The matter sequence is curious. We start with chain surveying and do not reach triangulation until p. 377. Surveys for purely engineering ends are often limited in extent, but none the less each method has suffered from being considered on its own merits and not as part of a whole. Geodesy and topographical surveying are barely mentioned.

We start with the field work, plotting, and area computing of chain surveys. The subject is clearly put, and the investigations of errors and of the accuracy of linear measurement are particularly valuable. It is curious to find reference in this chapter to British war maps, which owed none of their characteristics to chaining. The chapter on optics and on magnetism is welcome, though it might with advantage have gone further. After a description of instruments of minor importance and of the vernier and micrometer microscope, the author deals with theodolites, omitting mention, unfortunately, of Messrs. Watts and Co.'s latest patterns, which embody many improvements. Adjustments are fully described, and are followed by a few pages on the accuracy of angular measurements and on geodetic results.

Having already dealt with linear measurement, the author confines his description of traverses mostly to angular measurement by compass, dial, or theodolite. The investigation of errors of closure is valuable and includes an interesting mathematical analysis of Bowditch's rule. The surveyor who traverses between stations of an existing triangulation will find little help, however, for the problems which then arise are practically ignored. Two consecutive chapters deal with levels, levelling, contouring, trigonometrical levelling, and various relative and absolute methods of determining altitude. Mention is made of the Zeiss patterns of level in use on the Ordnance Survey, but there is no mention of the "water level" for contouring purposes. As usual, the student will have no excuse for failing to understand the relative values of different levelling methods. There is a brief mention of precise levelling generally, including a note on the new geodetic levelling of Great Britain. Tacheometry is thoroughly dealt with, the optics and attainable results being lucidly described, and leads on to range-finders, with special reference to the "Barr and Stroud." The chapter on plane-tabling is not so convincing as the rest, and is all too short. The plane-table has been used with success in climates as difficult as our own, and is an indispensable method of survey.

Chapters on curve ranging, earthwork calculations, and hydrographic surveying contain well-arranged information rarely to be met with elsewhere. It is under hydrographic surveying, curiously enough, that one finds a description of instrumental resection. As a subject it deserves more attention than it gets, and should not be confined to a solution from three points. Triangulation and base measurement are well dealt with and illustrated by historical references. The experienced surveyor will find little fresh information on astronomical surveying (except an interesting note on Driencourt's prismatic astrolabe), but will relish the simple and yet thorough way in which the theory is put.

The concluding chapter, on photogrammetry, deals with the photo-theodolite and contains a brief reference to stereophotogrammetry and to aeroplane photography. The get-up, printing, and paper are a pleasure to see. All surveyors should possess a copy of this book.

H. S. WINTERBOTHAM.

Australian Hardwoods.

The Hardwoods of Australia and their Economics. By Richard T. Baker. (Technological Museum, New South Wales: Technical Education Series, No. 23.) Pp. xvi + 522 + plates. (Sydney: The Technological Museum, 1919.)

THE author states in the preface to this work that his object is to make known to Australians and the world generally the diversity of the hardwoods with which Nature has endowed the vast Australian continent. Such a book can scarcely have been introduced at a more opportune time, when the problem of how to provide sufficient timber for the world's growing needs has become increasingly acute since the war. It is a remarkable fact that, while Australia has probably the largest variety of hardwoods in the world, covering hundreds of thousands of square miles, the number of species they represent is comparatively few—probably less than 500. Moreover, nearly half of these belong to the genus Eucalyptus, which covers at least two-thirds of the whole surface, and supplies the bulk of hardwoods required for commercial purposes.

The book is divided into three main sections. Part i. deals with the physical properties of timber, colour, grain, taste, odour, structure, weight, durability, combustibility, and other features. The author emphasises the great aid afforded by colour in the identification of Australian woods, and the fine series of chromatic plates scattered through the volume, illustrating the newly planed surface of all the important timbers, shows in a very striking manner the great beauty and variety of these woods. The writer of this notice has had an opportunity of comparing a number of these plates with specimens in the

fine collection of Australian woods at the Imperial Institute, and can vouch for their accuracy as regards both colour and delineation. Every timber has a distinct colour, though at times this is far from easy to describe in the absence of any standard colour nomenclature; in such cases coloured plates are a great help. Some of the colour terms seem to be used in a rather loose sense. The author employs eight types—(1) dark red, (2) red, (3) pink, (4) grey, (5) chocolate, (6) yellow, (7) pale, (8) white—but on comparing some of the plates we find it hard to draw the line between the types pink and pale, while some of the timbers described under the heading of white would be more correctly termed buff-coloured. The illustrations in black-and-white showing wood anatomy should also be a material aid to identification.

