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Title Manual of the Timbers of th World

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A MANUAL OF THE TIMBERS OF THE WORLD

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THE MACMILLAN COMPANY
OF CANADA, LIMITED
TORONTO

A MANUAL OF THE
TIMBERS OF THE WORLD

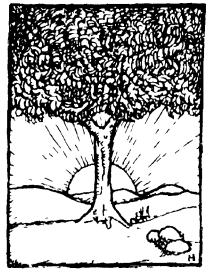
THEIR CHARACTERISTICS AND USES

BY

ALEXANDER L. HOWARD

REVISED EDITION

TO WHICH IS APPENDED AN INDEX OF
VERNACULAR NAMES



WITH UPWARDS OF 100 *ILLUSTRATIONS*

MACMILLAN AND CO., LIMITED
ST. MARTIN'S STREET, LONDON

1934

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First Edition 1920
Second Edition 1934

PRINTED IN GREAT BRITAIN
BY R. & R. CLARK, LIMITED, EDINBURGH

THIS BOOK IS DEDICATED

TO

SIR FREDERICK MACMILLAN, C.V.O.

AS A MARK OF ESTEEM

AND IN APPRECIATION OF THE ENCOURAGEMENT

WHICH HE HAS GIVEN ME

DURING THE PROGRESS OF THE WORK

PREFACE TO THE REVISED EDITION

THE second edition of *Timbers of the World* has been undertaken for the same reason as the first, namely, to supply a clearly arranged handbook which will give information regarding those timbers which have been, or are expected to be, used in works of art or utility.

In 1918, at the conclusion of the war, the first edition was in the press. At that time the general public were under the impression that the whole world was faced with a really serious shortage of timber supplies. There was at the moment a definite shortage resulting from the war and the cessation of shipping. A host of publications, some inspired by trade interests, some by the unprecedented high prices for timber, and all supported by the certain knowledge that the world's supplies were being too rapidly exhausted, confirmed the impression. As a result, new and hitherto unknown timbers poured into the markets of the world. Activity was specially noticeable in India and Burma, in which places a large accumulation of timber had been stored up, and the first and only really energetic exploitation of the forests of the Indian Empire had been vigorously pursued. The Indian Forestry Service, the largest in the world, with at that time fifty-four years behind it, would seem to have failed to realise the commercial value of their vast forest resources. Differing from other countries, India and Burma have never been forced by necessity to realise their forest wealth. The ease with which teak timber has been marketed has had a very deterring influence upon the exploitation of the remaining very abundant and highly valuable store of fine timbers. The situation has been remarked upon by several American foresters and writers, some of whom have visited India and reported upon the forests. It has also been referred to by Zon and Sparhawk in *Forest Resources of the World* as follows: "India is still undeveloped and industrially backward, and the existing forest resources have barely been touched." The greatly increased activity during and after the war provided much more information about those Indian

timbers which were reported in the first edition, and gave an opportunity for experience concerning a great many fresh timbers. This knowledge alone was of sufficient importance to call for some further publication.

Mr. J. S. Gamble, shortly before his death, sent me many specimens of Brazilian timbers collected by his brother the late Colonel J. G. Gamble, M.Inst.C.E., who had spent many years in Brazil, together with the catalogue which Colonel Gamble had compiled, and these considerably added to our information. A report on this collection, and on all other Brazilian woods which have been seen in commerce since the war, is included in this edition. There has always been great confusion in regard to most of these timbers, partly because of the duplication of names, but also on account of the fact that reliable information was not forthcoming. We have now Professor Samuel J. Record's *Timbers of Tropical America*, which provides the best up-to-date information.

Mr. J. H. Holland, of Kew Gardens, kindly supplied me with an interesting collection of Chinese woods which had been received by him from Professor Chung of the Amoy University, who apparently had despatched a similar collection to Professor Record of Yale University, and a description of these woods is included.

The certain knowledge that some small trees or shrubs, for instance laburnum, possess a special value, and that such might be utilised in works of art, started an inquiry in this direction. In this inquiry I have been greatly assisted by the Rt. Hon. Viscount Powerscourt, who by his energy and enthusiasm has accumulated a most interesting collection, with surprising results. It would be no exaggeration to say that very large quantities of timber grown throughout the United Kingdom, at present used for fuel, might be utilised to general advantage. Among the *British-grown timbers* which may be mentioned besides laburnum are acacia, mulberry, thuya, and even lilac, as well as others.

Throughout this book the common name, if it is well known, has been made use of in the alphabetical headings, and the alternative vernaculars, as well as the botanical term, have been added in all cases where it has been possible. It is hoped that the inclusion of these names will be of considerable service. For the Indian timbers, the vernacular names have been taken from Mr. J. S. Gamble's well-known *Manual of Indian Timbers*, and from Sir Alexander Rodger's *Trees and Shrubs in Burma*, by the kind permission of the Government of India and Sir Alexander Rodger. In the case of the South American woods, the common names have been

taken from Professor Samuel J. Record's *Timbers of Tropical America*, and those of Malaya and the Philippines from Dr. Foxworthy's *Philippine Journal of Science* and *Malayan Forest Records*, No. 3, by the kind permission of the respective authors. The publication of *Commercial Timbers of India*, by Pearson and Brown, has occurred at almost the last moment. From the timbers named in these volumes, although they have not been seen in ordinary commercial usage, a selection of some forty species has been made, as they would seem to be of sufficient importance to be included in this work.

The weights given are in all cases the weight per cubic foot when dry of my own specimens, but when this has been impossible, from the accepted authorities as stated.

An index of vernacular names is added to facilitate reference.

I wish to acknowledge my indebtedness to the various publications mentioned, and my gratitude to those friends—some of whom have alas gone from us—who have assisted me, by correspondence or otherwise, in the compilation of this work, namely: Mr. R. T. Baker; Sir Hugh Beevor, Bart.; Colonel James Brown, D.S.O.; Mr. H. J. Elwes, F.R.S.; Mr. J. S. Gamble, M.A., C.I.E., F.R.S., F.L.S.; Colonel J. G. Gamble, M.Inst.C.E.; Mr. Arthur Gardner; Professor Percy Groom, M.A., D.Sc., F.L.S.; Sir George Hart, I.F.S.; Mr. Edwin Haynes; Mr. J. Masters Hillier; Mr. J. H. Holland, Kew Gardens; Dr. Charles Hose; Major-General Sir Newton Moore, K.C.M.G.; Mr. B. Ohta; Mr. R. S. Pearson, C.I.E., F.L.S.; Professor Samuel J. Record, M.A., M.F., Yale University; Mr. Hugh Saunders; Professor R. S. Troup, F.C.H.; my secretary, the late Miss Eleanor Rudwick; also many others.

And for the permission to use their works: F. W. Foxworthy, Ph.D.; Professor S. J. Record, M.A., M.F.; and Sir Alexander Rodger, O.B.E., F.L.S.

ALEXANDER L. HOWARD.

15 CHESTER TERRACE,
REGENT'S PARK, W.1
March 1933.

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INTRODUCTION

Ao Viandante

Tu que passas e ergues para mim o teu braço, antes que me faças mal, olha-me bem.

Eu sou o calor de teu lar nas noites frias do inverno, eu sou a sombra amiga que tu encontras quando caminhas sob o sol de agosto, e os meus frutos são a frescura apetitosa que te sacia a sêde nos caminhos.

Eu sol a trave amiga da tua casa, sou a taboa da tua mêsa, a cama em que tu descanças e o lenho do teu barco.

Eu sou o cabo da tua enxada, a porta da tua morada, a madeira do teu bêrço e o conchego do teu caixão.

Sou o pão da bondade e a flôr da beleza.

Tu que passas, olha-me bem e . . . não me faças mal.

To the Wayfarer

Ye who pass by and would raise your hand against me, hearken ere you harm me.

I am the heat of your hearth on the cold winter nights, the friendly shade screening you from the summer sun, and my fruits are refreshing draughts quenching your thirst as you journey on.

I am the beam that holds your house, the board of your table, the bed on which you lie, and the timber that builds your boat.

I am the handle of your hoe, the door of your homestead, the wood of your cradle, and the shell of your coffin.

I am the bread of kindness and the flower of beauty.

Ye who pass by, listen to my prayer: harm me not.

So runs an inscription which in Portugal is displayed wherever, in woods, parks, and gardens, timber trees are to be found. This notice sets forth in the concentrated vigour of its style an appeal whose necessity is urgent in other lands than Portugal. Apart from its artistic and sentimental aspect, its aim is threefold. It appeals for due precautions against the misuse of timber trees. It demands that proper and necessary care be taken to use timber to the fullest and best advantage. It calls

for the recognition of the importance of timber trees in the multitudinous needs of the community.

In England these three considerations are but little regarded. The majority of our population show an indifference to the subject which is but the measure of their ignorance of it, while our educational and administrative authorities continue to neglect it in a manner which accounts for the general apathy.

This common lack of knowledge leads in many cases not merely to a passive disregard, but often to an active mutilation and disfigurement. Boys particularly are prone to damage trees simply because they have not been taught to value them.

The forests of England have been a source of national safety and national prosperity in the past. A seafaring nation whose history in the last three hundred years has been one of the imperial expansion of an island race, we owe it largely to our home timber supplies that our ships obtained the supremacy. Again, in the centuries before the general development of our coal deposits, it was the great Forest of the Weald that made the Sussex ironwork industry possible.

We see then that our national timber supply has been of the utmost value to us in the past. This is no longer so, as the manner of our forest utilisation has been wasteful and without forethought. Whole areas have been denuded of trees which might have continued to give a supply of home-grown timber; while, as with other commodities, we have relied of late years to a needless extent upon foreign supplies.

An educational system which is adequate should rightly include some knowledge of the vital needs of the country, some realisation of the possibilities of our national resources. In our schools there is an almost complete neglect of that necessary function of education which should develop the child as a member of an economic community, giving him a grasp of the material needs and resources of his country, and opening up before him avenues of industrial interest. Commercial geography does, for instance, claim to fulfil this function, but educational reforms need time before they can justify themselves, and the spread of modern methods of teaching geography upon these lines is all too slow. There is no reason why science should not be more often presented in its commercial relations. At present the teaching of science and geography in our schools lays itself open to the old charge levelled against the classical tradition. It was urged that classical education was remote from life, it was said to touch no springs of living or material interest, and it had no relation to modern needs. Might not the same be said with greater truth of much of the teaching of science in our public and secondary schools to-day? Is it not out of touch with living interests? Does it show constantly its close connection with industrial and commercial activities?

Here then we have a subject which in the past has been closely concerned with our national well-being, and which is no less so in the present, and yet it is one which is neglected in the teaching of science and geography in our schools. The subject of timber, its supplies both within and beyond our own Empire, together with its treatment and its possibilities, is one full of interest in itself, and which might well be introduced, not as an isolated item upon an already over-burdened list of subjects, but in rational correlation with science and geography. We are now faced with a period of wide industrial change and novel development, when the natural resources of the world must be mapped out, and measures taken for their right use and conservation. The forests of five continents hold in themselves a vast portion of the world's wealth, and much of its value is so far unrealised. Timber has been put to a multitude of uses in the past, but latterly a belief was gradually gaining ground that it might be superseded by steel and concrete. This belief is groundless and mistaken, as we have clearly seen since the war. In many ways it is again being used instead of these substitutes, while further uses are being discovered for it every day. Certain woods essential in industrial developments and the making of engines of war are finding new commercial values hitherto entirely unsuspected.

These considerations, though they may appear to be but generalisations, have a close practical application to the subject, and if they have shown anything, it is that the time has come for the British Government to concern itself with the all-important subject of an adequate supply of timber within its own boundaries. In the past it was the policy of the Government to maintain an attitude of *laissez-faire* with regard to industry, but opinion has now swung round to regard it as a normal function of Government to foster and assist all industries and trades necessary to the well-being of the community. The difficulties under which the timber industry labours should be removed. There should be adequate protection for woodlands, where, too frequently, valuable timber is ruined by wanton ill-usage, while the present unreasonable freightage dues need readjustment so that the trade be not strangled.

It was seen during the European war how effective definite Government propaganda could be when it was necessary to enlighten the public upon matters which concerned its interest. This weapon, through the schools and in the press, could well be used for the benefit of essential industries. As an illustration of such wise action of the State, might be mentioned the fact that in America, in Australia, in Norway, and in Portugal, the school children are taught to plant saplings in order that the timber supplies of these countries may not fail. In addition to protecting the industry and enlightening the public, the Government should take every opportunity to encourage and foster it by providing information

and advice as to the best policy to pursue. In the Forestry Regulations of France, Germany, Jugoslavia, and other countries, we can find models which it would be wise to follow, or even perhaps to actually adopt in their entirety. We cannot wish to see the number of our woodland areas decrease, when we realise the national, and indeed the imperial, importance of a fully sufficient reserve of timbered land. As far as may be reconciled with economic principles, the denuded areas should be replanted and fresh trees introduced.

So much for the material and economic aspect of the subject of timber. From an aesthetic point of view it is full of attraction. The proud tops of the pine and the larch which clothe our northern and our western hills add to their sombre beauty, while the more intimate loveliness of the lowland coppices and stately parks, with their "firs and ashes, oaks and elms, the poplars and the cypresses," has given the poets inspiration for delicate imagery. To know something of the description and the uses of these familiar trees, as well as of the woods of more exotic beauty from the dark forests of India and Burma, from the sun-drenched islands of the eastern seas, from South America and from Africa; their marvellous diversity of colour, their exquisite scents, and the strange glamour of their very names, is to gain a new and never-palling interest in a comparatively little-known portion of the grand heritage of the heirs of this world.

I would like to add one word more. Up till now the march of civilisation has everywhere proclaimed the destruction of trees over the wide surface of the globe, and successive generations of all races have continuously failed to establish any proper measures for reafforestation. Trevelyan says: "A bird's-eye view of England in Anglo-Saxon times would have revealed a shaggy wilderness of forest trees, brush-wood, marsh and down, spreading from shore to shore." Very different is the prospect viewed by the airman to-day. "But in those days there was hope of the future, for though elm and oak might fall, men planted others —AS THEY SELDOM WILL TO-DAY." Gabrielle Plattes, writing in 1639, remarks in his book *A Discovery of Infinite Treasure*: "Now the multitude of timber brought yearly from Norway, and other parts, doe plainly demonstrate the scarcitie thereof here; also it may be conjectured what a miserable case the Kingdom will be plunged into about an age or two hence, for want of timber." About 270 years ago John Evelyn wrote: "For I observe there is no part of husbandry, which men commonly more fail in, neglect, and have cause to repent of, than that they did not begin planting betimes, without which they can expect neither fruit, ornament, or delight from their labours." In 1853 an unnamed writer of a book entitled *English Forests and Forest Trees*, in the introduction says: "These forests are very rapidly passing away. At present few of those that were once so famous still exist. The fine forest of Sherwood was sold in 1827;

scarcely a year passes by but enclosures are made, or some forest is disafforested ; and very soon not one of the forests will retain its primitive appearance." A late contribution to this tale of woe is Mr. Tom Gill's reflection in his book *Tropical Forests of the Caribbean*, published by the Tropical Plant Research Foundation in co-operation with the Charles Lathrop Pack Forestry Trust, 1931 : " The American lumberman has cut his way across the Continent ; and now is hacking out the *last great* stand of virgin timber within the Continental United States, the Douglas Fir region of the Pacific North-West."

A PASTORAL

THERE stood the elm, whose shade so mildly dim
Doth nourish all that groweth under him;
Cypress that like pyramids run topping,
And hurt the least of any by their dropping;
The alder, whose fat shadow nourisheth,
Each plant set near to him long flourisheth;
The heavy-headed plane-tree, by whose shade
The grass grows thickest, men are fresher made;
The oak, that best endures the thunder-shocks;
The everlasting ebon, cedar, box;
The olive that in wainscot never cleaves;
The amorous vine, which in the elm still weaves;
The lotus, juniper, where worms ne'er enter;
The pine, with whom men through the ocean venter;
The warlike yew, by which (more than the lance)
The strong-arm'd English spirits conquer'd France.
Amongst the rest the tamarisk there stood,
For housewives' besoms only known most good;
The cold-place-loving birch, and service-tree;
The walnut loving vales, and mulberry;
The maple, ash, that do delight in fountains
Which have their currents by the side of mountains;
The laurel, myrtle, ivy, date, which hold
Their leaves all winter, be it ne'er so cold;
The fir, that oftentimes doth rosin drop;
The beech, that scales the welkin with his top;
All these, and thousand more within this grove,
By all the industry of Nature strove
To frame a harbour that might keep within it
The best of beauties that the world hath in it.

WILLIAM BROWNE (1591–1645)

ERRATA

WHERE authorities differ in the botanical names of trees it is difficult to decide which should be followed in a book such as *A Manual of the Timbers of the World*. Not only do these authorities change the names, as for instance for Douglas fir from *Pseudotsuga Douglasii* (Groom, Boulger, Laslett, etc.) to *P. taxifolia* (Sargent; and *Forestry Department of Canada Bulletin*), but the spelling is often different, e.g. *Chickrassia tabularis* (Gamble), *Chukrasia tabularis* (Rodger). Moreover, where a very great number of such names are dealt with, mistakes in typing and printing type are bound to occur.

I have entirely ignored the question of capital letters or otherwise, about which there exists a great deal of controversy. I am of the opinion that in a publication dealing entirely with the question of wood such points are of little consequence. Nevertheless, for the sake of accuracy the following corrections are noted :

Page	*For*	*Read*
38	F Bungeana Dc. var Pubinerbis	F Bungeana Dc var pubinervis
43	Africana Bingeria	Bingeria Africana
86	Casuarina Leuhmanni R.T.B.	Casuarina Luehmanni R.T B.
95	Octoea pretiosa	Ocotea pretiosa
126	Daphniphyllium	Daphniphyllum
144	Podocarpus Coriaseus	Podocarpus Coriaceus
148	Dephelium Longana	Nephelium Longana
191	Guectarda Soleriana	Guettarda Soleriana
217	*Flindersia Ifflaina	Flindersia Ifflaiana
241	Ouriria	Mouriria
256	Kurrima zeylanica	Kurrimia zeylanica
312	F. Chatawaina	F. Chatawaiana
314	Mimusops amazonca	Mimusops amazonica
386	Enterolobium elipticum	Enterolobium ellipticum
395	Calycophyllum Spruccanum	Calycophyllum Spruceanum
396	Guiacum offinale	Guaiacum offinale
398	Quercus Junghuhuii	Quercus Junghuhnii
402	Ochnasostachys amentacea	Ochanostachys amentacea
403	Symplock	Symplocos
430	Euxylphora paraensis	Euxylophora paraensis
447	Madbuca utilis	Madhuca utilis
494	P. ingra	P. nigra
505	Eucalyptus microrys	Eucalyptus microcorys
562	Lovea Klaineana	Lovoa Klaineana

* Baker quotes this in one place as Ifflaina and in another as Ifflaiana; Queensland Forest Service adopts the latter spelling.

ABEY. *Poeppigia excelsa* A. Rich.
Weight 50 lbs. 15 oz. San Domingo.

In North America it has sometimes been called bay-wood. The colour is brownish-red, resembling mahogany or satinee, generally more like the latter, with a firm, hard texture, and the same contrary grain of hard and soft layers. It has probably been used in the United Kingdom and termed satinee or mahogany, especially in old pieces of furniture. It is capable of a fine finish when sharp tools are used, and is satisfactory for turnery, mouldings, and show-cases, standing well under all conditions.

The pores are irregular in size and position, and sometimes appear in duplicate and triplicate ; they show on the tangential section a fine mark like chalk, which is similar to the marking of San Domingo and some Cuba mahogany. The medullary rays are clearly defined, parallel, and irregular, and are joined at right angles by sparse and rather faint similar lines.

ABEY MACHO. *Hedwigia balsamifera.*
The West Indies.

Little is known of this wood, though it is possible that it may at times have been mixed with the supplies of Abey.

Abies Pindrow Spach.
Weight about 30 lbs. (Gamble). Western Himalaya.

VERN—*Palúdar, rewari,* Jhelum—*Bádar, búdar, túng, túng bandar, budlu, drewar,* Kashmir—*Dhúnu, rág, rail, pe, re, salle, sara,* Chamba—*Tos,* Kulu—*Spun, pun, krok, kalrei,* Kunawar—*Bharda, thanera,* Shali—*Burla, pindrau, pindrai,* Hattu—*Kudrom,* Matiyana—*Span, krok,* Bashahr—*Burúl, búrra, búldu,* Bhajji—*Kalrai, satrai, chúr,* Kotkai—*Raho, row, chilrow, kilaunta,* Chor—*Morinda,* Jaunsar—*Ragha, ransla, rao ragha, raisalla,* Kumaon—*Himalayan silver fir.*

The two silver firs of the Himalayas are *Abies Pindrow* Spach, and *A. Webbiana* Lindl. The Pindrow fir, according to Gamble, is the better

known of the two, the wood of which is used " indiscriminately with that of the spruce." It has been introduced into Europe and resembles the wood of other *Abies* species, with some resemblance to the wood of *Pinus Strobus*.

ABURA. *Mitragyne macrophylla* Hiern.

Ivory Coast, Africa.

VERN—*N'towo*.

The wood is of a light straw colour, with a close, compact, firm grain, capable of a very smooth surface from the tool, resembling New Zealand kauri pine, but harder and heavier. Reports show that it has been favourably received for decorative cabinet woodwork in the United Kingdom.

Tropical Woods mentions that it is inclined to check in seasoning, and is not highly resistant to insect attack and decay.

The numerous pores are from very small to small, partially plugged and evenly placed, with numerous conspicuous rough-edged medullary rays which show on the radial section in small flecks.

ACACIA. *Robinia Pseudacacia* Linn.

Weight 40–50 lbs. America, Europe.

The tree, usually known in Great Britain as the " locust tree " or " false acacia," is a native of North America. A general impression has prevailed that Cobbett introduced this tree into England from North America in 1812 (?), but according to Prideaux Selby, who casts a doubt upon Cobbett's reliability, the first trees were introduced into England long before—about 250 years ago—where it is now widely grown, and has also been planted in Japan and in the Himalayas.

The timber has not been imported into England commercially and, strange as it may seem, is very little in demand. The heart-wood when fresh and planed is light greenish-yellow, showing a glossy lustre and a hard, bright surface, but it subsequently darkens to a dull greenish-brown. It is one of the number of valuable woods that we possess at our doors, yet use so little ; in France, where the economic utilisation of wood is practised, this timber receives the full attention that it merits. It vies with, and in some cases surpasses, European oak in strength and durability, is tough, very elastic, and has considerable powers of resisting shock. Its marked durability in contact with the ground renders this timber excellent for all outdoor work, such as posts, rails, trenails, and so forth. On Sir Hugh Beevor's estate, for instance, a large plank was used as a bridge for forty years, when it was carried away by floods ; and posts for palings have remained sound in the ground for more than thirty

years (1920). Elwes and Henry quote cases of posts that were still sound after eighty years. On this same subject of durability, Stone quotes several authorities as follows: " . . . almost incorruptible, stronger and more durable than oak, very elastic and of a vertical resistance one-third greater than oak ; the best wood for spokes."

