the get-up, as regards the figures and letters, could scarcely be surpassed.

Paraguay: The Land and the People, Natural Wealth and Commercial Capabilities. By Dr. E. de Bourgade La Dardye. English Edition. Edited by E. G. Ravenstein. (London: George Philip and Son, 1892.)

EVERY one who has any reason to be interested in Paraguay ought to read this book, which is in most respects a model of what such a work ought to be. The author spent two years in the country, so that he had ample opportunities for making himself acquainted with its leading characteristics. His impressions, upon the whole, were very favourable; but there is not the faintest attempt to convey an exaggerated idea either of Paraguay's resources or of the use she is making of them. M. de Bourgade writes in a spirit of scientific impartiality, bringing out the facts exactly in accordance with what he believes to be the most trustworthy evidence. He begins with an account of the geographical exploration of the country,

then presents a geological survey, and describes the basins of the Parana and the Paraguay, and Paraguay's vegetable and animal life and minerals. Next there are chapters on various aspects of social life—government, and laws, financial position, real property, population, and immigration. A section on "Labour" includes chapters on means of communication, the soil, stock-breeding, agricultural products, tobacco, timber, textile plants, various raw materials, yerba-maté, and the orange. On all these subjects the author writes clearly and with full information. The work is enriched with a map and illustrations, and of the translation we need only say that it has been done carefully and adequately.

LETTERS TO THE EDITOR.

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Thunderstorms and Sunspots.

ABOUT six years ago Prof. von Bezold laid before the Bavarian Academy a memoir relating to lightning-flashes that had done damage to houses in Bavaria. In that kingdom the fire-insurance of buildings is entirely in the hands of the State, and a long series of statistical data on the subject was available.

Two things appeared from this inquiry—first, that those damaging lightning-flashes had enormously increased in the last fifty years (to 1882), much more than the increase of houses; and second, that there was apparently some relation between the phenomena and the sunspot cycle. To each maximum of sunspots corresponded a minimum of damaging lightning-flashes or thunderstorms (only in two cases one year displaced); but between each pair of minima was another secondary minimum not far from the minimum of sunspots. The curve of lightning damage, in fact, shows a double oscillation for each sunspot period, maxima of sunspots corresponding with the better-defined of the two minima of lightning damage. A somewhat similar result had been arrived at by Prof. Fritz from a study of thunderstorms in the Indian Archipelago, but he considered it adverse to the idea of a causal relation between sunspots and thunderstorms.

In an earlier paper to the Bavarian Academy (1874), Prof. von Bezold, from a study of several thunderstorm records, came to the conclusion that "high temperatures and a spotless solar surface give years abounding in thunderstorms." This supposed relation between sunspots and thunderstorms does not seem to have attracted much attention of late years. The object of this note is chiefly to show some curves and figures from thunderstorm records, which, it appears to me, yield further evidence of the relation.

In the diagram herewith are two curves, one for Berlin from 1850, the other for Geneva from 1852. The numbers of days of observed thunder are taken and grouped in averages, each yearly point of the curve representing an average of five years. The vertical scale-figures are to the left. Below is an inverted sunspot curve, with scale-figures to the right. The upper points of the latter are minima, and it will be observed how maxima of the thunderstorm curves occur over them or nearly so; and similarly with sunspot maxima and minima of the other curves. There is not always exact coincidence, but a very considerable correspondence will be noticed. (I do not here reproduce the figures yielding those curves.)

It is to be regretted that the official Greenwich records do not, so far as I know, contain any tabulated series of figures relating to thunderstorms in a long course of years. From an examination of the *Greenwich Observations* and the *Weekly Return*, I am enabled to present a table of the number of days on which thunder was observed during the six months April to September in each year from 1850 to 1891. The actual figures are given in one column, and another column gives smoothed values (five year averages). In the curve made from these smooth values, we find maxima corresponding closely with the sunspot minima of 1856 and 1878, and it is now, apparently, near another pro-