In part ii. we have a description of each species in botanical sequence, followed by a list of timbers arranged in grades of hardness. Part iii. contains technical articles on (i) the determination of specific timbers; (ii) nomenclature; (iii) the seasoning of timber; (iv) the preservation of timbers, concluding with an account of the economic uses of the woods. The book contains a vast amount of information useful to both foresters and students.

The typographical arrangement is somewhat open to criticism. The use of unnecessarily large types for specific names and authorities, with a wide margin, entails a great waste of space, and makes the book rather cumbersome. On the other hand, the systematic portion of the work might with advantage have been in larger type. These minor defects, however, do not detract from the general excellence of the book.

Mr. Baker is to be congratulated upon a valuable addition to the literature of Australian forestry, which should bring home to Australians the importance of preserving these many valuable woods from the extinction which threatens them by a well-devised and vigorous scheme of re-afforestation. A. B. J.

The Columbian Tradition.

The Columbian Tradition on the Discovery of America and of the Part Played therein by the Astronomer Toscanelli: A Memoir addressed to the Profs. Hermann Wagner, of the University of Göttingen, and Carlo Errera, of Bologna. By Henry Vignaud. Pp. 62. (Oxford: At the Clarendon Press, 1920.) Price 3*s*. 6*d*. net.

IN various publications, especially in his "Histoire de la Grande Entreprise de Christophe Colomb" (Paris, 1911, 2 vols.), Mr. Vignaud has endeavoured to upset the traditional view of the discovery of America. According to that view, Columbus set out in 1492, not to discover unknown lands, but to reach the eastern parts of Asia by sailing westward across the Atlantic, having already in 1474 been encouraged to do so by the well-known astronomer Toscanelli of Florence. In this pamphlet Mr. Vignaud has again summed up the results of his studies and defended them against the attacks of his two principal opponents.

All we know about Columbus and the object of his first voyage comes from himself or his son or his blind admirer, Las Casas, and not one of these is a trustworthy witness, as the exposure of various falsehoods told about the family and early history of Columbus has proved. No trace exists of Columbus ever having spoken of going to Eastern Asia before he returned from his great discovery; but that idea is spoken of in a letter to the "Catholic Kings," which Las Casas placed as a preface to the log-book of the first voyage. This letter is, however, neither found nor alluded to elsewhere, and bears no date. In the log-book Columbus says that his sole object is *las Indias*, but that book was edited by Las Casas, and in the days when he wrote, this expression only meant the Antilles and neighbouring lands, and never the East Indies. Columbus, when leaving Palos, did not sail straight across the Atlantic, as would have been natural if his goal had been "Cipangu" (Japan), or "Cathay" (China); he first went down to the Canaries and then sailed straight westward along the 28th parallel. At 700 or 750 leagues west of the Canaries he fully expected to find land, and was greatly disturbed when none was seen, so that he must have had some private reason to believe that there were islands near that spot; and the discovery of these would seem to have been the sole object of the voyage. It has been objected to this that Columbus (according to Las Casas) carried with him credential letters for the "Great Khan." But it is known that his partner, Pinzon, had some idea of going in search of Cipangu. Mr. Vignaud suggests that it was to secure the indispensable co-operation of Pinzon that Columbus included the visit to Cipangu in his plan, but that when he only found land much further west than he had expected, he believed that what he had found was Cipangu, a belief which he kept to his dying day.

With regard to the alleged letter and map of 1474, attributed to Toscanelli, these were never alluded to by Columbus himself; and the copy of the letter found at Seville in 1871 was probably not written by him, but by his brother. The information in the letter (the map is lost) is such