In recent times the wood has been employed, especially on the Continent, in the manufacture of spokes for the wheels of motor cars. Carefully selected wood has been found to be excellent for this purpose, but in some cases the employment of defective (so-called " dead ") specimens of acacia wood, has resulted in serious accidents. British-grown acacia has been used occasionally in old furniture, and will compare favourably with satinwood for such work. Exposure to light and air improves the colour, and it is often mistaken for the latter wood. This was the case with a small bureau owned by Mr. Edgar Taylor, which had always been supposed to be satinwood, as it resembled it in its beautiful colour and texture. Examination proved it to be acacia. Some burrs taken from a tree growing in the front garden of No. 2 Lansdowne Road, Notting Hill, provided attractive wood from which several small table-tops have been made, and also a fair-sized music cabinet. The burrs, cut into veneer, although lighter in colour, compare favourably with Amboyna.

Especially worthy of note is the exceeding narrowness of the sapwood, which includes only from two to five annual rings, and during the first twenty-five to forty-five years of its life the tree grows fairly rapidly. Consequently a comparatively young tree yields serviceable timber, so that one, after thirty-eight years' growth only, was large enough to supply wood sufficient to make three sturdy gate-posts, or legs for half a dozen chairs. The " false acacia," with its graceful habit and beautiful pendant tassels of white flowers, deserves to be widely planted, both for its beauty and its utility.

The pores forming the pore zone are large, but all, except in the sapwood, are plugged with microscopic cysts (thyloses). The medullary rays are fine, but just visible to the naked eye in transverse section.

Acacia arabica Willd.

Weight 49–58 lbs. India, Burma.

VERN—*Kikar*, Pb.—*Babbar, kalikikar*, Sind.—*Babúl, babúr*, Hind.—*Gabur bakar*, Sonthal—*Babola*, Mal Pahari—*Karúvelam*, Tam.—*Túma, nella túma*, Tel.—*Gobli, jali, karrijáli*, Kan.—*Ramakantha*, Bombay.

The Babúl tree. Principally used for its gum, known as gum arabic.

The colour is a reddish-brown, with a hard, strong grain. Useful for many purposes throughout India, and unsuitable for export.

The pores are scarce, and irregular in size and position, somewhat

plugged. Medullary rays very irregular in size and position, conspicuous, showing on the radial section.

Acacia Catechu Willd.

Weight 61 lbs. (Gamble). India, Burma.

VERN—*Khair*, Hind.—*Khoira, koir*, Ass.—*Khoiru*, Uriya—*Karangalli, bágá, othalei*, Tam.—*Sandra, nalla sandra*, Tel—*Khair, kaderi*, Mar.—*Kagli, cachu*, Kan.—*Rat kihiri*, Cingh.—*Sha, cutch*, Burm.

Its chief name is "khair," but in Burma it is generally known as the "cutch tree." The wood is of a bright red mahogany colour, slightly lustrous, with a close, firm, hard texture. As a tree it is very important, less for its timber than for the astringent products which it gives. In India this is catechu, an important catechol tan, but in Burma the tree is valued for cutch, a black shining extract used as a tanning material, and exported to Europe for that purpose. The wood possesses many qualities which, were they better known, would bring a demand from many parts of the world. It is extremely hard and durable, highly suitable for cabinet work, and is not attacked by white ant or teredo. It is already in use in India and Burma for a great many purposes, which are not sufficiently important for its merits, and it is amazing to know that it is even used for firewood. As the tree grows rapidly and is not difficult to raise, its production should be much increased.

The pores, which are fairly numerous, are of moderate size, and generally surrounded by a white halo. Medullary rays are clear and distinct, but vary in fineness.

Acacia ferruginea DC.

Weight 70–73 lbs. (Gamble). India, Ceylon.

VERN—*Kaiger*, Panch Mehals—*Son khair, safed khair, brahmani khair*, Berar—*Kar khair*, Gondi—*Phandra khair*, Mar—*Teóri khair*, Bhil—*Banni*, Kan.—*Velvelam*, Tam.—*Ansandra, tella tuma, wúni*, Tel.

A very fine mahogany coloured wood, with a hard, close texture, equally valuable and comparable in all respects with Spanish mahogany.

The pores are from medium to rather large, open, single or arranged in duplicate, surrounded by thin light-coloured tissue. Medullary rays fine, irregular in size and position, crossed at right angles by very fine thin lines.

ACACIA, JAPANESE.

This wood is of a dull brown colour, with strongly marked layers of contrary hard and soft grain, showing some mottle. It is very similar

in grain and texture to camphor-wood, with a similar fragrant scent. An attractive wood for many classes of decorative woodwork.

The pores are numerous and open, varying greatly in size. Medullary rays are faint and hardly discernible under the lens.

Acacia leucophloea Willd.

Weight 58 lbs. India, Burma.

VERN—*Rerú, raunj, karír, nimbar, ringa, rinj, rohani, jhind, safed, kikar,* Hind.—*Arinj,* Raj —*Raundra, runjra,* Banswara—*Rinjra,* Kurku —*Renuja,* Bijeragogarh—*Tumma, reunja, rinja,* Gondi—*Gwaria,* Uriya—*Goiri,* Khond—*Hewar,* Mar.—*Haribawal,* Guz.—*Velvaylam, vel-vaghe,* Tam —*Tella tuma, harwar,* Tel.—*Bili jáli, topal, naibela,* Kan.—*Katu andara, maha-andara,* Cingh.—*Tanaung,* Burm.

The wood of this fairly large tree is brick-red, with lighter and darker streaks. Sir George Hart says that it is not generally common, and is unlikely to be of commercial importance.

The pores, which are in groups, are more or less plugged and are variable in size. The medullary rays are clearly defined and irregular. The tangential surface displays a minute, flecked appearance.

Acacia modesta Wall.

Weight 62 lbs (Pearson & Brown). India.

VERN—*Phulai,* Punj.—*Palosa,* Afgh.

Pearson and Brown in *Commercial Timbers of India* report this wood as " light russet with a faint greenish cast, ageing to dark brown, often with darker streaks ; somewhat lustrous . . . fairly even and straight-grained, medium-textured. . . . It is a strong and extremely hard wood. . . . Certainly the hardest *acacia* timber examined . . . durable, even in exposed positions, and in contact with water. . . . Can be classed as a decorative wood."

Acacia seyal.

The Sudan.

" Talk " is the native name of this wood. It is an unimportant, rough-grained wood with a strong, tough grain of the usual acacia kind.

The very small to rather moderate sized pores, not very numerous, are placed in straight, wide, wavy lines of light medullary tissue, with rather indefinite medullary rays crossing at right angles, irregular and uneven.

Acacia verugera.

The Sudan.

The native name of this wood is " kuk." It is similar to *Acacia seyal* but of a slightly yellower colour.

The small to moderate sized pores, open, single, and in duplicate, are placed between wide, wavy belts of light tissue, crossed very irregularly by uneven medullary rays, forming an irregular network pattern.

ACACIA, WEST AFRICAN.

See SATINWOOD, AFRICAN.

ACANA. *Labourdonnaisia albescens* Benth.

Weight 65 lbs. Cuba.

VERN—*Almique, acana, donsella,* Trade—*Acana, almiquí,* Cuba.

The colour is deep, dull purple plum, with a hard, close, dense grain, capable of a very smooth marble-like surface from the tool, often containing mahogany-like roe and mottle figure, with an inclination to split after planing. This wood is liable to attack from some species of worm or beetle, which bores in the direction of the medullary rays, parallel with the concentric layers, the damaged wood emitting a strong, unpleasant odour. Only small quantities have been imported into our markets at long intervals.

Record reports that the wood is used for walking-sticks, umbrella handles, and cabinet work.

The pores are small and somewhat obscure. The medullary rays are very fine and closely packed, and are linked at right angles by similar but more strongly marked white lines.

ACAPU. *Vouacapoua Americana* Aubl.

Weight 63 lbs. Brazil.

VERN—*Acapú, vacapou, vouacapú, wacapou,* Braz.—*Wacapou, épi de blé,* Fr. G.—*Bruinhart, berkhout, braunherz, wakabu,* Sur.—*Blackheart, dakamaballi ? partridge wood ?* B.G.—*Vouacapouholz, wegabaholz,* Ger.

This valuable timber bears a strong resemblance to dark coloured greenheart. It is streaked along the grain with lighter and darker lines like partridge wood, and might well be used as a substitute for teak, although a little harder and more difficult to work. It does not split, yields a fine surface from the tool, and stands well. The wood has a sticky surface, and my specimen also has a peculiar and unpleasant scent. Weisner describes his sample as exuding a fragrant odour, recalling that of the cigar-box cedar (*Cedrela odorata*). A specimen of a Surinam wood which I received from Rotterdam, known as "brownheart," and in Holland "bruinhart," is identical with my specimen of acapu. On the other hand, Record's description of acapu is not in agreement with the above.

Colonel Gamble says this species is the produce of *Bowdichia major* and notes the alternative common name of *Sycopira preta*. He remarks that it comes from Para, although found throughout the greater part o Brazil, is much recommended, will last for a hundred years underground and that it is used for civil and naval construction. Record treats *Bowdichia* as a separate species from *Vouacapoua*, and attributes " sucupira," " sapupira," or " sebipira " to the former, at the same time admitting that the identities of these woods have yet to be de termined.

The pores are not very open. The exceedingly fine medullary rays are invisible to the naked eye in cross-section, but with the magnifying glass are clearly defined by reason of their light colour ; they are linked at right angles by similar light lines. These, however, are not visible in the specimen of bruinhart.

In Colonel Gamble's Brazilian collection there is also a specimen o what is evidently an allied species, *Sycopira mirim*, which he says is no so good as the *Sycopira preta*. It is a coarse-grained wood of a brown colour, and on the tangential and radial sections the pores show longi tudinally in lighter coloured short lines, often filled with gum. There i a pretty ripple marking on the radial section. The Ministry of Agricultur (Rio) says that this wood is very flexible and makes sleepers of first-clas quality. Amongst its other uses are shipbuilding, flooring, and cabine work.

The pores are medium-sized and irregularly disposed ; they are often joined in threes and fours in short wavy lines, and are generally surrounded by a patch of loose tissue. Concentric rings are marked by an absenc of pores. The exceedingly fine medullary rays are very even and regular and rather wavy in contour.

There is also a similar wood, *Sycopira assu*, which is used for lik purposes.

Acer Campbellii Hook f. & Th.

Weight 37–40 lbs. (Gamble). The Himalayas

VERN—*Kabashi*, Nep.—*Daom, dóm, yali, yatli*, Lepcha.

Gamble reports this as the " chief maple of the East Himalaya." I resembles the Canadian or American maple, and English sycamore, per haps harder than the last, but the colour is browner, with almost an oliv tint. It is reported as being used for planking and tea-boxes, both un economical uses for a very handsome, valuable cabinet wood.

The minute pores are scarce, and hardly discernible under the lens with very numerous, exceedingly fine medullary rays, which show in th tiniest flecks on the radial section.

Acer caudatum Wall.

Weight 41–45 lbs. (Gamble). India.

VERN—*Kanzle, kandaru, kanjara,* Simla—*Kainjli, kanjla,* Jaunsar—*Khansing, kabashi,* Nep.—*Yalishin,* Bhutia.

This wood is white with a faint pink tinge, shiny and compact, moderately hard, with the same appearance and grain of the American or British maples, but much softer.

The concentric layers are marked with wide darker-coloured lines, the pores being numerous, and very small. The medullary rays are exceedingly small, and only discernible under the lens.

ACEUDE CANDEIA. Source unknown.

Weight 59 lbs. Brazil.

The colour is a rich nut-brown, with a fine grain, capable of a very smooth surface from the tool. It appears identical with a shipment of logs which came to London about 1913, and which were included with quite different woods, all classified together and sold as "Brazilian walnut." It would make a fine medium for all classes of decorative woodwork.

The pores are fairly large, numerous and evenly distributed, sometimes joined; they are plugged with a yellow substance. The medullary rays are very numerous, but so fine as to be scarcely discernible, even under the lens (+10). The concentric layers are clearly marked.

Acrocarpus fraxinifolius Wight.

Weight 39 lbs. (Gamble). India, Burma.

VERN—*Mandania,* Nep.—*Madling,* Lepcha—*Mallay kone,* Tinnevelly—*Kilingi,* Badaga—*Hantige, belanji, havuligc,* Kan.—*Shegappu agili,* Kader—*Kurangadi, kuranjan,* Trav. Hills—*Yetama, mayahnin,* Burm.

Gamble says it is one of the largest timber trees of India, "with a lofty cylindrical stem branching only at a considerable height," and "easy for reproduction." It is remarkable that the only use which has been found for this valuable timber has been for tea-boxes and furniture, and in Mysore and Coorg for shingles.

It is of a light mahogany colour, with an attractive, fine grain, capable of a smooth surface from the tool. It could easily be mistaken for some of the best classes of West African mahogany. The wood has not been seen in commerce, but some specimens sent over for the Holland Park Exhibition produced squares which were used for the capping of a wharf front, where, being exposed to wet and dry conditions, durability is essential. For ten years the wood has stood remarkably well, only sur-

passed by Pyinkado (*Xylia dolabriformis*), which was placed in the same position at the same time. Used for such a purpose the grain has hardened, and there is a total absence of the flaky splits which, under such a severe test, occur with most timbers.

The pores are scarce, rather large in size, and mostly in groups. Medullary rays are irregular in position, fine, and clearly marked, showing in small flecks on the radial surface.

ADERNO. *Astronium commune* Jacq.

Brazil.

VERN—(which may be only in part synonymous)—*Aderno, aderno preto, aderne, ubatan, ubatan amarello, ubatão, jubatan, ybatan, gibitan, gibatão, chibatão, chibatão pedro, chibatão vidrado*

This timber, which is also known variously as "chibatan" and "ubatan," is of a yellowish-brown, or reddish colour, with lighter or darker variegations. (Record.)

It is used for cabinet and building work, railway sleepers, and is reported as being strong and durable. It should not be confused with Urunday, *Astronium piptadenia*, from Argentina.

Aesculus indica Colebr.

Weight 34–35 lbs. (Gamble). West Himalaya.

VERN—*Torjaga*, Trans-Indus—*Háne, hanúdún, hán, kishing*, Kashmir—*Gún*, Ravi—*Bankhor, gugu, kanor, pankar*, Hind.—*Kandar*, Jaunsar—*Pú*, Sutlej—*Pangar*, Kumaon

This wood is of a light grey colour very much resembling the European horse-chestnut, excepting for the pronounced medullary ray on the radial section, somewhat like, but smaller than that shown in beech. A wood not likely to be seen in commerce. Its uses are the same as those for which the horse-chestnut is employed in the United Kingdom.

Concentric layers are clearly marked by light lines. The pores are very numerous, but exceedingly minute. The medullary rays very strong and clearly defined.

AFARA. *Terminalia superba* Engl. & Diels.

Nigeria.

Reported by the Imperial Institute as a wood very similar to oak in colour, and possessing a straight grain. Heart-shakes are present, but it should be useful for general joinery work.

AGBA. *Pterolobium* sp.

Nigeria.

Reported by the Imperial Institute as a good, useful wood of very serviceable width. It is resinous, and has no special figure; plain-polished

it would resemble oak. It would be useful for construction work, sills, treads, and cheap cabinet work.

Aglaia Roxburghiana W. & A.

Weight 60 lbs. India.

VERN—*Yerra aduga*, Tel.—*Chokkala, kanna kompu*, Tam.

The colour of this wood is bright red. It is hard, close-grained, and handsomely marked with a faint mottle, reported as being strong and standing well.

The rather scanty pores are of medium size, and are sometimes subdivided. The medullary rays are fine, fairly numerous but rather irregularly spaced.

Ailanthus glandulosa Desf.

Weight 38 lbs. 9 oz. China, Japan.

This tree, the " Chinese sumach," familiar under the name of " Tree of Heaven," said to be a translation of the local name " amboyna," is a native of China, whence it has been introduced into England and the Continent of Europe, but it must not be confounded with the wood known as Amboyna (*q.v.*).

The timber, which is neither well known nor much used, resembles in colour and grain that of the ash to such an extent that it is often mistaken and substituted for it. Careful tests made by the engineer G. Lauboeck showed that his samples of this wood, in resistance to rupture by bending, surpassed that of the ash grown on the Continent, and that it possessed a high degree of elasticity and resistance to crushing. In view of published statements opposing these results, and considering the rapid extension of the cultivation of the tree in England, renewed tests are desirable. My experience is that it does not possess the strength of English ash.

The annual rings are clearly marked ; they are easily identified because of the spring zone of wide open pores. The wood is easily distinguished from that of the ash, not only, as usually the case, by the great width of the annual rings, but also by the fact that the medullary rays are easily visible in cross-section to the naked eye.

AINYERAN. *Afrormosia laxiflora* Harms.

Nigeria.

The Imperial Institute states that this wood is of no value in the market of Nigeria, bad cross-breaks being present.

AKEAKE. *Olearia aricenniaelobia.*

New Zealand (South Island).

Only a very small quantity of this timber has ever been seen in England, but further shipments would be appreciated. The New Zealand Department of Agriculture reports the wood as " yellowish, with a satiny lustre, frequently wavy and prettily figured ; obtainable in short lengths and small in size. Used for ornamental cabinet-maker's work, inlaying, etc."

Albizzia amara Boivin.

Weight 54 lbs. (Pearson & Brown). India.

VERN—*Lallei,* Dekkan—*Wusel,* Madura—*Thuringi, uyil, wunja, suranji, shekram,* Tam.—*Nallarenga, shekrani, sikkai, narlingi,* Tel.—*Bel-khambi, tugli,* Kan.—*Kadsige,* Coorg—*Oosulay,* Mal.

Pearson and Brown in *Commercial Timbers of India* report this wood as " light brown, often with a purplish cast, beautifully mottled with darker lines alternating with lighter tissue ; lustrous, working to a smooth finish . . . straight or somewhat interlocked-grained, even and medium to coarse-textured. . . . Said to be very durable . . . when polished it is an extremely attractive timber. . . . It should make excellent tool handles . . . and articles where strength and toughness are required. A very superior timber and well worthy of further attention by cabinet-makers."

Albizzia lucida Benth.

Weight 38–43 lbs. (Pearson & Brown). India, Burma.

VERN—*Sil koroi,* Beng.—*Tapria-siris,* Nep.—*Ngraem,* Lepcha—*Mess-guch,* Ass.—*Gunhi,* Magh—*Thanthat,* Burm.

Pearson and Brown in *Commercial Timbers of India* state that this wood is " brown to dark brown with lighter and darker streaks ; rather lustrous, working smooth. . . . Broadly and shallowly interlocked-grained, very coarse-textured . . . a quite attractive wood, which would make good posts, rafters, and scantlings."

Albizzia odoratissima Benth.

Weight 54 lbs. (Gamble). Ceylon, India, Burma, Malacca.

VERN—*Lasrin, karambru, polach* Pb.—*Siris, siran, bhandir, bersa, bas, bassein, bansa,* Hind.—*Kalei, kala siris,* Merwara—*Chichalda,* Berar—*Koroi, tetura,* Beng.—*Sirsi tentura,* Khond—*Ginnera,* Koya—*Chichwa, chichola, yerjoohetta,* Gondi—*Chichwa,* Kurku—*Kali harreri,* Panch Mehals—*Sedong,* Lepcha—*Jati-koroi,* Ass.—*Moroi,* Chachar—*Kal-thuringi, kar vaghe, bilwara, ponnai muran-kai, solomanim, sela vanjai,* Tam.—*Shinduga, chinduga, telsu, yerjuchinta, karu vage,* Tel.—*Pullibaghi, billawar, godhunchi,* Kan.

—*Borhi, chichua, chichanda,* Mar.—*Karu vagei,* Mal.—*Suriya mara,* Cingh.—*Thitmagyi, thitpyu, taungmagyi, maikying-lwai, maikkyè, mai-tawn,* Burm.

This is a large tree which grows over the greater part of India and Burma. Both the tree and its timber are very like koko *A. Lebbek* (*q.v.*). The wood has the same lustrous appearance, but it is of a more reddish tint than koko, and is not so well figured. It is fairly durable, and seasons, works, and polishes well.

Professor Unwin recorded the following results of tests :

Resistance to shearing along the fibres . .	1283 lbs	per sq in.
Crushing strength	4·184 tons	,, ,,
Transverse	6·518 ,,	,, ,,
Coefficient of elasticity	755 ,,	,, ,,

The wood is used for building, shafts and axles of carts, wheels, ploughs, and casks, also for furniture.

The numerous pores are very large, and often surrounded by a patch of loose tissue, showing prominently on the vertical section. The medullary rays are exceedingly fine and numerous, scarcely discernible even under the lens (+12). There are concentric rings of darker coloured wood in which the pores are more scarce.

Albizzia procera Benth.

Weight 39–40 lbs. (average of Gamble's specimens, 46 lbs.).

India.

VERN—*Safed siris, gurar, karra, karo, karanji, gurbári, gurkur, kalsis, baro, karolu, garso,* Hind.—*Karallu, kini, kilai, kili, tihiri,* Bombay —*Takmur,* Lepcha—*Koroi, medeloa,* Beng., Ass.—*Kili,* Gáro—*Sarapatri,* Uriya—*Pandrai,* Kól—*Garso,* Kharwar—*Laokri,* Mechi —*Gura manja,* Khond—*Passerginni,* Gondi—*Kinni,* Bhil—*Gurar, kinhai,* Mar —*Konda vaghe,* Tam.—*Pedda patseru, tella sopara, tella chinduga,* Tel —*Chikul, bellati,* Kan —*Kottu vaga, karunthagara,* Mal —*Choi,* Magh—*Sibôk, thitpyu, sit,* Burm — *Búrdá,* And.

The produce of this tree, known in India as " white siris " and " sit " in Burma, is entirely unknown under these names in the United Kingdom. It is probable that it has been imported, mixed with the produce of *A. Lebbek* (Koko) (*q.v.*).

The wood is of a brown walnut shade, tinged with red or yellow ; it is lustrous and bright, and inclined to be streaky, but without the dark lines which are characteristic of European walnut. The sap-wood is not durable. The wood is often straight-grained and mild, although much of it is figured, and it stands well under all conditions. Gamble reports it as " straight and even-grained, seasons well, and the heart-wood is durable." It is used in India for a variety of purposes, which include wheels, agricultural implements, bridges, and house-posts.

The timber was tested for aircraft work at the Forest Research Institute at Dehra Dún, India, in 1918, with the following results :

Transverse strength	8·02 tons per sq. in.
Fibre stress at elastic limit . . .	4·77 ,, ,,
Modulus of elasticity	2·071,162
Compression	4·73 tons per sq. in.
Shearing (detrusion)	1·10 ,, ,,

The pores are scarce and rather large and open, with smaller ones which are occasionally plugged. The medullary rays are fine, and show very clearly in the radial section, in the same way as in sycamore.

Albizzia stipulata Boivin.

