many telegraph administrations which would be benefited by its clear practical character. But it is not immaculate. The chief defect of the book is the absence of recognition of what has been done elsewhere and the negation of existing literature dealing with the same subject. Mr. Latimer Clark's book on "Electrical Measurement" (published in 1868) was written especially for use in India. His "Electrical Tables and Formulæ," written in conjunction with Mr. Sabine and published in 1871, contains nearly all that is known of testing. Culley's "Handbook," first published in 1866, has run through six editions. Hoskier's "Guide to Electric Testing" was published in 1873, and has reached a second edition. Preece and Sivewright's "Text-book of Telegraphy" was published in 1876, and has also reached a second edition. Kempe's "Handbook of Electric Testing" (a most useful and valuable little work) was also published in 1876. Papers by Fleeming Jenkin, Siemens, F. C. Webb, Hockin, Heaviside, &c., are scattered everywhere; yet the impression left on the mind after perusing Mr. Schwendler's book is that, according to him, there is but one system of testing, and that is to be found in India; and there is but one book on the subject, and here it is!

OUR BOOK SHELF

A Physical, Historical, Political, and Descriptive Geography. By Keith Johnston, F.R.G.S. Maps and Illustrations. (London: Stanford, 1880.)

THIS work is in every way creditable to its unfortunate young author, who, our readers may remember, succumbed some months ago to the hardships of African travel while leading an expedition from the West Coast towards Lake Tanganyika. Mr. Johnston has not sought to enter into that minute and often painful detail with which we are familiar in most text-books of geography. His object has been to record in each of the great departments of geography the results of the latest research, leaving it to the teacher or to special text-books to fill up with details. After a brief sketch of some of the main points in mathematical geography, a clear and sufficiently full sketch of historical geography is given, treating not merely of the progress of discovery, but of the various movements of peoples and nations which have led up to the political divisions of the earth as they are at present; this we think a useful introduction of scientific method into history. Then follows a section on physical geography, in which the most trustworthy results of research in the various departments of this subject are stated with clearness and accuracy. The remaining two-thirds of the work is devoted to the special geography of the various continents and countries—their physical features, natural history, products, industries, peoples, and political and social conditions. The same method is followed throughout of dwelling only upon the important features. The work is amply illustrated by useful and beautifully executed maps, and is one of the best general handbooks of geography that we know.

Zeitschrift für das chemische Grossgewerbe. iv. Jahrgang. Von Jul. Post. Fortgesetzt von Arthur Lehmann. (Berlin: Oppenheim, 1880.)

WE have already had occasion to draw attention to the merits of this publication, and the present issue of the work is in no way inferior to its predecessors. It constitutes a complete compendium of the progress of chemical technology during the past year, and as such must be of great service to our manufacturers. The various articles are contributed by acknowledged authorities, and the whole is preceded by a short review indicating the more

striking improvements which have been introduced into the chemical arts since the publication of the last issue of the work.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

The Lesser Spotted Woodpecker

I HAVE had an opportunity lately of observing closely the habits of the Lesser Spotted Woodpecker (*Picus minor*) as regards the very peculiar sound which it makes upon trees by the action of its bill.

It is quite certain that this habit has nothing whatever to do with the quest for food. The bird selects one particular spot upon the trunk or bough of a tree, which spot is naturally sonorous from the wood being more or less hollowed by decay. The bird returns to this precise spot continually during the day and produces the sound by striking the wood on the spot with its bill, the stroke being repeated with a rapidity which is really incomprehensible; for it quite eludes the eye. It is effected by a vibratory motion of the head; but the vibrations are so quick that the action looks like a single stroke. After short pauses this stroke is again and again renewed, sometimes for several minutes together. During each interval the woodpecker looks round it and below it with evident delight and with an apparent challenge of admiration. The beautiful crimson crest is more or less erected.

The whole performance evidently takes the place of the vernal song in other birds; and so far as I know it is the only case among the feathered tribes in which vocal is replaced by instrumental music.

The nest does not appear to be in the same tree; but similar spots are selected on several trees in the neighbourhood, and as the sound is very loud and is heard a long way off, the hen bird when sitting is serenaded from different directions.

I have not seen or heard any attempt to vary the note produced by variations either in the strength or in the rapidity of the stroke, or by changing the point of percussion; but I have observed that the note varies more or less with the tree on which it is produced.

During about six weeks the performance has been frequent every day, and early in the mornings during part of this time it was almost constant. Of late it has been discontinued. In all probability this is parallel to the well-known fact that singing birds cease to sing after the eggs are hatched.

This instrumental substitute for singing among the woodpeckers is extremely curious.

ARGYLL

May 29

Mr. Preston on Vortex Atoms

SOME passages in an article in NATURE, vol. xxii. p. 56, on Sir William Thomson's theory of vortex atoms, seem to show that the author, Mr. Preston, has not perfectly apprehended the nature of vortex motion. On p. 57 he says that "the rotating portion" of the liquid "therefore glides smoothly over the incompressible liquid that surrounds it like a pipe." From this it appears that the vortically-moving fluid is conceived by him as slipping with reference to the rest of the fluid. This is, however, an incorrect view of the nature of the motion. If there be an infinite mass of fluid, then the stable existence of a vortex filament at any part necessitates motion throughout the whole, and there is, at the surface bounding the filament, no discontinuity of the kind apparently conceived by Mr. Preston.

Two vortices exercise very remarkable influences on one another, which are due to the irrotational motion of the parts of the fluid outside the vortices.

The existence of surfaces of finite slip in the hydrodynamics of an ideal perfect fluid is not precluded by any quality attributed to the fluid, but I do not think that the behaviour of vortices bounded by surfaces of slipping has been hitherto treated by any mathematician