

given to the numerical ones, and references to the text in the case of the descriptive ones. We have satisfactorily checked some of the calculations, and the book is laudably free from misprints. There is little original matter in the work, but the author shows good judgment and no little knowledge in his selection and treatment of the various branches of this important subject.

We are sorry that the author was compelled by considerations of space to devote little more than half a page to the important subject of lightning arresters. He divides them (p. 279) into (1) the aluminium cell arrester, (2) the spark-gap arrester, and (3) the non-arcing arrester. We usually divide them into (1) the electrolytic, (2) the intermittent, and (3) the continuous types of arrester. Engineers are probably familiar with the devices mentioned, but the non-technical reader will have to look up the references given at the bottom of the page. The numerous references form a useful feature of the book.

A. RUSSELL.

COTTON CULTIVATION IN THE UNITED STATES.

Field Crops for the Cotton-Belt. By Prof. J. O. Morgan. Pp. xxvi+456. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1917.) Price 7s. 6d. net.

THE "Rural Text-book Series" has furnished the agricultural students of the United States of America with several very useful volumes. Prof. Oscar Morgan's contribution now before us worthily upholds the reputation of the series, and is likely to be accepted as having a value considerably beyond the sphere of usefulness very possibly contemplated for it by its author.

Coming from an expert resident in Texas (the most important of the cotton-producing States), the book will be appreciated by cotton-growers throughout the world. In that light it is perhaps unfortunate that so much elementary science was thought necessary. The first principles of the physiology and chemistry of plant life might have been left to the lower school text-book. A glossary of terms would have got over any difficulty presumed to exist and might, at the same time, have been made useful to the general reader not familiar with American agricultural terms and expressions. For example, it is somewhat amusing to find the expression "Irish potato"; tobacco a stimulant; buckwheat a cereal; the "cotton square"; the "Corn-Belt"; the silking of corn, etc.

Setting these minor considerations on one side, there are numerous features of the work of great merit. It is a considered and practical exemplification of the actual conditions and experience of cotton production of the States, framed primarily for use in schools and colleges.

Limitations of space will not permit of a detailed analysis, but it may suffice if we indicate one comparative aspect, namely, between the

States and India, as illustrative of the numerous practical bearings of the book. Prof. Morgan describes very fully ten of the associated crops in the Cotton-Belt. The first and most important is corn, or, as in Europe it is more generally called, Indian-corn (*Zea Mays*). This, it would seem, occupies 38 per cent. of the belt, while cotton takes 39 per cent.; then follow (but far behind in point of area) oats, 3.7; wheat, 3.5; kafir and milo, 1.4; pea-nut, 0.9; rice, 0.8; sugar-cane, 0.6; while sweet sorghum, rye and barley show still smaller percentages. Practically all the cotton, sugar-cane, rice and pea-nuts grown in the United States come from the Cotton-Belt.

It may now be useful to exhibit a parallel assortment of the crops associated with cotton in India. Indian-corn, sugar-cane, rice, pea-nuts are not recognised as important crops in, and the Indian supplies of these are not drawn from, the cotton-producing districts. Oats and rye (except on the hills) can scarcely be said to be grown in India. Barley and wheat only occasionally accompany cotton, the former, as a rule, being mainly produced outside the cotton districts. On the other hand, Sorghum (*juar*), Pennisetum (*bajra*), *Cajanus* (pigeon-pea), *Sesamum* (*til* seed), *Linum* (linsced), and *Hibiscus cannabinus* (Deccan hemp) are very closely associated with the Indian cotton.

The Indian crops associated with cotton might be described as a slightly more tropical set than the American, and they denote at the same time differences in soil, climate, seasons of growth, tillage, manuring, and stock—differences that collectively account very possibly for the lower grade of the staple in India as compared with that of the United States. And perhaps the most vital aspect of these differences is the fact that the Indian cotton associates can scarcely be spoken of as rotated with it.

The Indian rotation, such as it is, is usually within the year, not after the lapse of one or more years. That is to say, two crops are taken off the same field every twelve months, one being cotton and the other the alternate crop. Interplanting is also largely followed, more especially with pigeon-pea (*Cajanus*), or with *juar* (sorghum, but only rarely the sweet sorghum), the balance in the soil being thereby to some extent preserved. Thus, while in India cotton is often grown year after year on the same field, our author tells us that in the States a three- or four-year rotation is universally accepted as essential. Thus: 1, cotton; 2, corn; 3, oats and wheat; and 4, cow-peas.

A study of the book leaves the conviction of its practical utility so deeply impressed that one is constrained to recommend improvement of existing supplies (especially Indian) on the lines set forth by our author as a more rational procedure than the discovery of new areas of production.

The book may be commended to all persons interested in cotton or the associated crops of cotton.