Weight 22–45 lbs. (Gamble). Southern India, Burma, Ceylon, The Andamans.

VERN—*Oi, oë, sirín, shirsha, kasír,* Pb.—*Siran, kanujerla, pattia, samsundra,* Hind.—*Kala sirs,* Nep —*Singriang,* Lepcha—*Sau,* Ass. —*Selcho,* Gáro—*Chakua, amlukı,* Beng.—*Chapun, kora serum,* Kól—*Bunsobri,* Mechi—*Kat turanji, pili vagel,* Tam —*Konda chiragu, chindaga,* Tel —*Kal baghi, hote baghi, bagana,* Kan.— *Laeli, udul, kasír,* Mar.—*Motta vaga,* Mal.—*Goiri,* Khond— *Kabal,* Cingh —*Pokoh,* Magh—*Bònmèza,* Burm.

The colour is a lighter red than that of *A. odoratissima,* but in other respects, such as grain and texture, there is no material difference. If supplies of this wood could reach the market in fair sizes and good quality, it would become popular.

The pores vary in size from small to large, and are invariably plugged. The medullary rays are exceedingly fine, irregular, and indefinite.

ALDER. *Alnus glutinosa* Gaert.

Weight 26–41 lbs. (Stone).

Although this tree is widely distributed in temperate Europe, Asia, and North Africa, in an area extending from the British Isles to Japan, the timber used in Great Britain is almost entirely of British growth, an exception being that of ply-wood, which is imported.

The wood is reddish-white, soft and light, and possesses a smooth, fine grain. It has a somewhat soft yet tough surface, which is rubber-like and resilient, so that a light blow causes a temporary depression unaccompanied by any considerable permanent indentation. It is used in the manufacture of clogs, soles of shoes, and toys, also in turnery and the cheaper forms of cabinet work. Being extremely durable when wholly submerged, it has provided the material for drain pipes, sluice gates, and so forth ; in fact, Holtzapffel states that the piles of the Rialto at Venice were composed of this wood. In America it has been used in the manu-

facture of combs. Alder charcoal has long been employed in the manufacture of gunpowder. Recently it has been used in large quantities for ply-veneer of all kinds, especially for trunks, tea-boxes, packing-cases, and the like. Still more recently such ply-veneer has been forthcoming from Japan, where wood of excellent quality, though slightly redder than European alder, is found. Since its utilisation in this connection there has been a good demand. Very handsome card- and cigarette-cases have been made from dark-grained, richly figured, gnarled pieces, but more profitable employment could be found if its good properties were better studied.

The annual rings are distinct in cross-section ; the pores are invisible to the naked eye, as are most of the medullary rays, but some of the latter, when aggregated, form dull-edged " false rays." Pith flecks are present.

ALDER, FORMOSAN. *Alnus maritima* Nutt. var. *formosana* Burhill.
Weight 33 lbs. Formosa.

The wood is of a light yellow, straw colour ; it has a bright sheen and takes a smooth surface. It is streaked with thin, reddish lines caused by the medullary rays, which show very strongly on the radial section, as in oak. Being of a very good texture, it gives every promise of standing well, without liability to warp or twist. It has never been imported into England, but would be very useful for a great number of purposes. Mitsui & Co. report (1920) that an available supply of one million and a half cubic feet exists.

The pores, which are very numerous, are small ; the medullary rays are strong and clearly defined, with a number of secondary smaller rays between the stronger and principal ones.

ALDER, RED. *Alnus oregona* Nutt.
South-eastern Alaska to California.

The colour is light brown tinged with red. The wood soft, light, brittle, not strong, close-grained ; it is used in the United States for furniture.

ALDER, WHITE. *Alnus rhombifolia* Nutt.
North America.

A light brown wood, brittle, soft, close-grained, not strong, and light in weight. Sometimes used for furniture, canoes, charcoal.

ALERCE. *Fitzroya patagonica* Hook.
Weight 28 lbs. Temperate South America.

This wood, the name of which is derived from the Arabic " al arzar," meaning " cedar," has the characteristic grain of the thuya and cypress,

ınd is of about the same weight. In colour it is of a reddish hue, deepening with exposure to light and air, to a brilliant rich, warm red, with ılternate lighter and darker streaks. Elwes says that in Chile, where it s largely used for shingles, it often turns to a blue colour, making the roofs ook as though they were covered with slates. It is easy to work, is :apable of a smooth surface from the tool, and stands well under all conlitions. It is not known commercially in the United Kingdom, but it vould undoubtedly be in demand for a variety of decorative and other vork, if any regular supply were available, especially as it is reported to ›e very durable.

The name alerce is also applied in Chile to the produce of *Libocedrus etragona*, another coniferous wood, but the true alerce is of the above-ıamed species.

Lord Powerscourt has sent me a piece of a tree, thirty years old, ;rown at Powerscourt Castle, in Ireland, capable of yielding a piece of vood of a diameter of ten inches. The growth is similar in every respect o that of the tree in its native land, except that the concentric layers are vider, the tree having made rapid growth.

The concentric layers, which are strongly defined, are very close, and show a slow-growing wood. The medullary rays are marked, and show ›n the radial section in fine flecks.

ALIGNA. *Afzelia africana* Sm.

Nigeria.

Reported by the Imperial Institute as a hard wood of light colour and good general character, suitable for solid doors, stair treads, and general oinery. It would probably command a price near to that of Iroko.

ALMOND, EUROPEAN. *Prunus Amygdalus* Stokes
Amygdalus communis Linn.

Weight 43 lbs. Europe.

The colour is dull reddish-brown, with darker veins. It is of but slight commercial use in turnery and marquetry.

The medullary rays are well marked, and the pores, except in the pore zone, are very small.

ALMOND WOOD.

See *Chickrassia tabularis.*

ALMOND WOOD, CUBA.

See NARGUSTA.

Alnus nepalensis Don.

Weight 27–28 lbs. (Gamble). India, Burma.

VERN—*Kohi, koe,* Pb.—*Kúnch,* Bashahr—*Kuntz, ni, newn,* Sutlej—*Utis, udish, wústa,* N.-W.P.—*Utis,* Kumaon—*Pusála,* Jaunsar—*Kúnis,* Garhwal—*Boshi swa, udis, útis,* Nep.—*Kowal,* Lepcha.

A specimen plank of this wood was sent over for the 1924 Exhibition, which is probably the only occasion upon which it has been imported into the United Kingdom.

It appears to be similar in all respects to the *Alnus* of Great Britain, although perhaps slightly lighter in weight, and more unevenly coloured with brown stains.

Alseodaphne semecarpifolia Nees.

Weight 47–63 lbs. (Gamble). Western India, Ceylon.

VERN—*Nelthare,* Kan.—*Phudgus,* Mar.—*Ranai, yavaranai,* Tam.—*Wewarani,* Cingh

Trimen says that this is one of the best timber trees of Ceylon, the wood being heavy, durable, and straight-grained, and obtainable in large sizes. My Ceylon specimen does not confirm this, as it shows an inclination to flaky shakes and worm holes. The colour is yellowish-brown with darker streaks. It has a very close, firm, and exceedingly smooth texture.

Gamble quotes Unwin : " Weight 63 lbs. per cubic foot ; shearing strength 927 lbs. per square inch ; crushing strength 2·605 tons per square inch ; coefficient of elasticity 459 tons per square inch," and states that the Ceylon specimen gave only 47 lbs. to the foot cube.

The very numerous pores are exceedingly small and plugged. Medullary rays so fine as to be hardly discernible under the lens.

Alstonia scholaris Br.

Weight 28 lbs. (Gamble). Ceylon, India, Burma.

VERN—*Chatwan, chatinn,* Beng —*Satiún, chatiún, satwin, satni,* Hind.—*Lationj,* Kumaon—*Chatiwan,* Nep.—*Purbo,* Lepcha—*Satiána,* Ass.—*Chhatiána,* Uriya—*Chhatni,* Sonthal—*Chhatin,* Mal Pahari —*Chatni, bomudu,* Kól—*Chochnia,* Khond—*Satwin, saptaparni,* Mar.—*Sattni,* Cachar—*Pala, wodrase, elilaip-palai, mukampalei,* Tam.—*Eda-kula, pala garuda,* Tel.—*Mukampala, elila-pala, kodapala,* Mal.—*Janthalla, mudhol, kodale,* Kan.—*Rukattana,* Cingh.—*Chaile, chalain,* Magh—*Taungmeôk, taungsaga, lettôk,* Burm.

A soft, light straw-coloured wood, yielding a fairly smooth surface from the tool. Not durable, or of particular value.

The pores are very small and scarce. The medullary rays are very

fine, not straight, and with finer and almost invisible rays spaced at irregular intervals.

Altingia excelsa Noronha.

Weight 46–47 lbs. British India, Assam, Burma, Java.

VERN—*Jutili*, ASS.—*Nantayôk*, Burm.

Gamble says this is a lofty tree, and that the crown is often over 140 feet from the ground and remarkably straight. The colour is a dull reddish-brown, with a fine, close grain, the wood yielding a rough surface from the tool. The tangential section is slightly lustrous, caused by innumerable tiny specks of shining resinous (?) gum. Like pyinkado, it is desirable to convert as soon as possible after felling, as the wood becomes very hard and all tools are severely blunted. Gamble reports it as the chief building material in Java, where he says it "grows to an enormous size."

The strange limitation of the Indian Forestry Service is again emphasised when we see a splendid hardwood of this description used for "indoor work in dry places, but too heavy for tea-boxes." If it is available in any quantity, and large sizes and long lengths can be secured, as stated, far more important uses should be found.

The concentric layers are marked by dark lines at varying intervals. The numerous minute pores, largely plugged, are confined between strong, clearly defined, very variable sized medullary rays, which are very numerous and show on the radial section brightly, in the tiniest of flecks.

AMARANTH or **AMARANTE.** *Peltogyne* sp.

Weight about 62 lbs. (Record). Brazil, The Guianas, Central America, Mexico.

The names "amaranth" and "amarante" have been applied especially in France and Germany to any brilliant purple or reddish-purple coloured wood, including sabicu and padauk from either Africa, the Andamans, Burma, or Indo-Chin, and also for other varieties of *Pterocarpus* sp. The names also have been used for the true purpleheart (*q.v.*) *Peltogyne paniculata*, which has come from British, French, or Dutch Guiana. A distinction has sometimes been drawn by calling the particular wood in question red amarante or purple amarante.

AMARELLA.

See ARARIBÁ.

AMARELLO. Source unknown.

Weight 49 lbs. Brazil.

This is a beautiful, decorative furniture wood with a very fine texture and grain. It is of a bright golden-yellow colour, with a lustrous appear-

ance as the light falls upon it from different angles, and shows a nice figure even in my small sample 2 inches by $2\frac{3}{4}$ inches. Colonel Gamble says that it is much used for furniture locally. In appearance it is remarkably like the bois de corail (*Adenanthera pavonina*) of the Andaman Islands.

The specimen in Colonel Gamble's collection marked " amarello " as described above, bears a very close resemblance to that marked " amarello vinhatico " which Record identifies as *Pithecolobium vinhatico* ; also another specimen marked " piquia marfim " identified as the *Aspidosperma eburneum* ; another marked " piquia " only, which possibly may be *Caryocar villosum* ; and still one more marked " piquia peroba " which is *Aspidosperma tomentosum.* All bear a strong resemblance, yet with some differences. It is impossible here to make any definite pronouncement regarding these woods and, therefore, they are reported under their different names (*q.v.*).

The concentric layers are marked by thin white lines, the innumerable tiny pores are all plugged, with somewhat indistinct, coarse medullary rays, which show faintly on the radial section.

AMARELLO VINHATICO. *Pithecolobium Vinhatico* (Record).
Weight 49 lbs. Brazil.
VERN—*Vinhatico, vinhatico de espinho, vinhatico de macaco, amarello,* Braz.—*Tatané, tatané blanco, espinollo, tataré,* Arg.—Goldwood.

The specimen in Colonel Gamble's collection marked " amarello vinhatico " is of a warm nut-brown colour, with a straight, firm, hard grain, and a fine texture. There are two small pin worm holes in the specimen, which indicate that the wood is liable to this attack ; but except for this defect, it is a very valuable wood, and might readily pass as true mahogany. The two specimens—namely, that marked " amarello " only (*q.v.*), and that marked " amarello vinhatico "—closely resemble each other, and the structure of the wood appears identical. Record's description also indicates that they are the same wood.

For identification see AMARELLO.

AMBOYNA. Source unknown.
Weight 39 lbs. Borneo, The Moluccas.

The name amboyna, or *kiabooca*, which is the native Malay name meaning, literally, " twisted wood," is applied to certain burrs imported from the Moluccas (including Amboyna) and Borneo. Whether these are all derived from the same species of tree is unknown ; various writers attribute them to the species of *Pterocarpus* or *Pterospermum*, or to a member of the mahogany family (*Flindersia* ?).

The wood is brown, tinged with yellow or red, but changes with age to a dull-brown leather colour. It is marked with little twisted curls and knots in a manner similar to, but more varied than, bird's-eye maple. With the naked eye it is difficult to distinguish between the burrs of Amboyna-wood and thuya, or even, according to some authorities, of yew; but though the burr-wood of the yew is similar to that of the other two as regards colour, it is nevertheless unlike them in all other respects.

Amboyna-wood has been freely utilised in the manufacture of ornamental furniture, especially during the Empire period (1804–14), but after this time its use gradually declined. Quite recently, however, a revival took place on the Continent, particularly in Paris, where a considerable quantity of fine burrs were converted into veneers, and employed in making up costly furniture, and interior decorations in motor-cars.

Several years ago some very fine burrs were imported into Paris under the name of "false Amboyna-wood," which measured up to 3 feet in length and 20 inches in width. With the naked eye it is almost impossible to distinguish these from true Amboyna-wood, but they possess a strong and variable scent, sometimes pleasant but often otherwise. It has not been found possible to trace either the geographical or the botanical source of these burrs. They probably may belong to one or more species of Pterocarpus from the French colonies

AMLA-KA.

See *Phyllanthus Emblica.*

Amoora Rohituka Wight et Arn.

Weight 35 lbs. (Pearson & Brown). India, Burma, Andamans.

VERN—*Rohituka*, Sans—*Harin harra, harin khana*, Hind.—*Sohága*, Oudh—*Tikta-raj, pitraj*, Beng.—*Bandriphal*, Nep.—*Tangarúk*, Lepcha—*Lota amari, amora amari*, Ass.—*Okhioungza, okhyang*, Magh—*Sikri*, Kól—*Chem-maram*, Mal—*Thitni, thanthatkyi*, Burm. Amoora.

Pearson and Brown in *Commercial Timbers of India* report that the wood is "red when first exposed, ageing to deep reddish-brown . . . somewhat lustrous . . . straight or somewhat interlocked-grained, coarse-textured. . . . It should make up into excellent three-ply boards. . . . It is a timber that should command a ready market in large commercial centres, and is worth cultivating."

Amoora Wallichii King.

Weight 40–48 lbs. India, Burma, The Andaman Islands.

VERN—*Amari*, Ass.

The colour is a dull reddish-brown, with a contrary hard and soft

grain, which produces an irregular surface detrimental to its appearance ; not suitable for export.

The pores are very variable in size and are often subdivided. The medullary rays exceedingly fine though clearly defined, crossed at right angles by almost indistinguishable similar fine lines.

AMYRIS WOOD. *Amyris balsamifera* L. West Indies, Northern South America.

The " West Indian " or " Venezuelan Sandalwood."

Record reports this wood as " with fragrant or sometimes rather unpleasant odor . . . brittle, easy to work, takes a lustrous polish, very oily specimens appear highly durable."

Anacardium occidentale Linn.

Weight 30–39 lbs. (Gamble). India, The Andamans.

VERN—*Kajú*, Hind.—*Hijuli*, Beng —*Kola mava, mundiri*, Tam —*Kajú*, Mar.—*Jidi, kempu geru, godambe*, Kan.—*Geru mavu*, Dharwar—*Thihothayet, cashew-nut, shitkale*, Burm.—*Caju*, Cingh

This is the " cashew-nut " tree. According to Gamble it was imported into India from America. The wood is of a dirty, pinkish-brown colour, with a poor grain ; not likely to prove durable, and more useful as a medicine or as an astringent, than for its timber.

The pores are somewhat scarce, and plugged. The very numerous medullary rays are confused, and hardly discernible under the lens.

ANAN. *Fagraea fragrans* Roxb.
F. gigantea Ridl.

Weight 60 lbs. Burma.

VERN—*Anan*, Burm.—*Lemesu, meriang, reriang, temesu*, Malay.

This timber was unknown in the United Kingdom until 1920, when it was shipped among the specimens for the Empire Exhibition at Holland Park. It was then noticed that occasional logs of the same timber, unnamed, had been shipped previously, but being unknown and receiving no recognition, were disposed of at ridiculously inadequate prices, and used in the wrong manner. Anan is a very fine timber, possessing remarkably durable qualities. Gamble quotes it as resisting teredo, and as being found good and sound after three hundred years. He says it is one of the most important of the second-class trees of Burma, but it might rank in the first class. Several articles of decorative woodwork constructed from this wood were exhibited at both the 1920 Exhibition and the Wembley Exhibition of 1924, and these were conspicuous for their outstanding qualities of strength and appearance.

A variety of this tree known as Tembusu (*Fagraea gigantea*), although

not abundant, is widely distributed throughout the Malay Peninsula, and is considered very durable. It is useful in contact with the ground or water, and for heavy construction.

It is close-grained and of a light yellowish-red colour; possesses a bright metallic lustre, and is capable of a very smooth surface from the tool. The pores are very scarce and obscure, and form a pretty ripple mark on the radial section.

ANGELIM. *Andira spectabilis* ? (Dept. of Agriculture, Rio).
Weight 69 lbs. Brazil.

My specimen is of a dull brick-red colour, with a close and compact texture, and a faint but well-defined mottle across the tangential section, showing more strongly on the radial section, much resembling partridge wood (*Andira* sp.).

Record makes no reference to this timber and it may be that it is identical with *Angelim rosa* (*q.v.*).

The pores are large and oval in shape, each one surrounded by a patch of loose tissue. The medullary rays are very fine and numerous.

ANGELIM AMARGOSA. *Andira vermifuga* Mart.
A. anthelminthica Benth.
Weight 49 lbs. Brazil.
VERN—*Angelim amargosa, angelim dos campos, aracui, aracuhy*, Brazil.

This wood is of a dark brown colour, streaked with lighter bands. It would be useful as a decorative art wood, although Baterden, who gives it as the produce of the above species, says that it is used in Brazil for sleepers.

Bates in *The Naturalist on the Amazons* mentions an "engaging" custom amongst a savage tribe of Indians, the Mundurucus, who inhabit the shores of the River Tapajos, in which this tree figures: "They had a diabolical custom of cutting off the heads of their slain enemies, and preserving them as trophies around their houses. They used to sever the head with knives and then, after taking out the brain and fleshy parts, soak it in the bitter vegetable oil of this tree, and then expose it for several days over the smoke of a fire or in the sun!"

The pores are usually in groups of four or five, each group in a patch of loose, pale-coloured tissue. The numerous medullary rays are exceedingly fine and are scarcely discernible even under the lens.

ANGELIM PEDRA. *Andira spectabilis* Sald.?
Weight 49 lbs. Brazil.

This is a pale reddish-brown wood with white streaks; it is close-grained and in general appearance it resembles partridge wood, though

the colour is not the same. The specimen is riddled with small worm holes, and therefore it is likely that the wood will generally be liable to this defect.

Colonel Gamble quotes this as being produced by *andira spectabilis*, but Record states it to be the Rio de Janeiro *angelim amargosa*.

The pores are very numerous, and appear in groups of four and five, surrounded by pale loose tissue. The medullary rays are very fine and numerous.

ANGELIM-ROSA. *Platycyamus Regnellii* Benth.
Weight 47 lbs. (Record). Brazil.
VERN—*Pereira, páo pereira, pereira amarella, pereira vermelha, folha de bolo, camará de bilro, páo pente, angelim rosa,* Braz.

My specimen is brown-coloured, rather porous, but strong. Record describes it as " colour, rose red, more or less variegated with a yellowish hue, fading upon exposure to yellowish-brown."

Whether this wood is identical with Angelim, *andira spectabilis* (*q.v.*), it seems impossible to determine. Record makes no reference to *andira spectabilis*.

ANGELIQUE. *Dicorynia paraensis* Benth.
Weight 49–53 lbs. British, French, and Dutch Guiana.
VERN—*Angélique, angélique rouge, angélique franc, angélique gris,* Fr G — *Basra lokus, bastard locus, kabakally, bois angélique,* Sur.—*Angelica do Pará,* Braz.

The tree is of a straight growth, and yields logs 12 to 22 inches square by 20 to 54 feet in length, clear of branches. It is known as " angélique " in French Guiana ; as " bastard locust " or " basralocus " in Dutch Guiana ; and is also probably known as " nutwood," although a specimen of so-called nutwood which came from Dutch Guiana is not altogether in agreement with any authentic specimen of angélique.

The wood is of a reddish-brown colour, clean and even in the grain, moderately hard, tough, strong, elastic, and not difficult to work, although it does not cleave easily. Occasionally a few logs are found with a waviness or figure in the grain, which would make them valuable to the cabinet-maker. There is little sap-wood. The timber is very sound and free from knots, and except that a small percentage of the logs have a slight heart-shake, or perhaps star-shake, at the pith or centre, there are no defects affecting the conversion of it into planks, etc. It has been said that the wood does not rot in water, that it is proof against attacks from many insects to which other timber is liable, and that it is durable. Occasionally it is found that in working, some of the logs emit an unpleasant odour.

Three varieties of angélique, black, red, and white, are distinguishable ; the description here given concerns the brownish-red kind. Beauverie says that the wood finds little use in France, because it is supposed to cause nails to rust. For many years the import into the United Kingdom has entirely ceased, but in 1914, during the war, a small shipment of logs from Surinam, hewn square, was placed on the market under the name of " nutwood."

The wood shows no distinct annual rings. Its pores are large, scattered, and not numerous ; they contain a white, or reddish, but opaque and glistening substance. The medullary rays are very fine, and are almost invisible ; they are joined at right angles (in cross-section) by many shorter or longer, light, wavy concentric lines, which are just visible to the naked eye, and show independently of the pores, though here and there linking with these. The tangential view reveals, even to the naked eye, beautiful *tiered structure* or ripple marks, which are especially distinct on the lighter-coloured wood, and resemble, in miniature, the ripple marks on a sandy shore, or the patterns in finger-prints.

ANGICO. *Piptadenia rigida* Benth.

Weight 71 lbs. Brazil.

VERN—*Angico, angico vermelho, angico verdadeiro,* Braz.—*Angico, angico colorado, anchico colorado, curupay-rá,* Arg.

The colour is " a pale reddish-brown. It is used for heavy construction and appears to be durable " (Record).

Aniba panurensis Mez.

Weight 37–43 lbs. (Record). Brazil, French Guiana.

I have a specimen marked " Anuiba " which agrees with Record's description of the above. The colour is a bright greenish-yellow, with a lustrous surface, reported to darken with exposure ; a very close, firm grain, capable of a very smooth finish and reported as durable and splitting easily.

The small pores are scarce, plugged, in uniform position, evenly distributed, with very fine, clear medullary rays which show faintly on the radial section.

Anisophyllea zeylanica Benth.

Weight 35 lbs. (Gamble). Ceylon.

VERN—*Wéli-penna, weli-piyanna,* Cingh.

A yellow wood, with a tinge of red in it, and a grain resembling that of English yew—close, firm, and hard. A very attractive cabinet wood for small work.

The pores are excessively small and plugged. The medullary rays very clear and fine, with irregular wavy belts of lighter markings, somewhat following the lines of the concentric layers.

Anogeissus acuminata Wall.

Weight 50 lbs. India, Burma.

VERN—*Chakwa*, Beng.—*Panchi*, *pasi*, Uriya—*Numma*, Tam.—*Páchi mánu*, *panchman*, *paunchinan*, *bucha karum*, *pashi*, *pansi*, Tel—*Ghor dhok*, Jeypore—*Gara hesel*, *pandri*, *pansi*, Kól.—*Phás*, *phassi*, Mar.—*Saikamehhia*, *thekri napay*, Magh—*Yung*, *sehoong*, Arracan—*Yôn*, Burm.

This valuable wood, which is very popular in Burma, where it is known by the name of "yôn," is fairly plentiful. It has been imported into the United Kingdom during the last few years, but has not found much favour, although it is a strong, useful timber, and is favoured by the oil mills in Burma for their heavy constructive work. The wood is of a dull grey colour streaked with yellow and brown, and of a very hard, close, firm texture It seasons well, but is difficult to work. If its true value were fully realised, it would be greatly in request for strong, durable woodwork in this country.

Under its Burmese name of "yôn" it has been used in Burma for structural work, for oil wells, and experimented upon rather extensively for the manufacture of tool and pick handles, as a substitute for hickory and ash, but although it may be possible that it can be employed in India and Burma economically for these purposes, it is unlikely that the wood will be able to compete.

The pores are exceedingly small and numerous. They are generally in groups which make rather a pretty pattern, and the concentric layers show in a rather irregular manner. The medullary rays are exceedingly numerous and very fine, though under the lens they show clearly on the radial section.

Anogeissus latifolia Wall.

Weight 62 lbs. (Gamble). India.

VERN—*Dhaura*, *dhauri*, *dhau*, *dhâwa*, *dhauta*, *dohu*, *bákla*, *bákli*, *bánkli*, Hind.—*Gólra*, *goldia*, *golia dhok*, *dhaukra*, *dhokri*, *dau*, Rajputana—*Khardhâwa*, Banda—*Goria*, *golia dhau*, Merwara—*Dhaora*, *dhamora*, Berar—*Dhauta*, *seya*, Koderma—*Hesel*, Sonthal, Kól.—*Vellay naga*, *namme*, *veckali*, Tam.—*Chiriman*, *sheriman*, *yettama*, *tirman*, *yella maddi*, Tel.—*Dohu*, *dhobu*, Uriya—*Dhaori*, *dhamora*, *dhaunda*, *dandua*, *dhavada*, Mar.—*Mala kánjiram*, Mal.—*Dinduga*, *dindlu*, *bejalu*, *dindal*, Kan.—*Arma*, *yerma*, Gondi—*Dhawa*, Baigas—*Dhaundak*, Bhíl—*Dhaura*, Kurku—*Muniah*, *miriah*, Khond—*Sirikara*, Palkonda—*Vellema*, Reddi—*Dawu*, Cingh.

The colour is a pale bluish-yellow, somewhat like bleached hare-wood, but not the stained sycamore which commonly passes for it. The wood

has a close, firm grain, and extraordinary strength and elasticity; so much so that it has been found impossible, even with a foul blow, to break a golf club shaft, but although it possesses a considerable degree of resilience, it is too heavy for this purpose. It is used extensively in India for the handles of all kinds of tools, for which it is considered the best wood possible. It seasons and stands well, and would be a suitable wood for chair-making. A fair proportion of the supplies produce good figured pieces with mottle.

Under the name of axle-wood this timber is referred to in the *Imperial Institute Bulletin 29*, No. 2. Reference is there made to its use as substitute for hickory and ash for the manufacture of tool and implement handles. While it may be found a competitor for these purposes in India, it is unlikely that it can compete for these uses in the United Kingdom, with the woods which have been continually used up to the present, and others which are coming to the fore

The pores are numerous and regular, and are joined by wavy belts of light lines forming a very pretty pattern. The medullary rays, which are fine and clear-cut, are exceedingly numerous and parallel and are almost equidistant.

Anthocephalus Cadamba Miq.

Weight 25–50 lbs. (Gamble). India, Burma, Assam.

VERN—*Kaddam, karam,* Hind., Beng.—*Bol-kadam,* Chittagong—*Pandúr,* Lepcha—*Kodum,* Mechi—*Roghu,* Ass.—*Kadambo,* Uriya—*Kurambo,* Kurku—*Sanko,* Kól—*Vella cadamba,* Tam.—*Kadambe, rudrak-shamba,* Tel—*Pedda soko,* Reddi—*Heltega, arsanatega,* Mysore—*Kadam, nhyu,* Mar.—*Maoo, sanyepang,* Magh—*Ma-u, ma-ugaungdôn, ma-ukadôn, ye-ma-u,* Burm—*Embul-bakmi,* Cingh.

An indifferent wood with a dirty stainy yellowish colour, and having a porous and soft grain. It has no general commercial interest. Gamble quotes the weight as ranging from 25 lbs. to 50 lbs., the latter being from a sample taken from Darjeeling, and speaks of 40 lbs. per cubic foot as an average. But it seems very doubtful that a wood of the character of my specimen could weigh so heavily.

The pores are scarce, fairly uniform in size and position. Medullary rays very fine, confused and hardly discernible under the lens.

APITONG. *Dipterocarpus* spp.

Weight 40–41 lbs. The Philippines, Borneo, Malaya.

VERN—*Kruin, kruen, krewing, tempoeroew, palaglar, dau-con-rai, eng, gurjun, hora, kalub puteh, kapor ulu, karubang, Karubang tudan, lalungkab, selangan babi, takam bukit, bagac, Philippine mahogany.*

The question of what exactly is apitong, Philippine mahogany, tanguile, or bagac presents some difficulties. This subject has been dealt with

generally in the article Lauan. Timber first offered in Liverpool many years ago under the name of " apitong," that more recently seen styled " Philippine mahogany," and specimens of so-called " bagac " have varied in colour, texture, weight, and general character of grain. The multiplication of vernacular names in the country of origin, with the additional confusion caused by the introduction of different varieties of Dipterocarpacaea, taken in conjunction with the apparent practice of the Trade to call the timber different names according to circumstances, all combine together to make it impossible to speak very definitely about this wood. This has also been noticed by Luis J. Reyes, Wood Technologist, Philippine Bureau of Forestry, who remarks that " there has been, during the last ten to fifteen years, a noticeable change in the quality of woods now found in the market from those of twenty-five years ago." The colour is generally of a reddish-brown, and it has a somewhat coarse grain. Irregular and unexpected results are experienced in the seasoning, the expansion and contraction of the wood varying in different shipments, necessitating careful handling and examination.

The Philippine Bureau of Forestry recommend the wood for high-grade flooring, and as being durable for interior work. A floor in an old house in Manila is reported to be in excellent condition after at least fifty years. It is also used for sleepers, bridging, telegraph poles, and other constructional works, but it does not resist the attack of the white ant.

Apitong.—The pores are scarce, large, in singles and duplicates, open, with a coarse, wavy medullary ray, rather frayed on the edges, showing prominently on the radial section.

Bagac.—Has numerous pores, from very small to medium size, mostly plugged ; with close, fine, irregular medullary rays, which show on the radial section faintly.

APPLE. *Pyrus Malus* Linn.
Weight 48 lbs. 3 oz. Europe.

The heart-wood of apple is hard and reddish-brown, while the sapwood is light red. When thoroughly seasoned it stands well, but is very apt to warp and split during the process. It is used for a variety of purposes, these including cog-wheels and turnery, and it has been utilised for the heads of golf clubs.

The annual rings are recognisable, though not marked ; both pores and medullary rays are invisible to the naked eye.

APPLE, OREGON CRAB. *Malus rivularis* Roem.
Alaska, British Columbia, California.

The colour is light brown tinged with red, the wood very close-grained, hard, and heavy. It is used for mallets, tool handles, machinery bearings.

Aquilaria Agallocha Roxb.

Weight 23–29 lbs. (Gamble). India, Burma.

VERN—*Ugúr*, Hind., Beng.—*Sasi, hasi*, Ass.—*Akyau*, Burm.—*Kayu garu*, Malay.

Gamble, quoting Kurz, says this wood is used by the Karens for making bows. He remarks that : " In the interior of old trees are sometimes found irregular masses of harder and darker-coloured wood, with a honeylike scent, which constitute the Eaglewood of commerce." An experimental shipment was made of this wood for the 1924 Exhibition, but it received no recognition. " Pores small and moderate-sized, in short radial lines. Medullary rays fine, numerous ; the distance between two consecutive rays less than the transverse diameter of the pores. Numerous short transverse bands of pores and intercellular ducts filled with a brownish substance " (Gamble).

ARARIBÁ. *Centrolobium* sp.

Brazil.

According to Record, " Araribá is the generic common name in the markets of Rio de Janeiro and San Paulo for the various woods of the genus *Centrolobium*. The kinds commonly recognised are ' amarella,' ' branca,' ' rosa,' and ' vermelha.' " The great confusion regarding the timbers of tropical America, because of the duplication of names, is particularly emphasised in the case of those timbers called *amarillo, amarello,* and *amarilho*. While Professor Record's work has helped the student, there are still many cases in which correct identification remains impossible. He reports *amarello* as the vernacular of the product of *Pithecolobium Vinhatico,* also of *Plathymenia reticulata ; amarilho* and *amarillo,* of *Terminalia* aff. *januarensis ; amarillo,* of *Aspidosperma Vargasii.*

In Colonel Gamble's collection there are three specimens, one marked " amarello," which is a beautiful Spanish mahogany-like wood, with fine splash mottle figure, so like mahogany indeed that the expert might identify it as such ; one marked " potumuju " which is like a fine-grained, hard Costa Rica mahogany ; and one marked " arariba roza " which is of a pale yellow colour, with a close, compact grain, the minute pores shining with brilliant sparkling gum. These three specimens are beautiful in colour, appearance, and wood structure.

Amarello.—The concentric layers are clearly marked by thin, dark lines, the rather small pores plugged, surrounded by light rings or tissue, with rather coarse, irregular, indistinct medullary rays, not following the usual straight lines.

Potumuju.—The concentric layers are marked by strong, dark lines, the very numerous, very small pores are entirely plugged, with medullary rays so fine that they are hardly discernible under the lens.

Arariba roza.—The very numerous, tiny pores are half the size of those in potumuju, with strong, well-defined medullary rays straight, pronounced, and showing on the radial section in tiny flecks.

According to Record the prevailing colour of " araribá " is yellow often variegated with red or black streaks, it is durable and hard, used for naval architecture, fancy woodwork, and railway ties It splits readily, and when worked against the grain is likely to tear out. He says that this timber should not be confused with " araribá " (*Pinckneya rubescens*). He further remarks that in Bahia " arariba " is commonly known as " putumuju " with the various specific designations already mentioned. As already noticed, Colonel Gamble's specimen marked " potumuju " differs from that marked " arariba roza."

Arariba *Sickingia* sp. and Arariba vermelha *S. rubra* K. Sch. are reported separately (*q.v*).

ARARIBA. *Sickingia* sp.

Weight 55 lbs. (Record). Brazil.

VERN—*Arariba, arariba vermelha, arariba roxo, arariba rosa, arareua,* Braz.—*Paraguatan,* Venez.—*Coloradito* ?, *candelillo* ?, Col.

Record treats this as identical with Arariba vermelha (*Sickingia rubra*), but Colonel Gamble's specimen is different, as stated

Record differentiates between arariba of the *Centrolobium* sp. by means of an accent on the last " a," while that of the Sickingia family has no accent.

ARARIBA VERMELHA. *Sickingia rubra* K. Sch.

Brazil

Record would seem to treat this as identical with the foregoing arariba, *Sickingia* sp. But Colonel Gamble has a specimen with the name *A. vermelha,* and the source given as *Sickingia rubra,* which is a bright red colour, with dark streaks, and which he reports as used for the same purposes as arariba (as he terms it).

As with so many other Brazilian timbers, there is much confusion, which renders certain identification impossible.

Araucaria Bidwilli Hook.

Queensland.

This wood, locally known as " bunya-bunya," is regarded as the pine of North-east Australia.

It is a useful, straight-grained, light-coloured wood, resembling pine.

Araucaria imbricata Pav.

Weight 20 lbs. South America.

This tree, familiar in English gardens under the name of " monkey puzzle," is a native of Southern Chile. The wood, in colour and grain, resembles a very mild, straight-grained deal (*Pinus sylvestris*), but shows a smoother surface, and has no resin-passages. The timber has not been sufficiently tested in this country to permit of definite statements as to its uses. The trees grown in England would also yield wood with too many faults, due to the rosettes of knots which represent the clusters of branches, so that it could not be used for work requiring strength, or where long lengths free from defect were needed. In other respects it would be useful in joiners' work.

ARBOR VITAE. *Thuya occidentalis* Linn.

Weight 19 lbs. (Gibson). North America.

This soft coniferous wood is seldom encountered in commerce. Gibson (*American Forest Trees*, p. 97) says that " the wood is soft, brittle, light and weak . . . very inflammable. The fact that it is durable even in contact with the soil permits its use for railway ties, telegraph poles, posts, fencing, shingles, and boats "

Arbutus unedo Linn. Southern Europe, Asia Minor, Southern Britain.

This is known as the " strawberry tree " on account of the strawberry-like fruit which it bears. In Ireland, where the tree attains a height of 40 feet, with a girth of 10 feet, it is called " caithne " and " cuince." It is said that it was introduced into Great Britain in 1586.

The wood is reddish-brown in colour, with a hard, close grain, rather liable to split, and taking a good polish. It can be used in ornamental cabinet work, inlaying or parquetry.

The minute pores are scarce, with pronounced variable-sized medullary rays, which show on the radial section as in sycamore.

Sargent mentions three other varieties of Arbutus known as Madrona (*q.v.*).

ARERE.

See OBECHI.

ARISAURU. *Pterocarpus guianensis* Aubl.

Weight 46¾ lbs. (Stone & Freeman). British Guiana.

VERN—*Arisouroo, dartrier, ourisoura,* B.G.—*graine à dartre,* Fr. G.

The colour is yellow to brownish-red, with richer-coloured heart-wood and a lustrous surface, slightly darkening on exposure. It is fairly soft

and light, with a coarse, open grain, stands exposure to weather well and is not attacked by worms, has a very bitter taste ; it polishes badly, and does not turn or plane well. Useful for planking vessels, and making sluices.

The pores are large and conspicuous, evenly distributed. Medullary rays very fine, uniform, and regular.

AROEIRA DO SERTÃO. *Astronium Urundeuva* Engl.
Weight 69 lbs. (Baterden). Brazil.

VERN—*Urundeuva, orendeuva, aroeira do campo, aroeira preta, aroeira do sertão, coronilla.*

Record says: "The name 'aroeira' (with or without qualifying terms) is applied to other species of *Astronium* and also to *Schinus*."

The handbook *Brazilian Woods* says that this is one of the best woods in Brazil, and that it is used for building and hydraulic works as well as for joinery. Baterden describes it as a tawny-coloured wood with red markings. He adds : "It stands variation of temperature and wet and dry well . . . is valuable for all wearing surfaces, such as brake blocks. The logs are small. (It is) one of the first-class sleeper woods of Bahia, where it has a life of sixteen years."

The colour is a deep purplish-red, with slightly varying darker and lighter shades, with a firm, hard grain, showing rather open pores on the tangential surface. A wood highly suitable for turnery, and the best description of high-class decorative woodwork.

The pores are rather scarce, plugged, and of small to moderate size. Medullary rays very obscure, difficult to see even under the lens, very numerous and very fine.

Artocarpus Chaplasha Roxb.
Weight 34 lbs. India, Burma, Andaman Islands.

VERN—*Chaplash, chaplis,* Beng.—*Lut-ter,* Nep.—*Chram,* Gáro—*Sam, sahm,* Ass.—*Cham,* Cachar—*Pani, toponi,* Magh—*Taungpeinnè,* Burm.—*Kaita-dá,* And.

This wood has a very attractive golden-brown colour, and a satiny lustre. As it is somewhat cross-grained it requires careful planing with a sharp tool. Although suitable for decorative cabinet work on account of its appearance, it should not be used in large or unsecured work, as the nature of the grain renders it liable to warp to a certain degree. Gamble says: "It should be seasoned standing by ringing, so as to prevent warping when cut and sawn," and quotes Chevalier Paganini, who says he "considers it equal to or superior to teak for household furniture."

The pores are rather scarce, not large, and generally plugged, but show prominently on the tangential section rather prettily, in a somewhat

flaky pattern. The medullary rays are well defined, close, parallel, and irregular, and show on the radial section in minute flecks.

Artocarpus hirsuta Lamk.

Weight 31–41 lbs. (Gamble). India.

VERN—*Ayni, anjalli, aiyanepela,* Tam.—*Aini, ansjeni,* Mal—*Hebalsu, heb halasu, hebbalsina, hesswa, hessain,* Kan.—*Hebalsu, pat-phanas, ran-phanas,* Mar.

The wood of this tree and that of *A. Lakoocha* are so similar that they may be classed together. The colour when first cut is a bright yellow, but not so bright as that of *A. integrifolia*; it rapidly darkens on exposure, and in Europe continues to darken year by year until it reaches a warm, rich, dark brown with a golden hue. In tropical climates it becomes a dark rosewood colour, or almost black. The grain is close, firm but not very hard, like that of an ordinary African mahogany. On the radial section the medullary rays show in bold silver flecks. The wood has been used in India for " dug-outs," some of which are said to be two hundred years old and still in use ; also for door and window frames, and general constructional work. A somewhat extravagant use for a very attractive furniture wood, and above all, one which is reported in India as being immune to the attack of the white ant.

The pores are rather large and scarce, mostly open. Irregular medullary rays, rather thick, which display a very good pattern on the radial section.

Artocarpus integrifolia Linn. f.

Weight 33–44 lbs. (Gamble). India, Burma, Ceylon.

VERN—*Kanthal, katol, kathal,* Hind.—*Panása,* Uriya, Tel.—*Kanthar,* Sonthal—*Phanas,* Mar.—*Pilla,* Tam.—*Halsu, heb-halsu, halsina,* Kan.—*Porós,* Kól—*Teprong,* Gáro—*Kos,* Cingh.—*Peinnè,* Burm.

This wood is well known, not only throughout India, Burma, and Ceylon, but also in Europe, under the name of *jak* or jackwood. When first cut it is of a brilliant orange or gamboge colour ; in Europe this deepens to a warm brown colour, but in India the wood darkens to the colour of rosewood, and almost black. The grain is hard and close, and shows a strongly marked hard and soft contrary grain, which requires a very sharp tool to obtain a smooth surface. The tree, with its oval-shaped pods which provide the bread fruit, is one of the most striking trees in the forests.

It is interesting to notice how in India and Ceylon the use of this timber increases in ratio to the increase in the cost of teak. In India it is used to a certain extent for carpenters' work and for decoration, for turnery, and inlay and for brush backs, while its use in Burma is quite negligible,

In Ceylon, however, where teak is costly on account of transport, it is by far the most extensively used timber for all kinds of furniture, fittings, and decorative woodwork. It is reported as free from the attack of white ant, and in other respects it is a superior furniture wood to teak, although its good qualities are not sufficiently recognised. In Ceylon it is reckoned second only to Nedun, a wood which is becoming exceedingly scarce. It is surprising that, bearing in mind its immunity from insect attack and its other good qualities, it has not been more highly thought of and used in India and Burma. Gamble dismisses the subject by saying " it is very largely used for carpentry, boxes, and furniture . . . occasionally exported to Europe for cabinet-work, turning, and brushbacks," and Pearson and Brown in *Commercial Timbers of India* do not even list it. Yet the value of the tree for food was recognised so far back as 1787, when the British Government provided an Admiralty ship, commanded by a naval captain, to carry seed and trees to the West Indies, as a remedy for the recurring famines which were experienced, an expedition which had a romantic and tragic ending.

As Gamble says, " good trees are valuable." They are valuable for their fruit, for their timber, for " their shade which is fair," for the dye which is obtained from the wood and which is " used in Burma to dye the yellow clothes worn by the *phoongies*, or Buddhist priests. The bark yields a gum ; the juice is used as birdlime, and the fruit-juice gives a kind of caoutchouc." It is surprising that with such a reputation, even without the qualification that the timber possessed immunity from the white ant, the Forest Service has not further exploited the tree, and increased its production.

Although there is some similarity between *A. integrifolia*, *A. nobilis*, *A. Lakoocha*, *A. Chaplasha*, *A. hirsuta*, and *A. incisa*, the first named is outstanding in quality.

Jackwood has been met with in small quantities on the European markets at irregular intervals during the last fifty years, but there does not appear to be any particular use for which it has been employed.

The pores, which are numerous and rather large, are grouped in wavy bands, and are generally filled with a bright sparkling gum. The medullary rays are very bright and well-defined, parallel but irregularly spaced. On the radial section they show strongly in numerous straight light lines, at right angles to the longitudinal grain.

Artocarpus Lakoocha Roxb.

Weight 40 lbs. India, Burma, Andaman Islands, Ceylon.

VERN—*Tiún, dheu, daheo*, Pb.—*Dahu, dhau, barhat, lakúch*, Hind.—*Dháo, dhanwala*, Kumaon—*Dephúl, dehua*, Beng.—*Dowa, chama, chamba*, Ass.—*Dawa*, Cachar—*Dao*, Sonthal, Kól—*Kamma regu*,

laku-chamma, nakka-renu, Tel.—*Wotomba, badhar,* Mar.—*Wonta,* Kan.—*Myauklok, myauk-laung,* Burm.—*Kana-gona,* Cingh

The wood of *A. Lakoocha* is so similar to that of *A. hirsuta* that the description of one is sufficient (see *A. hirsuta*).

Artocarpus nobilis Thw.

Weight 48 lbs. (Gamble). Ceylon.

VERN—*Del, bedi-del,* Cingh.

The colour of the wood is bright yellow, with rather strong contrary layers of hard and soft, generally rather hard, grain. Gamble reports it as used for furniture and other cabinet work, and the hollowed-out stems for fishing canoes, while the seeds are roasted and eaten by the Cinghalese. The wood is not generally seen in commerce.

The pores are irregularly placed, scarce, very small to medium sized The medullary rays very fine, irregular, not pronounced.

ASH, AMERICAN. *Fraxinus americana* Linn.
F. sambucifolia Lam.

Weight 42 lbs. America.

The wood is derived from about ten different species of ash. The produce of these is mixed together without any attempt at sorting the different kinds, which vary greatly in quality ; it is, therefore, impossible to secure timber of any standard quality. Occasionally small supplies equal to British or Canadian ash have been imported into England. As a rule the wood is not so white as the Canadian, yet the best kinds rank with, and are difficult to distinguish from, either the Canadian or English For instance, a frame of American ash remained perfectly sound and very hard, after it had been in continual use for thirty-five years in an old horse-car on the London tramways

Immense quantities of logs, boards, and planks have been imported into England for a number of years, and the timber has found its way into general use for every kind of purpose for which ash is used. Latterly the greatest demand has come from motor-carriage and waggon works Although a very small percentage of supplies yield wood strong enough yet during the war it was condemned for use in aeroplane construction.

Both the pores and medullary rays are larger and coarser than in the British ash, although in general character the growth is the same.

ASH, CANADIAN. *Fraxinus* sp.

Weight 41 lbs. 14 oz. Canada.

This wood is perhaps equal to British ash in quality, and some of i may even be stronger. It is in demand for making oars for the Roya Navy. Supplies, however, are daily decreasing.

ASH, CAPE. *Eckebergia capensis.*

Weight 40–48 lbs. Cape Colony, Natal.

VERN—*Muyama, mgwenyezinja—Cape ash, dog plum* (local); *essenhout* (Dutch, Trade).

A whitish-coloured wood, soft, tough, fairly strong and elastic; it slightly resembles elm, is coarse-grained, not durable, takes a good polish. Used for floors, waggons, furniture, beams, etc.

ASH, EUROPEAN. *Fraxinus excelsior* Linn.

Weight 46 lbs. 14 oz. Europe.

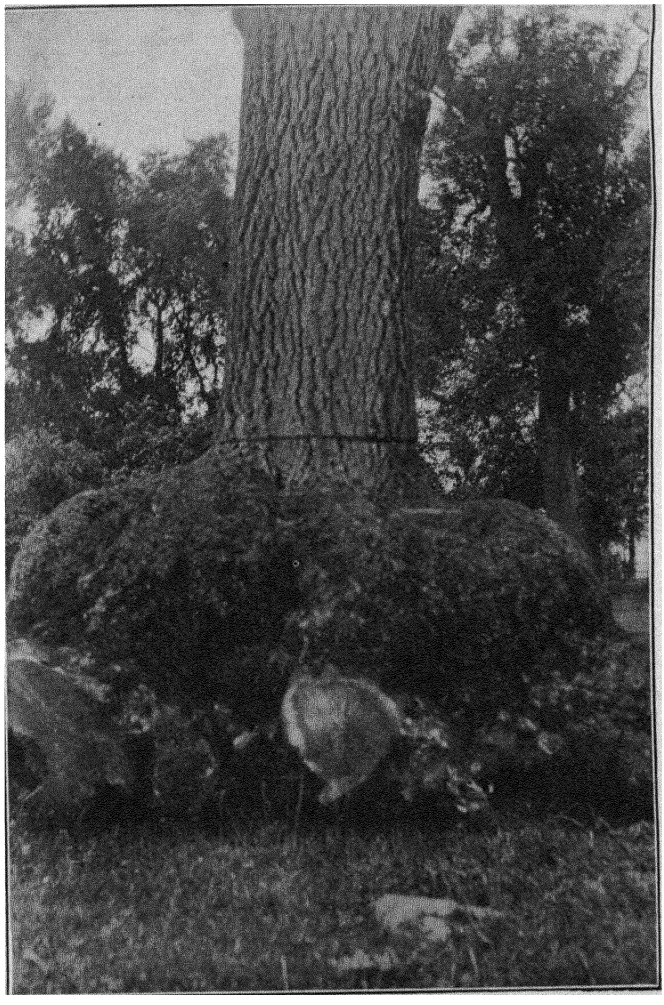
The common ash tree is widely distributed over Europe and supplies the English, French, Hungarian, and Turkish ash timber of commerce.

(*a*) **ENGLISH.** Weight 47 lbs.—The wood is greyish-white in colour, of moderate weight and hardness, very even and close in the grain, tough, elastic, and easily worked. Owing to its great flexibility it can never be safely used in architectural work. For hoops and all kinds of agricultural implements it is invaluable, since when steamed it can easily be bent into any form of curve required, without injury to the fibre. Ash is extremely durable if felled in the winter months, and properly seasoned before use; but where these precautions are neglected few woods are more perishable. Very great advantage will be found in reducing the ash logs, soon after they are felled, into planks or boards for seasoning, since, if left for only a short time in the round state, deep shakes open from the surface, which involves a very heavy loss when brought on later for conversion. The advantage of converting ash logs into planks and so forth at the earliest possible moment after felling, cannot be overestimated.

Among English woods, ash is without equal for toughness and power of withstanding sudden shock. The finest English ash is sought for to make hockey-sticks, tennis-racquets, gymnasium poles, and other athletic appliances. Since the advent of the automobile it has been greatly in demand for framing, pillars, and the general construction of bodies of motor vehicles, and also for the woodwork of the hoods.

As a result of the great impetus given to the manufacture of aircraft on account of the war, supplies of English ash for use in this connection became of the greatest importance. The best wood obtainable was, in the early stages, used for spars and langerons. Very soon, however, the employment of ash for spars was largely discontinued, silver spruce and other woods being substituted. For langerons it retained its position of importance, and no other wood has yet been found so suitable for this purpose. Later, when the construction of aircraft of all kinds and sizes became necessary, it was found to be the best wood for the keel pieces of the gondolas, and for some of the other constructional parts, such as the

ribs. A great number of pieces were required up to 32 feet in length, with straight and even grain throughout the whole length, and entirely free from the slightest defect. In our efforts to obtain command of the air, which subsequently proved successful, it is impossible to overestimate



A LARGE ASH BURR AFTER DIGGING OUT

the important part played by a sufficient supply of this exceptional wood being available. At a comparatively early date in the war, the Air Board realised the great importance of securing regular and adequate supplies, and large contracts were placed all over the country. Even then it was not considered that sufficient quantities of the right material would be secured, and one of the officials of the Air Board originated a scheme to

solve this problem. An organisation known as the "Aerial League" was formed, one of the functions of which was to approach every land-owner throughout the country, with the object of securing from him at a moderate price the whole of the ash trees growing on his estate, which could be used for aircraft purposes. The immediate result was an almost universal acceptance of the scheme. Accordingly, within a short time large numbers of suitable trees were cut down, promptly converted to the required thicknesses, kiln dried, and speedily manufactured into aircraft. It would not be an exaggeration to say that timber which was growing in this country was within a few weeks actually a part of aeroplanes which were then flying over the German lines in Flanders.

As already said, ash is always a difficult wood to season; nevertheless, under the impulse of necessity, and the use of the most scientific methods of kiln seasoning, success was achieved. Indeed the kiln-seasoned product showed, on the whole, better results than were obtained from the air-seasoned wood, which previously had alone been obtainable. The effect of the large demand made on the resources of the country in this respect during the war must be felt in the future, and it is to be hoped that some measures may be taken that will enable a fresh reserve of the best possible growth of ash to be built up for the future, although up till now (1932) nothing is being done.

During the progress of the war a considerable number of trees were cut in France and brought to London and elsewhere, a feat which in itself is worthy of note, as demonstrating the transport resources of this country, and its command of the sea. The quality of this ash produced in France under the superior French forestry system, when compared with the quality of that grown in this country with its lack of any such adequate system, displayed great superiority.

The tree has a very wide sap-wood (about forty annual rings to the inch) which is yellowish or greyish-white, and the heart-wood is light brown. The annual rings are rendered very distinct by the spring zone of large pores. The medullary rays are scarcely recognisable to the naked eye in transverse section.

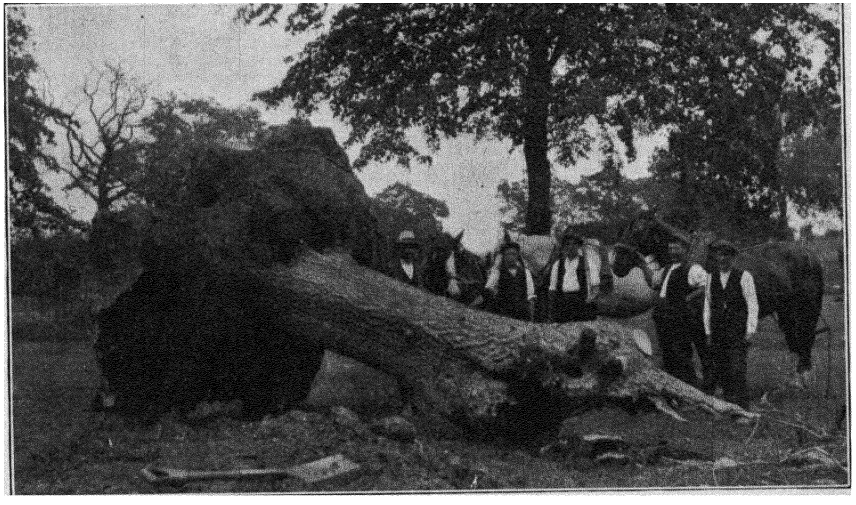
(*b*) **FRENCH.**—This wood is similar to English ash, but is generally milder and less strong.

(*c*) **HUNGARIAN.** Weight 47 lbs. 13 oz.—Only a limited amount of this wood, which is brownish-white to pure white, has been imported into England, and this chiefly in the form of burrs specially selected for their wavy, curly grain. For the sake of the handsome figure, this type of wood has been eagerly purchased at high prices, in order that it might be converted into veneers for decorative panel-work in railway carriages and for furniture. Of late years little of this genuine Hungarian ash has been procurable in England, most of that which is sold under this name

being of American origin. A certain quantity of small, tough trees with the bark on have been regularly imported from Transylvania, and used to supplement the supplies of home-grown ash in making billiard cues, for which the Hungarian wood is specially suitable. Although it is almost impossible to distinguish between the Hungarian and English grown timber when first cut, it can generally be identified after long exposure to light and air, as it then assumes a greenish-yellow tint not unlike that of acacia wood.

The pores are very numerous and irregular ; they are generally small and form a ripple pattern in the autumn wood. The medullary rays are very fine and numerous.

(*d*) SOUTH RUSSIAN and TURKISH.—This timber is nearly white, but



THE ASH BURR READY FOR CARTING AWAY

almost invariably contains a small black heart. It is difficult to distinguish from the English wood, and is strong and tough. The use of the timber has been restricted by the fact that it has been imported only in sizes smaller than can be readily obtained from other sources. The trees have been imported in the round with the bark on, and ranging in diameter from 10 to 20 inches at the butt end and in length from 8 to 21 feet. The wood has proved to be of a fine, strong, elastic quality.

ASH, JAPANESE. *Fraxinus mandschurica* Rupr.

Weight 34 lbs. 10 oz. Japan.

According to Dr. W. Terazaki of the Forest Experimental Station, Tokio, the commercial supplies of Japanese ash may also sometimes

include, in addition to the above-named species, the produce of *F. Spaethiana* Lingelsh, and *F. Bungeana* DC. var. *Pubinerbis*.

During the last few years very large quantities of this fine and exceedingly useful timber have been imported into London and Liverpool. It is known in Japan by the name of "Tamo." The first shipments arrived about 1908. Messrs. Mitsui & Co. imported by far the largest quantities, although some shipments came from other sources. The imports of this firm were as follows:

1908	13,181 cubic feet	1913	—
1909	1,092 ,, ,,	1914	22,829 cubic feet
1910	—	1915	12,525 ,, ,,
1911	387,434 ,, ,,	1916	53,170 ,, ,,
1912	—	1917	62,940 ,, ,,

This gives a total of over 500,000 feet, or over 11,000 loads.

The above figures are conclusive evidence of its popularity. Since the war, economic and other reasons have greatly reduced the volume of imports of this timber into the United Kingdom. Sargent, in *Forest Flora of Japan*, p. 52, says: "*Fraxinus mandschurica*, which is common in Manchuria, Saghalien, and Corea, is a noble tree in Yezo, where it is exceedingly abundant . . . and where it often rises to the height of one hundred feet, and forms tall, straight stems three or four feet in diameter." The timber has been imported in square, hewn logs, sawn planks, boards, etc., and selected figured flitches and roots, with a small quantity also of prepared floorings. When first imported it was mixed with a quantity of timber sold as Japanese ash, but which was soon discovered to be quite a different wood. This proved to be the product of *Acanthopanax ricinifolium*, S. & Z., and known in Japan as "Sen," a timber which, although resembling ash in the grain, possesses none of its other qualities. This timber, being light in weight, having little or no strength and being specially short-grained, gave Japanese ash a very bad name at the outset. As soon as the discovery was made, steps were taken to ensure that shipments of Japanese ash consisted exclusively of the product of *Fraxinus mandschurica*, and as previously mentioned, large quantities have since been imported.

The wood is generally lighter in weight and browner in colour than British ash, and the colour is detrimental to its use for some purposes. As the wood is relatively strong, its weight, which averages about 10 per cent less than British, and 6 to 8 per cent less than American, is a great advantage for many purposes. The timber is really stronger than its weight and appearance would suggest. This is partly due to the closeness of the concentric layers, which give nearly three times the number of rings to the inch of circumference. The conditions under which it is shipped make it impossible to select the stronger growth from the

milder. The variations in the strength of the British wood are well known, and the workman requiring the strongest and toughest ash would not seek for it among large, park-grown trees, knowing well where to find the growth required. In Japan, however, the produce of all the growths becomes mixed before shipment, and as it is impossible to determine where or how the timber has been grown, selection for toughness becomes difficult. There is undoubtedly a large percentage of exceedingly tough, strong wood.

Experiments for the purpose of testing the transverse strength were made, with the following results :

No 1 broke at 2968 lbs
No 2 ,, ,, 2688 ,,
No 3 ,, ,, 3360 ,,
No 4 ,, ,, 2464 ,,
(Each piece measured 30 × 2 × 2 inches)

The character of the break in Nos. 1 and 3 was very satisfactory, and showed long and tough fibre. Nos. 2 and 4 were only fair. Several tests for bending strains have been made, giving excellent results, the most difficult and trying turns and strains being accomplished satisfactorily. There is no doubt that, except for bent work, where very white wood is demanded, and which is a condition which Japanese ash cannot fulfil, this timber would satisfy all requirements. Sargent concludes his article in the *Forest Flora of Japan* as follows : " Here are great supplies of oak and ash of the best quality . . . a storehouse of forest wealth, which, if properly managed, could be drawn upon for all time." These remarks are of singular importance now (1932). When we consider the gigantic demands which were made upon our own home-grown supplies of ash in only the three years of 1916, 1917, and 1918, and limited to the knowledge we now possess, it should be considered almost criminal to use any of our own home-grown supplies of ash for any kind of purpose for which such a timber as the Japanese variety could be substituted. The trees are the product of a perfectly natural virgin growth, under the best conditions, and yield clean, straight boles of considerable length and diameter, from which a large amount of sound straight-grained boards and planks clear from knots can be obtained. This quality makes Japanese ash most useful for a great variety of purposes. It has been utilised for cabinet and pianoforte work, both solid and as a groundwork for veneer. The wood takes the glue admirably, and the veneers laid retain a hard, flat surface. For constructional work, excepting where considerable strength is needed, it can be used advantageously, and its comparative lightness of weight increases its value. This same quality, added to the fact that it possesses the requisite strength, makes it an ideal timber for automobile construction, both for carriage body work and for

delivery vans and lorries. In many places in Scotland and elsewhere, it has been used for house and club decorative joinery, and furniture. When finished in its own natural light colour, or stained like dark oak, it has produced some very artistic and decorative results. For ships' fittings, cabins, etc., and furniture, it is especially suitable. Without a very rigid selection, reliable stretcher-poles have been provided. A small quantity has been found strong enough for aeroplane construction, and if more care is taken a considerable supply could undoubtedly be found suitable for this work. At least one aeronautical pilot has selected the wood for use. In Japan it has been largely used for house-building, sleepers, oars (both for the navy and for ordinary use), clogs, and all kinds of wooden ware. It is beyond question that the demand for ply-wood in the future will be almost unlimited, and as Japanese ash is very suitable for veneers, probably the whole available supply from Japan could be used for this purpose alone.

The disadvantages of the wood consist in its colour (though that is chiefly because of the rather prejudiced preference for ash which is white in appearance), its liability to brown streaks, which follow the lines of the concentric layers, and its somewhat porous nature.

A considerable quantity of hewn pieces and roots containing twisted, curly, and fiddled mottle grain were imported into France, Germany, Belgium, and the United Kingdom for veneers, before the war, and these were well received. This popularity will probably revive in the future expansion of trade. A number of sleepers were imported, which, although they are accepted and used largely in Japan, have not found favour in this country. According to Baterden, such use has been made of the wood on the Chinese and Manchurian railways

The concentric layers are very clearly defined. The pores are open and numerous in the spring growth, but exceedingly small in the autumn growth. The medullary rays are very small, fine, clear, and parallel.

ASH, MOUNTAIN. *Eucalyptus* sp.

The name " mountain ash " has been given to several quite different species of Eucalypts in Australia, probably for trade purposes, but perhaps because of the appearance of the bark. The practice of naming a wood because of the appearance of the bark, referred to elsewhere, is specially undesirable in this case, and causes annoyance and confusion both scientifically and practically, as none of the woods named has any of the qualities or appearance of ash.

Under the name of Mountain Ash Baker lists :

Eucalyptus Delegatensis R. T. B. " Southern Mountain ash," " Tasmanian oak," " Stringybark."

E. fastigata, " Cut Tail."
E. fraxinoides J. H. M , " White ash."
E. virgata Sieb., "Tasmanian ironbark," "Tasmanian Mountain ash."
E. Oreades R. T. B., " Smooth-bark Mountain ash."
E. Sieberiana F. v. M , " N.S W. Mountain ash."
E. Smithii, " Gully ash," " White Top."

The alternative name " Stringybark " is equally undesirable, and it is not surprising that when the wood many years ago was exploited under this name it was not a success. Some shipments of Stringybark, Tasmania oak, and what has sometimes been called " Australian oak," have produced irregular and uncertain results, some of the timber having shown unusual liability to shrink and swell and warp and twist, while other shipments have proved quite satisfactory. While some similarity has been noticeable in the different shipments, there has been a sufficient variation to call for a separate description of each of the timbers named above.

ASH, MOUNTAIN *Eucalyptus regnans* F. v M.
Weight 41 lbs. (Baker). South Australia, Tasmania.

This tree, known as " giant gum " and " peppermint tree," to which the name of " mountain ash " is given, is of a pale yellow colour, but possesses a grain having somewhat the appearance of ash, without any of its qualities. It is easily worked, said to be durable under water, and according to Baker, seasons well and is used extensively for house-building, coach-work, and recently for cabinet work.

The not very numerous pores are irregular in position, and open, with fine, indistinct medullary rays.

ASH, SILKY. *Ehretia acuminata.*
Weight 35–43 lbs. (Swain). Queensland.

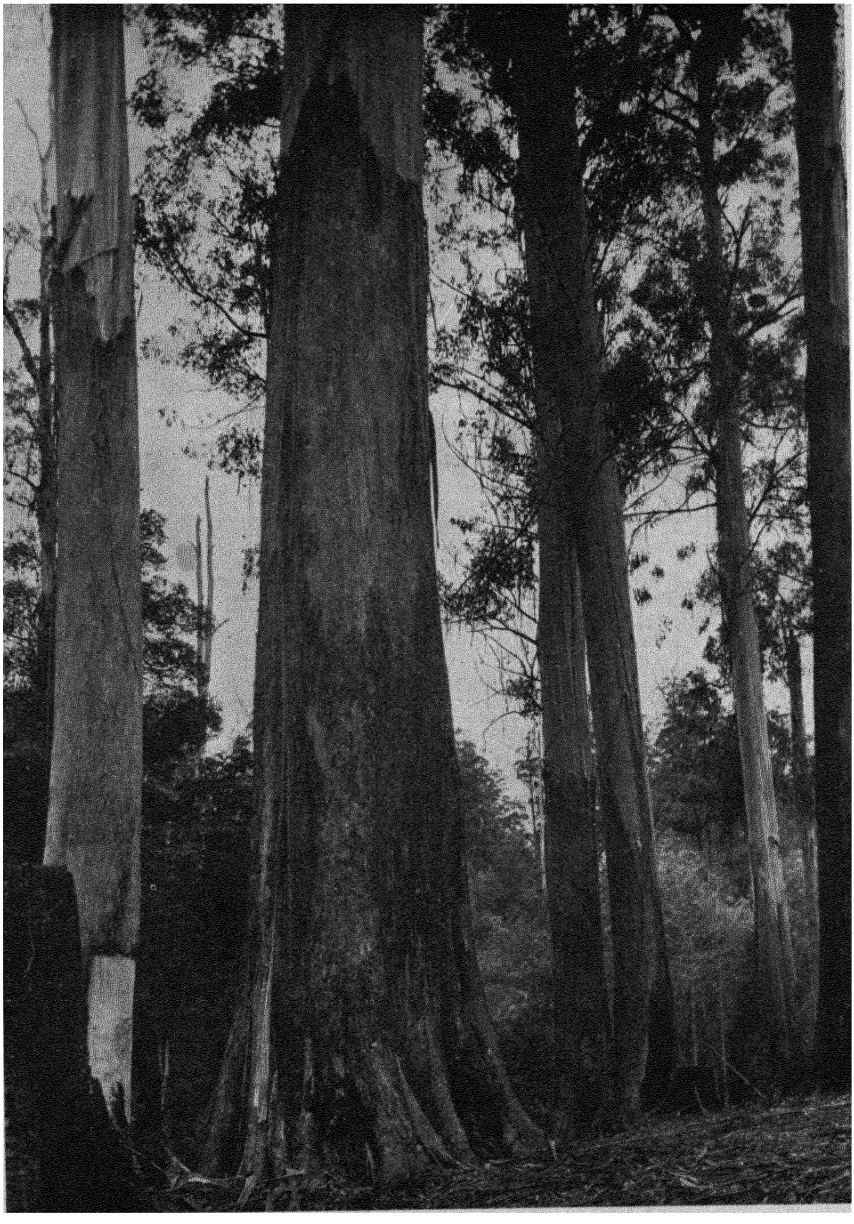
Known as churnwood and brown cedar.

The Queensland Forest Service report it as a most desirable softwood, with the hue and sheen of Fuji silk, and a perceptible silver-ray mottling. It is light, firm, tough, works easily, holds nails and screws well without splitting, and dresses with a clean shining surface. It is considered to be stronger than Hoop pine, suitable for cabinet work and general turnery

ASPEN. *Populus tremula* Linn.
P. tremuloides Mich.
Europe.

VERN—*Aspe, espe, zitterpappel*, Germ.—*Peuplier tremble*, Fr.—*Alamo tremblon*, Span.

This tree is found all over Europe, where it occasionally reaches over 100 feet in height and 6 to 8 feet in girth, but in the British Isles it is



MOUNTAIN ASH—VICTORIA

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usually much smaller. The colour is a dingy white, and has a reddish-brown appearance in transverse section, with no heart-wood. The rings are circular, broad, and distinct. The wood is soft, light, elastic, easily split, warping and cracking but little; it is used for a great number of articles, such as matches, milk-pails, butchers' trays, casks, and in France for sabots and flooring. This wood also produces the best and whitest pulp suitable for the paper used in books and magazines, when mixed with a portion of sulphite spruce pulp (about 40 per cent), to give it additional strength.

Waste land suitable for planting *P. tremula* might be found in parts of Scotland and Ireland; experiments in this direction would be advisable.

The medullary rays are not visible to the naked eye.

ASSA LEITAO. Source unknown.

Weight 49 lbs. Brazil.

Record does not mention this timber, but there is a specimen in Colonel Gamble's collection, the wood being very close-grained and hard, of a light nut-brown colour, somewhat resembling that of *Arariba rosa.*

It does not appear to possess any distinctive value for ordinary commercial usage, but it is a good hardwood.

The pores, which are generally plugged, are exceedingly small and numerous. The medullary rays are very numerous, but so fine as to be difficult to distinguish even with the lens (+10). There is a faint light line which may be a concentric layer. The rays show on the radial section as in beech, but much finer.

ASSEGAI WOOD. *Curtisia faginea* Ait.

Weight 60 lbs. Cape Colony, Natal.

VERN—*Umguna, umnoiso, Cape lancewood,* Zulu.

Specimens of this wood have been seen occasionally, included with other African exports, without securing any interest in the timber world.

The colour is a dull plum-red, and the wood has a hard, tough grain.

While providing a useful medium for works such as those for which it is used in its native country, the most important perhaps is that from which it receives its name. It has no further interest for timber users in Europe.

AUKCHINZA.

See DYSOXYLUM SPP.

AVODIRE. *Africana Bingeria.*

Weight 20–21 lbs. Ivory Coast, Gold Coast, Liberia, The Cameroons.

Among the very large shipments of all West African woods, a few logs of light-coloured, light-weight, white wood, manufactured in the same

manner as the mahoganies and coming with the shipments of the same, have been offered for sale as African white mahogany, African satinwood, and African furniture wood. These logs have varied in colour, grain, and quality, and it is only lately (1930) that a separate identification has become possible.

Among the best of these timbers it is now possible to name Avodire, which possesses a golden-yellow colour, with a firm, clean grain, capable of giving a very smooth surface with ease, and very strong, having regard to its light weight. For all these reasons the wood has been favourably received, and has provoked a brisk demand for railway-carriage work, ships' fittings, furniture, and many other kinds of decorative woodwork. It is a most attractive and valuable wood.

The rather scarce pores vary greatly in size, and are all open. The medullary rays are very regular and strongly marked, showing in very strong flecks on the radial section, as in beech.

AYOUS.

See OBECHI.

BACUPARY. *Platonia insignis* Mart.

Weight 37 lbs. Brazil.

The colour is a dull yellowish-red, showing a silver grain on the radial section. Record gives the weight at 54 lbs., and also refers to another wood from the Amazon district, " bacury-pary " (*Rheedia macrophylla*), which possesses a medicinal bark. In reference to *Platonia insignis*, he states that " it seasons without difficulty, is easy to work, and takes a good polish." Charpentier, in *Timber*, says the wood is a little elastic, and employed for use in civil and naval buildings.

The pores and medullary rays are exceedingly fine and numerous, with a very fine alternately dark and light layer, following the concentric layers.

BAGAC.

See APITONG.

BAGTIKAN.

See LAUAN.

Balanocarpus utilis Bedd. = ***Hopea longifolia.***

Weight 67 lbs. (Troup). India.

VERN—*Kara kong, kong,* Tinnevelli.

The colour is yellowish-brown when first cut, darkening to a warm salmon-brown colour, with a very close, hard, compact grain. Gamble reports the wood as being used for house-building, carts, and shafts. It has not been met with in commerce.

Pores very numerous, very fine ; very fine medullary rays, which do not show on the radial section.

BALSA, INDIAN. *Sterculia campanulata* Wall.

Weight 16-24 lbs. The Andaman Islands, Burma.

VERN—*Papita*, Hind

The only product of *Sterculia* sp. which has found its way into commerce is the one mentioned above. Gamble mentions several different varieties, and Parkinson still more, but no opportunity has yet been afforded to report upon any of the others.

In the winter of 1921-22 specimens were shown to me in the Andamans, when I immediately recognised the usefulness of the wood, and subsequently introduced it into the London market under the name of Indian balsa. The wood of *Ochroma lagopus* is difficult to procure, costly, defective, and small in size, while the Indian " papita," although not so light in weight as American *Ochroma*, is still light enough for many purposes, my two specimens taken at random weigh 16 lbs. and 24 lbs. respectively. The wood is obtainable in larger sizes, longer lengths, and more free from defects ; difficulty has been encountered in manufacturing it and keeping it bright, sound, and free from discoloration or sweating. The wood has been received on all hands, including the British Admiralty, with approval for the same kind of uses as those for which American balsa has been in demand.

The concentric layers are marked by clear, dark-coloured lines. The exceedingly scarce pores are large and open, with strong, bold, well-defined medullary rays, with intermediary scarce and fine rays between, which show on the radial section in pronounced flecks.

BALSA WOOD. *Ochroma lagopus* Sw.

Weight 9-10 lbs. Central and Southern America.

VERN—*Balsa, balsa wood*, Trade, Ec , Peru, Col., C. R., Nic.—*Palo de balsa*, Peru, Boliv —*Tami*, Boliv —*Lano, balso*, Col —*Gatillo, polak, polach*, Nic.—*Cajeto, moho, lana*, Guat.—*Tanbor, lanillo*, Guat., Hond.—*Guano*, Sp. Hond —*Algodón*, Salv —*Lanillo, lanero, seibón botija*, Cuba—*Corkwood, down tree, bombast mahoe, dum*, Jam.—*Corcho, tacarigua, bois flot, corkwood, down tree, balsa wood*, Trin.—*Bois flot, patte de lièvre*, Mart.—*Bobwood, balsam*, Misc.

This species of balsa, which comes from South America, is the one most commonly used in the United Kingdom. The wood is of a whitish, pale yellow colour, exceedingly light and porous, very elastic, and strong relatively for its weight. It came into prominence during the war, when it was in demand for many purposes, including the packing of armour

plates for battleships. It is used in the United States for insulating material, refrigerator cars, for life-saving appliances, in the construction of hydro-aeroplanes, and in a limited degree over here for the same purposes. Its lightness and good working properties favour its use as a packing material for highly finished furniture surfaces. Record says: " In the natural state the wood is very perishable . . . it shrinks and warps badly." But these objections have been more or less overcome by a light impregnation of hot paraffin solution, and the wood was treated in this manner during the war for buoyancy purposes.

Balsa wood was used by the natives of Central and Southern America for making boats and canoes, etc., which is probably the original source of its name, the word balsa being the Spanish name for raft.

In an article by " M. I." in *The Church Times* referring to a journey across South America, he speaks of crossing Lake Titicaca in Bolivia, and watching the " native navigators, who move about the lake in crazy-looking *balsas*—curious canoes made of bundles of reeds tied together, and with one large sail, also made of reeds."

The wood is so soft and woolly that it is practically impossible to get a sufficiently smooth surface to give an account of the transverse grain.

In *Tropical Woods*, No. 17, the following specimens are reported, viz. *Ochroma peruviana* Johnston, *O. boliviana* Rowlee, and *O. obtusa* Rowlee, *O. grandiflora* Rowlee, *O. limonensis* Rowlee, and *O. velutina* Rowlee, the last being reported as harder and heavier than the others. There does not appear to be any necessity to differentiate between these varieties merely on the question of timber values; in any case, the information available is insufficient at present.

The Balsa Wood Co. have informed me that *Ochroma lagopus* is the balsa most used in this country, coming from the South American States. Also that *Ochroma tomentosa* is not a marketable proposition, and no stock of it is kept in London.

BALSAM, ALPINE FIR. *Abies lasiocarpa* Nutt.

Called by Elwes " Rocky Mountain Fir." Wood similar to Balsam, *Abies amabilis*. Used for fuel.

BALSAM, AMABILIS FIR. *Abies amabilis* Forbes.

British Columbia, N.W. United States.

Sargent gives the name of " White Fir " to this and to *A. grandis*; to the latter Elwes gives the name of " Giant Fir," and " Lovely Fir " to *A. amabilis*. The wood is pale brown in colour, close-grained, light, hard, but not strong. Sometimes used for lumber in interior work.

BALSAM or LOWLAND FIR. *Abies grandis* Lindl.
British Columbia, N.W. United States.

Light brown in colour, this wood is soft, coarse-grained, light in weight, and neither strong nor durable. It is sometimes manufactured into lumber for the interior work of buildings, also used for packing-cases and wooden ware.

BANAK. *Virola merendonis* Pittier.
Weight 34 lbs. British Honduras.

A very light mahogany-coloured wood, with a straight, even, regular grain ; it would pass as a rather mild, and perhaps inferior quality of Honduras mahogany. A useful timber which would bring a demand if supplies were forthcoming.

Shipments in the log have been made to the markets in the United States over a period of four or five years, but according to Mr. Stevenson, the Conservator of Forests at Belize, this export was discontinued in 1927. He says : " The chief difficulties encountered were the great susceptibility of the wood to the attacks of various species of ambrosia beetles, known locally as pinworm, and to splitting. Prolonged experiment in the extraction of this timber has failed up to the present to prove preventive measures, or indeed to indicate any way in which the damage might be minimised. The cost of extraction has also militated against successful exploitation of this wood. The price in the New York market has fallen as low as $65 per 1000 ft."

Information lately received (1932) from a source of supply claims that beetle attack can be controlled, if not prevented, by delaying the removal of the bark until the log is ready to be placed in the water when it is kept submerged until shipped. And according to the same authority, the wood is immune from attack in moderate climates.

The concentric layers are marked by rather obscure darker lines at irregular intervals ; the pores scarce, very small, exceedingly numerous ; the medullary rays fine, and very close together.

BANKSIA. *Banksia littoralis*
B. integrifolia, etc.
Weight 26 lbs. Australia.

This wood, which is named after Sir Joseph Banks (1744–1820), is occasionally known as honeysuckle, but it should not be confused with the New Zealand honeysuckle, Rewa-rewa (*q.v.*) (*Knightia excelsa*), which is quite a different species. There are several species of banksia growing in different parts of Australia ; my two specimens come from Western Australia and Victoria respectively, but they do not appear to differ materially. The wood is a pinkish-brown colour, and is of a rather soft

and spongy nature, the specimen from Western Australia being much softer than that from Victoria. The broad medullary rays give a very distinct silver grain on the radial section, and the tangential plane has a finely netted or reticulated appearance. R. T. Baker in *The Hardwoods of Australia* says that banksia is used for furniture, and that it would be suitable for veneers.

In the timber museum at Kew there is a small sideboard made of

BANKSIA—WESTERN AUSTRALIA

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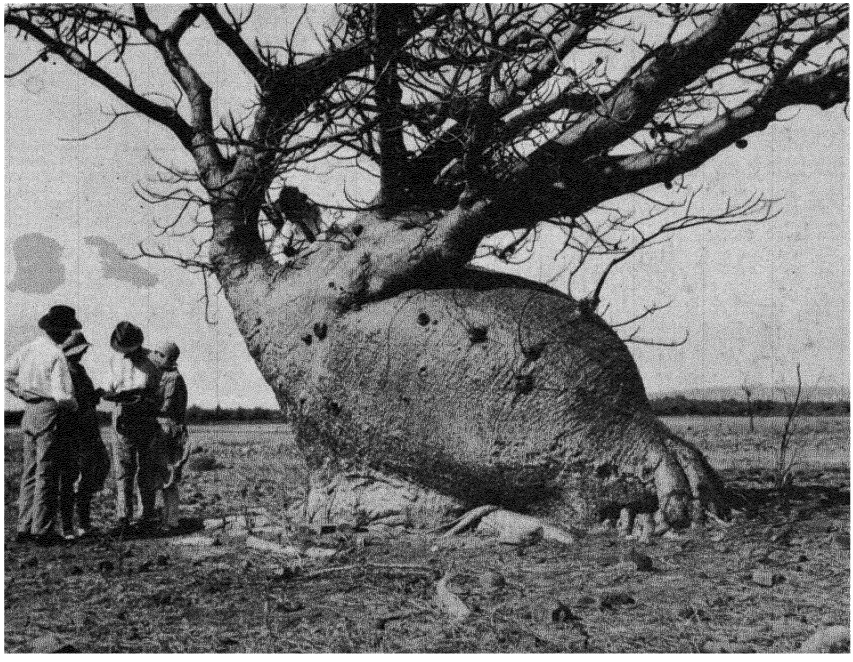
banksia and *Xylomelum pyriforme*, which belonged to Francis Bauer, botanical painter to King George III. Tramcar seats of Western Australian banksia were shown at the Empire Timber Exhibition in 1920. The wood seasons and stands well, becoming harder with age. It grows sparsely over a wide extent of country, and there is difficulty in getting supplies.

The pores are rather difficult to distinguish, even with the lens, as they appear to run together in wavy, concentric lines of loose tissue. The medullary rays, very broad and distinct, and showing in silvery plates on the radial section, are characteristic of the genus.

BAOBAB. *Adansonia digitata* Linn.

South Africa.

The " Cream of Tartar tree." A strange tree, more interesting on account of the peculiar formation of its growth than for its timber, which, according to report on the *Native Timbers of South Africa*, is " spongy and soft, and of but little use for economic purposes . . . the natives use the wood for making boxes to contain provisions . . . (and) the



THE BAOBAB TREE—SEEN IN NORTH WEST AUSTRALIA

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timber separates into rings which can be reduced by caustic soda into fibre layers."

BARBA TIMAO. Source unknown.

Weight 26 lbs. Brazil.

The colour of this wood is similar to that of European oak, which it also resembles in general appearance, although the grain is softer and milder. The medullary rays show on the radial section as in oak, but they are exceedingly small and fine, and form by no means a prominent display.

The wood is not suitable for export, though possibly it is valuable

locally. A pamphlet issued by the Ministry of Agriculture (Rio) says that trunks from 3 to 4 metres long are obtainable.

The pores are scattered and somewhat sparse. The medullary rays are very fine, and are darker in colour than the surrounding ground. Dark streaks follow the line of the concentric growth, but these do not show on the tangential or radial sections.

BARBERRY. *Berberis Darwinii.*

The Himalayas.

When first cut it is a brilliant, gamboge yellow-coloured wood, darkening with exposure, with a firm, hard, close grain. If sound pieces could be secured in any required size, it would form an attractive medium for inlay cabinet work. A yellow dye used for tanning is extracted from the wood.

The concentric layers of growth are clearly marked by light-coloured lines. The numerous pores are minute, plugged, between very strong, well-defined medullary rays, which are not parallel, and show strongly on the radial section forming a pretty pattern.

BARBERRY. *Berberis vulgaris* Linn.

North America.

The name barberry, or more correctly "bearberry wood," is given to the wood of Canadian buckthorn (*Rhamnus purshiana*) and possibly to common buckthorn (*R. cathartica*). The former is described by Anderson (quoted by Stone) as "used for ornamental purposes . . . one foot in diameter or slightly smaller." The barberry wood of commerce may be any of these, or it may be the produce of *Bumelia lanuginosa*. Generally the wood is of small size, not exceeding 4 inches in diameter. The heart-wood is streaky, of dark and light colour. The sap-wood is a bright yellow when fresh, and retains this colour for many years when screened from the light (as, for instance, in Nördlinger's wood-sections). The wood is hard and dense in texture, and is used in turnery and marquetry.

The annual rings and medullary rays are well marked, and there is a distinct porous spring zone.

Barringtonia acutangula Gaertn.

Weight 37 lbs. (Pearson & Brown). India, Burma.

VERN—*Ijal, samundar phúl, panniári, ingar,* Hind.—*Injar, panniha,* Oudh—*Hijál, samundar,* Beng.—*Kinjolo, hinjolo, hinjara,* Uriya —*Hendol,* Ass.—*Kanapa, batta, kurpá, kadamic,* Tel.—*Piwar,*

tivar, ingli, Mar.—*Ijar*, Monghyr—*Saprung*, Kól—*Atta péra*, Mal.—*Adampu*, Tam.—*Ela midella, Kyèni*, Burm.

Pearson and Brown, in *Commercial Timbers of India*, state that this wood is "light pinkish to reddish-grey, or in some cases nearly white towards the outside of the log; heart-wood not distinct; lustrous, with smooth feel . . . straight-grained, medium fine-textured. . . . Easy to saw, works well by hand and on machine, and finishes to a dull smooth surface. If cut on the quarter it presents a noticeable silver grain, which should be taken advantage of in cabinet work. Used for boat-building, well construction . . . cabinet work, and carts."

Barringtonia racemosa Bl

Weight 27 lbs. (Gamble). Western India, The Andamans, Ceylon.

VERN—*Nivár*, Mar.—*Kumia*, Beng.—*Samudra, cuddapah*, Tam.—*Samatravádi*, Mal.—*Diya midella*, Cingh.—*Kyé*, Burm.

This wood is of a pale yellowish colour, with a very close texture, inclined to have a rough surface. Gamble describes it as white and very soft, but my Ceylon specimen shows it as moderately hard, and more yellow than white, rather supporting the opinion of various authorities, to which Gamble refers, that the wood is "strong and serviceable."

The exceedingly small pores are very numerous, wholly plugged, with rather coarse and ill-defined, numerous medullary rays, which show in flecks on the radial section

BARWOOD. *Pterocarpus osun* or *P. tinctorius*.

Weight 54 lbs. West Africa.

VERN—*Osun*, Yoruba—*ume*, Benin.

There is a doubt as to the definite source of this wood, the older authorities having given it as *P. santalinoides* or *P. angolensis*. Zon and Sparhawk give it as *P. osun*, and a pamphlet issued by the Governor of Nigeria, which includes notes collected by Forest Officers, reports it as *P. tinctorius*. That the wood imported under the name of "barwood" and sometimes "camwood" was somewhat similar to the African padauk is certain, but as the difference in colour, quality, and grain is noticeable, and also the fact that barwood was imported in small poles ranging from 4 to 12 inches in diameter while the African padauk was in large sizes, it appears that both woods may have come from the same source, but from trees of different age.

The wood is of a bright and vivid red colour; it has a close, firm texture, and is capable of a very smooth surface from the tool. It is imported in small sizes and used for a dyewood, and also for handles of

tools and cutlery. If immersed in water the red colouring matter is washed out.

The large pores are very unevenly scattered. The light wavy concentric lines are very noticeable, but no medullary rays are visible.

Bassia latifolia Roxb.

Weight 62 lbs. (Troup). India.

VERN—*Mahwa, mowa, mahúa,* Hind.—*Mahwa, mahúla, maul,* Beng.—*Moha, moholo,* Uriya—*Mátkom,* Sonthal—*Mihul,* Mal Pahari—*Mandukam,* Kól—*Mohúl,* Bhumij—*Irpi,* Khond—*Mahu,* Baigas—*Irúp, irrip, irhu,* Gondi—*Mohu,* Kurku—*Mohwa, moho,* Mar.—*Ippa, pedda ippa, yeppa,* Tel—*Illupei, elupa, kat illippi,* Tam.—*Ippi, honge,* Kan.—*Poonam,* Mal.—*Mudayat, kanzaw,* Burm.

This timber is of a very bright, rich rose-red colour. The texture is hard and close, and much resembles that of pyinkado (*Xylia dolabriformis*), without possessing any of the sticky feeling of that wood. Although there is a strong contrary grain, it is capable of a smooth surface. Gamble says that it is used for house-building, furniture, and the naves of wheels. It would be useful for many purposes where a hard-wearing, smooth work is required. It should also be suitable for turnery, and it evidently stands well in all conditions.

Pearson and Brown, in *Commercial Timbers of India,* report its use in shipbuilding, as keels and trenails, and as a sound constructional timber of the heavy class.

A few logs of this timber reached London several years ago. They were described as Indian junglewood; a ready sale was found for the wood at satisfactory prices

The pores are neither large nor numerous. Gamble describes them as being "in short, radial wavy lines more or less in echelon." The medullary rays, which are exceedingly numerous, are very fine indeed.

Bassia longifolia Willd.

Weight 61 lbs. (Gamble). Western and Southern India, Burma, Ceylon.

VERN—*Ippa, yeppa, sanna ippa, pinna,* Tel.—*Moha,* Mar.—*Illupei, kat illupei, elupa,* Tam.—*Ippi, hippe,* Kan.—*Ellupi,* Mal.—*Mi,* Cingh.—*Mèzè, kamsaw,* Burm.

The wood is a nut-brown colour with some lighter streaks, and a very close, firm, hard grain and exceedingly smooth texture, like pencil cedar. It is reported as being strong, very flexible and durable, and lasting well under water.

The transverse section gives a pretty pattern; the minute pores, arranged in wavy belts, are crossed at right angles by the finest possible medullary rays.

BASSWOOD. *Tilia americana* Linn.
T. heterophylla Vent.
T. pubescens Ait.
Weight 30 lbs. North America.

True basswood is the wood of several North American species of lime tree. The name is often, though erroneously, employed in England and Scotland to designate the wood of *Liriodendron tulipifera*, which is most commonly known under the name of whitewood or canary wood in this country, and yellow poplar or poplar in America. The consequence is that misunderstandings are liable to arise on the rare occasions on which genuine basswood is ordered from the timber merchant, for the latter assumes that whitewood is wanted. Small quantities are imported into Liverpool and London in the form of logs, and in boards and planks from 10 to 16 feet in length, and from 4 to 24 inches in width. The wood imported varies both in tint, which ranges from white to light or greyish-brown, and also in quality, this possibly, to some extent, because it consists of the product of several different species of lime tree, but also certainly according to the time and manner of felling and storing the produce of the tree. The wood is soft, light in weight, and by no means strong. " Its lightness makes it serviceable as valves and other parts of bellows for . . . organs (mechanical) and piano-players. . . . Apiarists find no wood more suitable for the small light frames in which bees build the comb. . . . Its whiteness and freedom from stains and unpleasant odours are likewise important when vessels are to contain food-products " (Gibson, *American Forest Trees*, p. 638). Indeed, Longfellow mentions the wood in this connection—for at the wedding feast of Hiawatha

> All the bowls were made of basswood,
> White and polished very smoothly

In the United States the wood is largely employed, especially in the pianoforte trade, and its uses are very varied; but in England, although it is inquired for in the same trade to a limited extent, there are other woods available that are equally serviceable yet procurable at lower prices, and which, therefore, have the precedence. For joiners' work it is not so serviceable as whitewood, as it is more liable to warp.

The annual rings are recognisable though not sharply marked. The pores are small and scattered. The medullary rays are just visible to the naked eye in cross-section.

Bauhinia racemosa Lam.

Weight about 46 lbs. (Gamble). India, Burma, Himalayas, Ceylon.

VERN—*Kaliar*, Kashmir—*Kosúndra, taur*, Pb.—*Kachmál, gúriál, thaur, ashta, makkuna, amli, maula, dhorára*, Hind.—*Jhinjhora*, Dehra

Dún—*Dhondri, dhundera, astra, bosha,* Gondi—*Jhinja,* Ajmere—*Ari, arro,* Tel.—*Ati, archi, areka,* Tam.—*Apta, seyára,* Mar.—*Banraj,* Beng—*Ambhota,* Uriya—*Aupta, banne,* Kan.—*Amba bhósa,* Bhíl—*Bossai,* Kurku—*Jinga,* Jeypore—*Kaimu,* Kól—*Ghatonli,* Oraon—*Katmouli,* Kharwar—*Beriju,* Sonthal—*Jhinga, jija,* Merwara—*Choveri,* Khond—*Palan,* Burm.—*Mayila,* Cingh.

The colour and grain are similar to that of *B. retusa* (*q.v.*). In my specimen the grain is finer and the growth closer, but they sufficiently resemble each other to make it unnecessary to distinguish between them commercially.

For identification see that of *B. retusa,* but it is on a finer scale.

Bauhinia retusa Ham.

Weight 58 lbs. (Troup). India, Burma.

VERN—*Kurál,* Punjab—*Kandla, kanalla,* Kumaon—*Kandiáwa,* Garhwal—*Kuayral, gwayral, kanlao,* Hind.—*Semla,* Dehra Dún—*Thaur,* Gondi—*Tewar,* Oraon—*Laba,* Kól—*Katmau,* Kharwar—*Tenrh,* Koderma—*Nirpa,* Tel—*Makarokranda,* Khond—*Aré,* Reddi.

A log of this wood was sent over to the Imperial College of Science and Technology, South Kensington, in 1914. The wood is of a dull, rather dirty brown colour, with almost black streaks which are apt to develop gum cracks and other defects, giving altogether a rather unusual appearance, on account of which it would be useful for inlay work for cabinets. Gamble says: "The wood is the best of those of the Bauhinias, but is not much used. . . . [The] wood [is] red, with irregular dark red or black patches and streaks near the centre, hard; having pale bands of soft tissue, which alternate with dark bands of firmer texture."

The pores are very variable in both size and position, and the medullary rays are exceedingly fine and regular.

BAY CEDAR. *Guazuma ulmifolia* Lam.

West Indies, South America.

VERN—*Guácima* or *guácimo,* Sp. Am., gen.—*West Indian Elm, guazuma plum,* B.W.I—*Guácima boba,* Cuba—*Bois d'orme, guazuma, Trinidad elm,* Trin.—*Orme des Antilles, bois puant,* Mart.—*Orme d'Amerique, cacaoyer à feuille d'orme,* Fr. G.—*Guácimo macho,* Venez.—*Mutamba,* Braz.—*Camba-acá, cambeza de negro, ingá-hú, ingá-negro, marmelero,* Arg.—*Guácimo colorado,* Col.—*Guacimillo,* Nic.—*Chicarrón, caulote,* Salv.—*Cablote, caulote,* Guat.—*Aquiche, bulines, majahua de toro, palote negro, pixoi, pixoy, tablote, vácima, yaco granadillo,* Mex.

A pale whitish, straw-coloured wood, giving a hard, smooth surface under the tool. The concentric layers are clearly marked by dark lines.

Exceedingly small and rather scarce pores, fairly regular in position

with fine medullary rays, which show in a marked manner on the radial section, as in sycamore.

BAY TREE. *Laurus nobilis* L.

North-eastern Asia.

The bay tree also grows to a considerable height in Southern Europe, having a colour and grain like walnut, for which it would pass in finished work. A wood suitable for decorative cabinet woodwork.

Holtzapffel mentions that this is the laurel that was used by the ancients for their military crowns.

A specimen taken from a tree growing at Powerscourt Castle in Ireland yields a wood quite good enough for use in decorative woodwork.

The pores are numerous, minute, mostly open Medullary rays numerous and very fine.

BAYWOOD.

This name was originally applied to, and still is used occasionally, especially in Scotland and the North of England, for mahogany which comes from the Bay of Honduras, although the term has developed into a name for any pale mahogany-coloured wood from either Africa or any other part of the world, and even including the wood of Magnolia and Rhododendron (according to Hough). The origin can be traced back to the early time when mahogany was first known, when only wood from the Spanish possessions, known as Spanish mahogany, was available. When the wood first came from the Bay of Honduras it was not recognised as mahogany.

An art critic at the Exhibition of Dutch pictures in the Royal Academy of 1930 gave it as his opinion that a certain picture was not painted by Rembrandt, because it was on a panel of Honduras mahogany; but whatever the facts might have been, there is no doubt that it would have been quite possible, and indeed not unlikely if Rembrandt's original and intimate knowledge of the best material to work upon is taken into account, for him to have painted a picture on a Honduras mahogany panel, although at that early date in Holland it may not have been recognised that the wood was mahogany.

BEDARU. *Urandra* (*Lasianthera*) sp.

Weight 58 lbs. 6 oz. Borneo, The Malay Peninsula.

This wood has not yet been imported into England in commercial quantities. It is of a light yellow colour, somewhat resembling satinwood, shows broken streaks of dark and light colour, and is mottled and

speckled. It is dense, heavy, and of close texture. It should serve as a useful furniture wood. Foxworthy mentions its use for piling.

There appears to be some doubt as to the origin of bedaru, as it has also been referred to another genus, *Apodytes*, belonging to the same family (*Icacinaceae*), also to *Sideroxylon malaccense* in the Malay Peninsula; the authority for its reference to the genus *Urandra*, as far as Borneo is concerned, is F. W. Foxworthy in *The Philippine Journal of Science* (vol. iv. p. 542).

In cross-section concentric zones are marked here and there. The scattered pores are invisible, though their arrangement is marked by a white halo round each; under the lens they are seen to be plugged. The numerous medullary rays, though fine, are just visible.

BEECH, CANADIAN. *Fagus grandifolia.*
Weight 45 lbs. Eastern Canada.

The heart-wood is a warm buff colour, with brownish-cream sap-wood. It is a fine-textured wood, hard, dense, and very strong; suitable for furniture, flooring, machinery, tools, etc.

"Has been imported into the United Kingdom in small quantities" (*Imp. Bulletin*, 1922).

BEECH, CAPE. *Rapanea melanophleos* Mez.
Myrsine melanophleos R. Br.
Weight 44–45 lbs South Africa.
VERN—*Magona, isiquaqu, siqwanesehlat, Beukenhout,* Dutch, Trade.

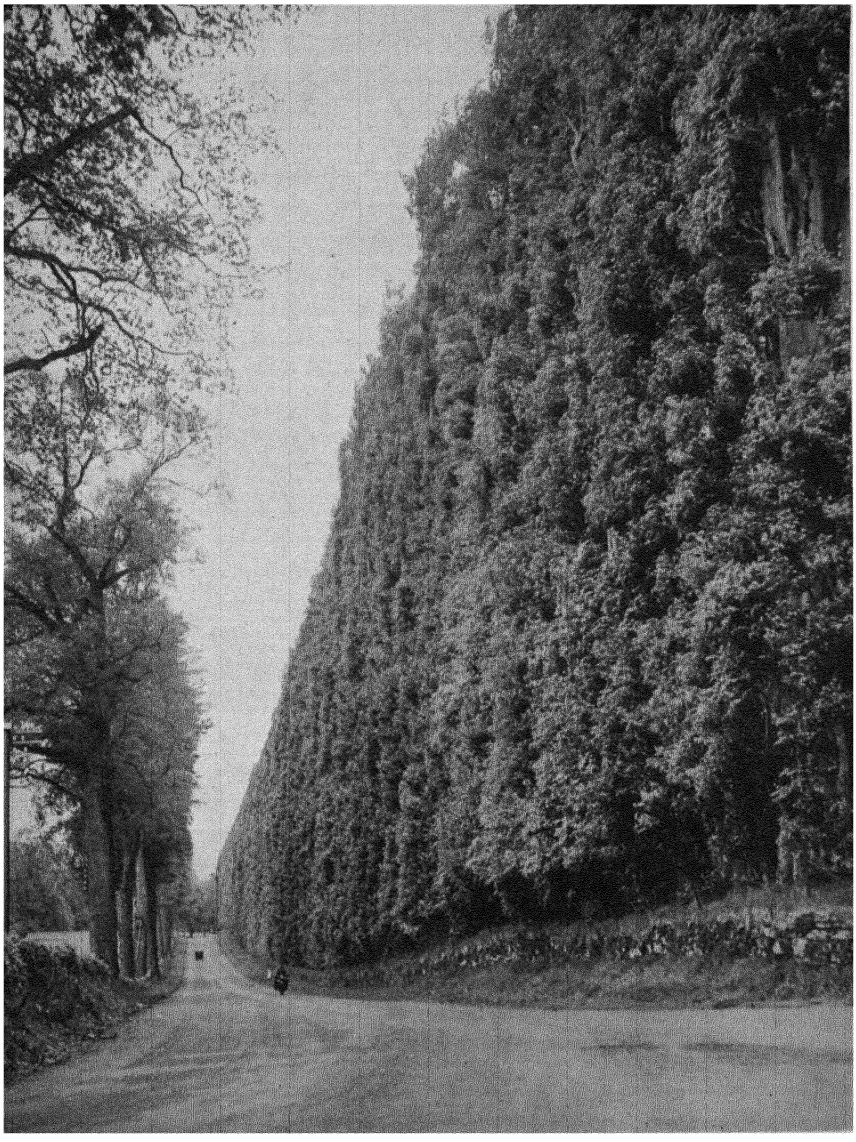
A whitish-brown coloured wood, moderately heavy, strong, hard and brittle, with a good figure, polishes and planes well, but is not durable when exposed. Used locally for furniture and wheelwrights' work.

BEECH, EUROPEAN. *Fagus sylvatica* Linn
Weight 43 lbs.

The common beech tree is widely distributed over Europe, extending from Great Britain and Norway to Spain; it is also found in Asia Minor, and occurs in Japan.

The wood is light reddish-brown, moderately hard and heavy, close and even in texture, with a fine silky grain. The trees after being felled should be sawn into planks, boards, and scantlings as soon as possible. If conversion be delayed, incipient decay is soon indicated by the appearance of white specks or brownish or pink streaks. The wood is lacking in durability when exposed to alternate dryness and wetness, so that it is unsuited for outdoor constructional work, or for props or railway sleepers; moreover, it is sensitive to changes in moisture, for it readily warps and

cracks. Yet when felled and at once placed under water, beech is very durable. In partial illustration of this statement may be mentioned the



UNIQUE BEECH HEDGE AT MEIKLEOUR, PERTHSHIRE

By kind permission of "The Times"

beech logs that formed the original foundation of Winchester Cathedral. These were laid in 1262 in successive layers in peat (which probably

helped to preserve the logs) and water to a depth of from 5 to 15 feet. In 1906 Messrs. J. Thompson & Co., of Peterborough, raised these water-covered logs, which were found on the outside to be soft and spongy to a depth of many inches, but at the core to be hard and sound, varying in colour from light brown to dead black. In the dry air of rooms, beech in the form of furniture lasts indefinitely as far as resistance to decay is concerned, but here it is very liable to attack by "worm" (beetle), which sooner or later will excavate and with its fine tunnels destroy the wood. Gilbert White ("Selborne") says that these maggots are the larvae of *Ptinus pectinicornis*. Many costly chairs of the Queen Anne period were made of beech, stained and inlaid in beautiful English and Dutch marquetry work. The framework of some of these is often found to be riddled with the "shot-holes" of the "worm," which has thus caused the destruction of the furniture. A valuable violoncello has been lately spoilt owing to the appearance of these "worm" holes, which have perforated the sides and back, in which unfortunately beech-wood had been used. These beetles also continually spread to other furniture, of whatever wood it may be made. If, therefore, any article is to last for any considerable length of time, beech should not be used in its construction.

Despite these limitations beech-wood is valuable, and is employed for many and very varied purposes, since it is strong, elastic, splits well, takes a good polish, and when steamed is readily bent. It is used for tools, planes, keys and cogs of machinery, shoe-lasts, boot-trees, toys, malt shovels, brushes, and saddle-trees. Another important use is in the making of wrest-planks for pianos, and of the English beech used for this purpose, it has been said that that which is grown in Devonshire or Essex far excels any other. In welding or fusing glass it is used almost exclusively. According to Messrs. J. Powell & Sons, beech-wood billets are used for supplying great local heat whilst large glass objects are being fashioned. All other wood, except beech, produces a white film (sulphur) on lead-potash glass, which is only removed with some difficulty. In this connection some sycamore billets used by mistake caused considerable trouble.

One of the chief uses of beech is in chair-making. In addition to the manufacture which is carried on in factories, the industry is also plied in the woods of Buckinghamshire and other districts of England. Here the felled trees are sawn through, cleft, and turned into legs and rails for chairs in the same manner, and by the same primitive kind of pole-lathe, in use for centuries. Beech is extensively employed in the brush industry. Its cohesive qualities, associated with a moderate degree of softness, enable this wood to withstand the strain of the close boring without splitting, as in the case of some stronger and harder woods. It also resists the combined action of soap and water to a greater extent than do most timbers.

In Hungary, for the brush trade, the trees are cut into lengths of from 6 to 8 feet ; the resultant drums are then cleft into four quarters, which are set out to dry, and are finally sawn into the necessary sizes. This method of cleavage is wasteful, but yields exceedingly bright, good-coloured timber. In that country the wood is also used for the manufacture of complete suites of furniture for domestic rooms and offices.

There seems no reason why English beech should not make very good wood-pavement and flooring, if properly creosoted and carefully laid. Indeed for the former purpose it has already been used with fairly satisfactory results. It possesses the necessary tough, spongy quality, and does not become slippery, as with some other hardwoods. Its expansion and contraction are also less.

Prideaux Selby refers to the use of beech leaves for mattresses, saying : " Upon the Continent the dead leaves, which, when dry, are of an elastic and very imperishable nature, have long been used for filling beds, for old Evelyn speaks of them in Switzerland, where, he says, ' I have sometimes lain on them to my great refreshment ' " ; and Sir T. Dick Lauder, after quoting the passage from Evelyn, and speaking of the excellence of the beds in Italy, made of mattresses filled with the elastic spathe of the Indian corn, adds, " but the beds made of beech leaves are really no whit behind them in their qualities, whilst the fragrant smell of green tea which the leaves retain is most gratifying."

Beech is an excellent firewood, and is largely used for this purpose in France. It is also admirably adapted for the production of acetic acid (and acetone), by its destructive distillation.

The concentric layers are very strongly marked, the pores are small and obscure ; the medullary rays, which are sharply defined, are very numerous, and vary greatly in strength and size. They are very pronounced on the radial section.

BEECH, JAPANESE. *Fagus sylvatica* Linn. var. *Sieboldi* Maxim.
Weight 26 lbs. Japan.

The Japanese beech is very similar to that grown in England, but it is of a more uniform colour, a light yellow-brown, not white, and is rather softer and milder, and keeps its shape very well. Goto states : " Beech in Japan is used for making boats, ploughs, handles of tools, rifle-stocks, clogs, spinning-wheels, lacquer ware, and various utensils. . . . Oil from the seeds is used for lighting as well as for food . . . treated with preservatives it is especially suitable for sleepers and foundations."

The annual layers are very narrow and uniform. The pores are very small and indistinct, and the medullary rays strong and prominent.

BEECH, SILKY. *Villaresia Moorei.*

Weight 40–47 lbs. (Swain). Queensland, New South Wales.

Known also as " churnwood " and " soap box," and in New South Wales as " maple." A brownish-toned whitewood with a silver grain, firm, tough, easy to work. Used for cabinet work, mouldings, and turnery.

BEECH, WHITE. *Gmelina Leichhardtii* F. v. M.

Weight 36 lbs. (Baterden). New South Wales, Queensland.

VERN—*Binburra, cullonen.*

Known as " grey teak " in Queensland. This is one of the most valuable of the Australian timbers. It is whitish colour with a brown tinge, generally plain, but sometimes having a silvery grain, cross-grained, easy to work. For purposes where a wood harder and more durable than pine but softer than hardwood is required, it is considered very valuable ; is fairly free from termite attack. It is reputed as being especially useful for flooring boards, and ships' decks, as it shrinks very little ; also for all carpentry purposes, and is said to be better than oak for large casks and wine vats.

The *Queensland Forestry Bulletin* No. 2 states that " this wood is oily, aromatic, very soft, and of medium weight . . . very durable in all parts of buildings exposed to weather. . . . It is the most easily worked of all Queensland timbers, and is probably the finest carving wood in Australia."

It has not been seen in commerce in England.

BEEFWOOD. *Mimusops globosa* Gaert.

Weight 59 lbs. 11 oz. British and Dutch Guiana.

VERN—*Bullet wood, bully tree, balata tree, beefwood, horseflesh, red lance-wood, barueh, buruea,* B.G.—*Bolletrie, bolletrieboom, balataboom, bloedbalata, pardeflesh, pardenvleesh, roode balata,* Sur.—*Balata, balata franc, balata rouge, bois rouge, bois de natte, sapotillier marron, manil-kara, l'abeille, hymarikushi, mora-balli, assapookoo, morakokuru, mamushi,* Fr. G.—*Acana, ausubo, balata, mameyuelo, sapote, sapote de costa, zipote,* P.R.—*Jaimiqui,* Cuba—*Wild dilly,* U S., Bah.—*Balata, purgo,* Venez.—*Nispero,* C.A.—*Massaran-duba, massaranduba vermelha, maçeranduba, maparajuba, aparahiú, apraiú, apraua, balata, chauá, muirapiranga,* Braz.—*Pferde-fleischholz,* Germ.

This wood is imported in the form of square hewn logs ranging from 15 to 40 feet in length, and from 10 to 18 inches square. That from Surinam (Dutch Guiana) is the better quality, the Demerara (British Guiana) timber being rather knotty. In the log, on calliper measure it averages about 30 to 32 cubic feet to the ton.

The colour is a dull plum red, and in this respect it somewhat resembles raw beef. With the plane it yields a very smooth surface, upon which glisten the minute shining specks of substance contained in the pores. Stone and Freeman give the following account of its other qualities: "Very durable, stands exposure, suffers from teredo and worms . . . fissile, takes nails badly." In England it is only in occasional demand, and is used in the manufacture of the best umbrella sticks, which, even when thin, are very strong. On the Continent, where there is a constant demand, beefwood (of this and possibly other kinds) is used largely for making violin-bows of a second-class quality, walking-sticks, rollers, and tools.

Beefwood is very similar to messaranduba (*Leucuma procera*) (*q.v.*). Under the name of beefwood another timber may be encountered, that of *Swartzia tomentosa* DC , which appears (judging from Stone and Freeman's description) to differ, *inter alia*, by the tiered structure shown in the tangential section as well as by the scattered pores.

The cross-section is marked by concentric layers of various widths (which may represent annual rings) visible to the naked eye, also by numerous light-coloured concentric lines, which, like the similar but finer invisible medullary rays, are almost or quite invisible to the naked eye. The small numerous pores are individually invisible, but are linked in small radial lines by light-coloured tissue, and these light radial groups are visible to the naked eye. The pores have contents that are light yellow or orange in my specimen, which in structure and appearance accords with the description given by Stone and Freeman, except that these authors describe the contents of the pores as red.

Beilschmiedia sikkimensis King.

India.

VERN—*Konháiah*, Oudh—*Tarsing*, Nep.—*Kanyu*, Lepcha.

A light grey-coloured wood with a close, even grain, taking a smooth surface from the tool. Gamble reports it as being used for building purposes and tea-boxes, which is the best use to which the wood could be put. Not likely to repay the costs of export.

The pores are scarce and rather small. Medullary rays are very fine, irregularly placed, and showing on the radial section in small flecks.

BENTEAK.

See *Lagerstroemia lanceolata*.

BETIS. *Payena utilis* Ridl. and other species.

Weight 56 lbs. Malayan Peninsula, The Philippines.

VERN—*Belian, metis, nyatoh bukit, putat bukit, seminai, surin.*

Foxworthy, in *Malayan Forest Records* No. 3, describes this wood as being very hard, heavy, strong, durable, and fine-grained. The sap-wood

is white to pale yellow or pinkish, narrow and very distinct from the heart-wood, which is reddish-brown, occasionally with streaks of lighter and darker colour. It is used for heavy construction, and is suitable for fine furniture.

BIBIRU.

See GREENHEART.

BIG TREE. *Sequoia Wellingtonia* Seem.

Weight 24 lbs. California.

The tree, known as *Sequoia gigantea* and *Wellingtonia*, has been successfully cultivated in England. It should not be confused, as it often is, with the *Sequoia sempervirens*, the redwood of America. The wood is brittle and possesses little strength or value. It is light in weight, soft and spongy, varying in colour from pale yellow to a warm red, with a very broad white sap edge, and used to a limited extent in lumber, and for fencing, constructional work, shingles, and said to be durable in the ground.

The concentric layers are usually wide, and irregular, they are also marked by dark bands. The medullary rays are very numerous and exceedingly fine.

BILLIAN. *Eusideroxylon Zwageri* T. & B.

Weight 70 lbs. (Baterden). Borneo, Malay Peninsula.

This timber, known as Borneo ironwood, varies in colour from dark to light brown when first cut, while it deepens almost to black on exposure to light and air. It is one of the hardest and heaviest of the Borneo and Malay woods. It has occasionally been imported, and has been inquired for from time to time in the United Kingdom, for some works of importance. Foxworthy mentions its use in heavy construction, bridges, telegraph and telephone poles, also railway ties and sleepers, and says that it is perhaps the best wood in the world for piling. He adds: "Billian is one of the very few woods of Borneo which is known outside this region. It is exported to Europe in some quantity, and has been used for piling at several places in Holland and France. It is deserving of wider use, but a few years' vigorous exploiting will exhaust the available supply of it."

This was one of the woods tested by Foxworthy and Woolley, and which survived five years of that test. (See PYINKADO.)

BILLY WEBB. *Sweetia panamensis* Benth.

Weight 63–64 lbs. British Honduras, Mexico.

VERN—*Chichipate*, Guat., Hond.—*Huesito, huesillo*, Mex.—*Malvecino*, Pan.—*Billy Webb*, Br. Hond.

A beautiful wood, with a close, compact grain, equal to Spanish mahogany. The general appearance of this wood is similar to that of *Adenanthera Pavonina.*

The colour is from a light reddish-yellow when first sawn, to a rich, dark Spanish mahogany tone on exposure to air and light, in the same manner as *Adenanthera*. It is a valuable timber, and if supplies were forthcoming would be in good demand for cabinet work.

The exceedingly numerous, invariably plugged pores, which are very small, are plainly seen on the transverse section like a multitude of stars, with well-defined, exceedingly fine and numerous rays, parallel and very close.

BIRCH. *Betula alba* Linn.
B. lenta Linn. etc.
Weight 47 lbs. 13 oz. Europe, Asia, North America.

The wood is of a yellowish-red colour, and is very tough and fairly hard, close in texture, and easy to work. It is imported into this country in logs varying from 6 to 20 feet long and 12 to 30 inches wide, and in sawn square-edged planks and boards mostly from 10 to 16 feet long and 4 to 18 or 20 inches wide. For many years it was used extensively for furniture of all kinds, but of late, except for inexpensive chairs, it has largely gone out of fashion. It is, however, in great demand for automobile carriage building, for step-boards and framework, carts and vans, desks and office furniture, agricultural implements (Spenser in the *Faerie Queen* speaks of "the birch for shafts"), and general woodwork. Some of the wood is beautifully figured with wavy, curly grain, and when stained and well polished is a good substitute for mahogany. In America it is employed in this manner for doors, and general trimming for hotels and other buildings. In that country it is also used for floors, for which it is admirably adapted. It is remarkable that it is not used for this purpose in the United Kingdom, as it makes a very fine flooring, both as regards appearance and durability. In America, ply-work has of late years consumed large quantities. Other varieties of birch are also used in the same manner, both in this country and in America. Amongst these Holtzapffel mentions the following: "*Betula excelsa*, also called yellow birch, has wood much like *Betula lenta*, and *B. nigra* is also much esteemed. *B. papyracea*, paper or canoe birch, is employed by the North American Indians in constructing their portable canoes. *B. bhojputtra* is a Himalayan species of which the bark is used for writing upon, and for making the snakes of hookahs."

According to Hough, the products of *B. lenta*, *B. papyrifera*, and *B. populifolia* are used in America for various purposes, in wood ware and spools.

"The bark of the paper birch, and, to a less extent, that of other species, is as important to the inhabitants of Canada as that of the common

birch is to those of Northern Europe. Canoes and lodges are covered with large sheets of bark ; it is placed on shingled roofs under the shingles, to prevent the water from coming through ; and very ornamental boxes, baskets, and other articles are made from it by the Indians. It also serves as a writing material, and I have a clearly written letter from Professor Elrod, sent me by him when, making an expedition in Montana, he ran out of paper" (Elwes and Henry, *Trees of Great Britain and Ireland*, p. 994).

There is little doubt that the birch planks and boards from America are the produce of all the different varieties mixed indiscriminately, and it may also be the case with the Canadian, as it is doubtful if even experts can with certainty discriminate between the wood of the different sorts.

British and Continental grown trees are much smaller than Canadian, American, and Japanese. Most of the former are much lighter in colour, though Holtzapffel says that the Russian wood is of a full yellow colour. Three-ply and other veneer in which this bright-coloured wood has been used has lately been imported. A considerable quantity of birch is received from Sweden and Norway in small sizes and sawn squares, for various trades. Perhaps the largest demand is for short pieces, about 3 inches square and 6 feet long, which are used for placing in the brickwork of buildings to support the scaffolding. These are called putlogs and are mostly imported from Christiansand. All sizes are employed for brush-making, and a moderate supply for staves and box-boards is greatly in demand.

Holtzapffel notes that the wood is not very durable, and adds : " The bark of the birch tree is remarkable for being harder and more durable than the wood itself ; amongst the northern nations it is used for tiles of roofs, for shoes, hats, etc. The Russians employ the tan of one of the birch trees to impart the scent to Russia leather, which is thereby rendered remarkably durable. The inner bark is used for making the Russia mats."

During the European war, as the shipments of foreign supplies largely ceased, a considerable quantity of British birch was used, especially in the brush trade. On the whole it was found to be quite useful, although it was reported as being not quite so good as the Norwegian wood.

The pores are exceedingly small, somewhat plugged. The medullary rays are fine, close, and parallel ; the wood shows dense, close, compact growth.

With the American wood the pores are larger and more open. The medullary rays are well defined, parallel, and joined at irregular intervals at right angles by deeper-lined veins.

The pores and rays of the Canadian wood are similar in all respects

to the American, but the general character of the growth is more dense and compact.

BIRCH, INDIAN. *Betula alnoides* Ham.

Weight 41 lbs. (Gamble). The Himalayas, Burma.

VERN—*Púya udish, chambar maya, makshéri, sheori, shag,* Pb—*Bhújpattra, háur, shául,* Hind.—*Kath bhúj,* Jaunsar—*Utis, sauer,* Garhwal—*Ban utis, haoul,* Kumaon—*Shakshin,* Tibet—*Saver, sauer, payong, utis,* Nep.—*Hlosúnli,* Lepcha—*Dingleen,* Khasia—*Lãyang,* Kc.—*Birch,* Burm. Hills.

The common birch of Northern India. This wood is so similar to that of European birch (*q.v.*) that the same description applies.

The pores are small, generally plugged, and not very numerous. The medullary rays are coarse, irregular, and less prominent than is the case with European birch.

BIRCH, JAPANESE. *Betula Maximowiczei*
B. ulmifolia
B. alba Linn. var. *vulgaris* DC.
Weight 48 lbs.

Prior to 1920 a considerable quantity of hewn square logs from about 8 to 20 feet long and 12 to 36 inches broad have been imported from Japan. This import has now ceased. It is there termed Shira-kamba (*Betula alba*). The logs are clean and very sound, with straight hearts, and are of better quality than any of the Canadian or American wood. The colour is a bright yellowish-red, and the wood is slightly harder, tougher, and more closely grained than the Canadian. I consider it superior to other kinds in commerical use, for all purposes for which birch is used. Recently some well-made three-ply veneer faced with Japanese birch has been imported.

The pores are smaller than in the Canadian wood, and are almost entirely plugged. The medullary rays are fine but distinct, and are joined at right angles by a thin vein which occurs at close intervals.

BIRD CHERRY. *Prunus Padus* Linn.

Canada, North America.

The colour is ivory white, with a glistening surface, marked by a dull greenish-brown stain, and dark veins. The branches are sometimes used in the manufacture of pipes. Sargent describes the wood (I think incorrectly) as "soft," the surface of my specimen being as hard as maple.

The concentric layers are marked by thin dark lines following the line of growth. The pores are scarce and very small, hardly discernible

under the lens, with strong well-defined medullary rays, which show faintly, but bright, on the radial section.

BIRNUT.

A trade name given to birch which has undergone a darkening process.

BISCHOFIA. *Bischofia javanica* Blume.

Weight 45 lbs. (Gamble). Formosa, India, Burma.

VERN—*Paniála, bhillar,* Dehra Dún—*Kot-semla, káen, kein,* Garhwal—*Pun, kein, korsa,* Kumaon—*Irúm,* Oudh—*Kainjal,* Nep.—*Sinong,* Lepcha—*Taisoh, urum,* Mechi—*Uriám,* Ass.—*Joki,* Cachar—*Bolzuru,* Gáro—*Boke,* Mar—*Thondi, malachithiyan,* Tam.—*Gobra nairúl,* Kan.—*Govarnellu,* Hassan—*Nira,* Mal.—*Nannal, thiripu,* Trav. Hills—*Modagerri vembu,* Tinnevelly—*Bogaungsa, aukkyu, kywetho, tayok-thè, ye-padauk,* Burm. Bishopwood.

This wood is a dull reddish-brown colour, and of close, firm texture, while in appearance it closely resembles American black walnut (*Juglans nigra*). Much of it displays wavy grain. It possesses great strength of compression and shearing, but is very liable to the attack of a small boring beetle, which perforates it through the sap-wood to the heart-wood.

The pores are small and evenly distributed. The medullary rays are numerous, fine, parallel, and equidistant.

BITTERWOOD.

See QUASSIA.

BLACKBEAN. *Castanospermum australe* Cunn.

Weight 48 lbs. (Swain). New South Wales, Queensland.

Known as Moreton Bay chestnut, bean tree, and yuba.

This timber, well known in Australia and said to be rather rare in Queensland, first came into prominence at the White City Exhibition, where a room panelled and furnished throughout was exhibited. The wood has an attractive appearance, showing various shades of olive-green brown, traversed with dark to black streaks, and often handsomely mottled. The grain is very close and hard, and the wood takes a smooth surface from the tool. It is durable in the ground, stands exposure to weather, and is said to be resistant to white ant.

Among the various places in London where this wood has been successfully used are: Australia House, employed for panelling, flooring, doors, and general woodwork of the library and elsewhere, by Messrs. Wylie & Lochhead of Glasgow, and panelling of the High Commissioner's room. The Royal Automobile Club, Pall Mall, where it is used for the doors, counters, decorations, and furniture of the second floor (the wood

here has not stood as well as might be desired). At the Yellow House, Bayswater, the residence of the late Percy Macquoid, a handsome panelled room was executed in wood which had been lying in the docks for many years, although it had not been recognised as blackbean until long after the room had been finished.

Owing to the very close resemblance between *Ormosia* sp. and *Castanospermum australe*, they have often been confused with each other.

Baker, in *Hardwoods of Australia*, remarks upon the difficulties of seasoning this wood in Australia, and it is far more difficult to season it in England, but when well seasoned, fixed woodwork stands well. Swain claims that it possesses a very special quality of high resistance to electricity, up to 100 times greater than with most cabinet woods.

The pores are visible, rather large, moderately numerous, and plugged with microscopic cists (thyloses). They are scattered, and are either found solitary or grouped in minute radial series, up to five pores in number. They are surrounded by an almost white tissue, which extends and tapers in a tangential direction and may link on to the next mass, thus giving rise to concentric light lines. The excessively fine and numerous rays are invisible to the naked eye.

BLACKBUTT. *Eucalyptus pilularis* Sm.
E. patens Benth.
Weight 57 lbs. 5 oz. Australia.

This is a close-grained, hard wood of a dull yellow-brown colour. There is a marked inequality between the hard and the soft grain which causes an uneven surface after seasoning, also a liability to warp and twist, and sometimes to crack. It was tried in London for wood pavements but did not give much satisfaction. It is highly esteemed in Australia for paving-blocks, shipbuilding, and bridge-work, sleepers and carpenters' work. It is very strong, tough, and durable, and possesses, to an unusual degree, fire-resisting qualities. Messrs. R. J. White & Co. of Sydney state : " In Australia blackbutt as a firewood is shunned, as it is most difficult to light and even when blazing the slightest disturbance of the fire sends it black and the fire will readily die out."

The pores are numerous and in groups, partly plugged. The medullary rays are extremely fine and irregular.

BLACK MANGROVE. *Avicennia nitida* Jacq.
Weight 57 lbs. (Record). British Honduras, South Florida, West Indies, Northern South America.

VERN—*Black mangrove*, Fla., B.W.I.—*Blackwood, black tree*, Fla.—*Green turtle bough*, Jam.—*Manglé blanco, manglé bobo, chifle de vaca,*

P.R.—*Manglé prieto, manglé negro,* Cuba, Venez.—*Ceriúba, ciriúba,* Braz.—*Bois de meche,* Guad.—*Paletuvier blanc,* Fr. G.—*Parwa, parwa,* Sur.—*Orozuz,* Mex.—*Arbol de sal, ishtatén, istatén,* Salv.

This wood merits a rather special interest. It is hard, heavy, of a deep dark olive-green colour, lined with lighter stripes of a yellowish character. The squared edge of the wood when prepared is almost like a knife, with a distinct tendency to cut the flesh if the wood is handled carelessly. It is probable that it has been marketed at times as " Green Ebony."

The pores, which are extremely small, are very numerous and generally plugged, with medullary rays so fine as to be hardly discernible under the lens.

BLACK POISON. *Metopium Brownei* (Jacq.) Urb.

British Honduras.

A brownish-green wood, reminiscent of ebony. Of hard, close texture, with a light grey sap-wood.

Fine medullary ray, showing on the radial section, smaller but otherwise like beech ; concentric layers marked by dark lines. The pores are exceedingly small, and not very numerous ; the medullary rays are fine, but very pronounced.

BLACKTHORN, IRISH. *Prunus spinosa.*

Although the Irish blackthorn is probably of world-wide fame—and the tree has been known to serve a useful purpose for Irishmen throughout many generations—the question of the wood as one possessing other useful qualities has probably never been considered. The colour is bright yellow on the outside of the tree, with a rich, warm brown heart, having dark coloured streaks. The grain is close and firm, and capable of a very smooth surface. If sound wood of even, narrow widths could be secured, it would make an attractive decorative wood for inlay, comparable with the best of other woods imported for that purpose. It has great strength, both tangential and tensile, which makes it highly suitable for those purposes to which the limited size obtainable restricts it.

Elwes reports Chevalier in 1850, who describes a tree at the Chateau du Chabrol, St. Patrice, on the Loire midway between Saumur and Tours : " There is a large blackthorn, called *l'épine miraculeuse,* which flowers every year in the last week in December, even in the severest seasons. The legend is that St. Patrick, while on his way to Tours in A.D. 395, reposed one night in winter, under the shade of this tree, which burst forth into flowers and leaves to shield him from the cold."

This is one of those trees which invariably carry a dark-coloured heart, which is generally limited to a small proportion of the tree contents.

The concentric layers of growth are clearly marked by dark-coloured rings. The very numerous, minute pores are plugged ; with conspicuous medullary rays radiating from the heart in irregular wavy lines, and showing on the radial section in minute flecks.

BLACKWOOD. *Dalbergia latifolia.*
See ROSEWOOD, EAST INDIAN.

BLACKWOOD, AFRICAN. *Dalbergia Melanoxylon* Guill. & Perr.
Weight 89 lbs. 4 oz. Tropical Africa.

This timber has been called black Botany Bay wood, although the name is now somewhat out of date. It is an almost black wood, with a tendency to a dark purple plum colour. It is now imported from Mozambique and the east coast of Africa, and for this reason is also known as Mozambique ebony. Mr. A. E. Gardner says the wood was formerly known as Ebène du Portugal, and that it is quite a different growth from the ebony of the West Coast or the Madagascar ebony. It is probably the same timber reported by Holtzapffel as being of doubtful origin, but that certainly some had been imported from the Mauritius or the Isle of France. He adds : " It is probable that this wood, in common with many others, may have several localities. . . . It is most admirably suited to excentric turning, as the wood is particularly hard, close, and free from pores, but not destructive to the tools, from which, when they are in proper condition, it receives a brilliant polish. It is also considered to be particularly free from any matter that will cause rust, on which account it is greatly esteemed for the handles of surgeons' instruments."

These characteristics should recommend this wood to the attention of those who are looking for a high-class, reliable substitute for ivory and other articles, now very much more costly, which have been used for the handles of knives and tools ; but its chief use is in the construction of musical instruments. It is imported in billets, from 5 to 10 inches in diameter, of irregular growth and shape, and of a faulty description.

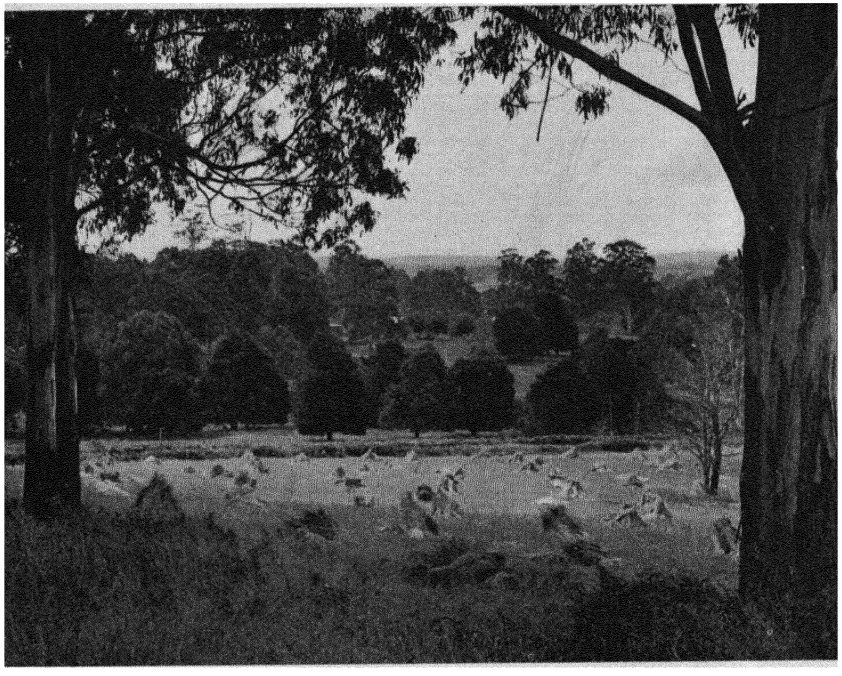
The Bombay blackwood, otherwise known as rosewood (*q.v.*) and well known in the timber trade, is the product of *Dalbergia latifolia* Roxb.

The pores and the medullary rays are equally indistinguishable with the lens.

BLACKWOOD, AUSTRALIAN. *Acacia Melanoxylon* R. Br.
Weight 48 and 57 lbs. (other specimens stated to be as low as 36 lbs.). Australia (including Tasmania).

In colour the wood varies from rich reddish-brown to nearly black, banded with golden brown ; sometimes it is brown and red with dark streaks, and may show metallic lustre. Its grain is close, often curly, and

with pretty figure and mottle. It is easily worked and is susceptible of a fine polish, but must be thoroughly seasoned. Baker, in *The Cabinet Woods of Australia*, states that blackwood should perhaps be placed second only to *Cedrela Toona* as an Australian cabinet timber. As a handsome decorative wood it has been used for fittings in banks, railway-cars, and passenger steamers. A mantelpiece made of this wood was exhibited some years ago in the Colonial Exhibition at Earl's Court. It has been successfully used for gun-stocks It is, moreover, a strong



AUSTRALIAN BLACKWOOD IN GIPPSLAND FORESTS, VICTORIA
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timber, and Mr. C. Lyne (Minister of Lands and Works) wrote in 1903 : " Orders are now being supplied to the Admiralty for use in the construction of gun-carriages in the arsenals, where it has been tested and given satisfaction." It is not well known, and has not been much used in the United Kingdom, where it might with advantage be employed in decorative and cabinet work.

The wood in cross-section shows alternating darker and lighter concentric bands, which may denote the presence of annual rings ; the pores themselves are invisible (though clear enough in side view), but their positions and scattered arrangement are revealed by reason of the light

haloes surrounding each tiny group. The medullary rays are invisible, and so fine as to be only just recognisable with the magnifying glass (+12).

BLUE GUM.

See GUM, BLUE.

Boehmeria rugulosa Wedd.

Weight 41 lbs. India.

VERN—*Geti, gainti, genthi,* Garhwal, Kumaon—*Dar,* Nep —*Sedeng,* Lepcha.

This timber is unknown in commerce though possessing remarkable qualities, probably surpassing all other woods for carved work. The colour is a light salmon-red darkening on exposure to the air to a dull red mahogany shade. The sap-wood is an unsightly dirty brown. The trees are liable to the attack of small worms or beetles, and also to a grub which leaves a larger hole The wood works easily, and the grain is straight and takes a very smooth surface from the tool. Troup says it is " apparently not to be obtained in large size . . not common in India, being found scattered in the Forests." Gamble mentions that it is " used for making bowls, cups, plates, and all kinds of domestic utensils . . . for which its character of being easily cut and carved without splitting or warping, well adapts it." The Rajah of Nepaul presented a marvellous piece of native carved work in this wood to Mr. H. J. Elwes, on his last visit to India. It would be greatly esteemed by the artist craftsman for fine work if it became known and supplies were available.

The concentric layers are clearly marked. The pores are scattered irregularly between the rays, mostly plugged with shining specks of solid substance. The numerous medullary rays are thick, parallel, but not regular.

BOLLYWOOD, BROWN. *Litsea reticulata*

Weight 33 lbs. (Swain). Queensland.

Known as bolly gum and she-beech.

The colour is a pale brown, and the wood has a firm and rather woolly straight grain. Used for boat-building, cabinet work, wood-carving, joinery, mouldings, picture frames, and ply-wood, and bends well.

Bombax ceiba Linn.

China.

The wood is yellowish-red, harder and heavier than any of the Indian bombax.

The pores are very sparse, irregular and open. The medullary rays

are variable in width, with very fine dotted specks of fine light tissue between, and the rays do not show on the radial section.

Bombax insigne Wall.

Weight 31 lbs. Andaman Islands, India, Burma.

VERN—*Semul, thula,* Beng.—*Saitu,* Magh—*Didu, didôk, taung-letpan,* Burm.

Like the well-known cotton tree, *Bombax malabaricum,* this yellowish-white, soft, perishable, and non-durable timber is not likely to find much use in Europe. In structure it is similar to *B. malabaricum,* except that the pores are smaller and less scanty. It is a better timber than the latter though it is far less common, and is used in India for cheap work, such as planking and packing cases, also in Assam, for making tea-boxes. For the last named purpose it is used in Calcutta indiscriminately with *B. malabaricum.* These two species were largely used for match-making in the factories at Rangoon and Mandalay.

Bombax malabaricum DC.

Weight 23 lbs. India, Burma, Ceylon.

VERN—*Simbal,* Hazara—*Shirlan,* Sutlej—*Shimlo,* Kumaon—*Shimal,* Garhwal—*Semul, shembal, serur, pagun, somr,* Hind., Beng.—*Bouro, buroh,* Uriya—*Bolchu, panchú,* Gáro—*Sunglú, tunglu,* Lepcha—*Simal, saodi,* Melghat—*Khatsawar,* Bassim—*Kamba,* Khond—*Buroh,* Saora—*Wuraga,* Palkonda—*Edel,* Sonthal—*Dél,* Kól—*Simur,* Mal Pahari—*Burga, búrgú, búraga,* Tel—*Sayar,* Mar.—*Sawar,* Guz—*Illavam, púla, parutti,* Tam.—*Burla, sauri, buruga,* Kan.—*Wallaiki,* Gondi—*Katseori,* Bhil—*Lapaing,* Magh—*Ilavu,* Mal.—*Letpan,* Burm—*Katu-imbul,* Cingh.

This is the silk-cotton tree of India. It is a very soft wood of a greyish-white colour, which darkens on exposure. Very liable to the attack of "worm," it is not durable except under water, when it lasts fairly well. It is used in India for planking, packing-cases, tea-boxes, and toys. Gamble says that if it is allowed to dry in the log the wood gets discoloured, so that to ensure white planking, the trees should be sawn up at once, and the planks dried separately.

The pores are scarce but very large and open. The medullary rays are not distinguishable, even under the lens.

BONGOSSI. *Lophira procera* A. Chev.

Weight 65–72 lbs. West Africa.

VERN—*Ekki, eba,* Nigeria—*Kaku,* Gold Coast—*Okoka, okoa, lihos, kos, bokoka, bongossi, bois de fer, red ironwood, African oak, azobe.*

The colour is red, resembling beefwood; the wood has a very strong, hard, interlocked grain. It is one of those innumerable woods to which

the term " ironwood " has been given, and it has also been called " African oak," but neither of these names is justified. A sample of this wood under the name of " pondosa " was inquired for this year (1933), but this name is not included in the vernacular lists of any of the usual authorities. It is reported as being used abroad for maritime and other heavy constructional work, and as standing well. A few logs have been seen on the English markets from time to time, generally sold under the name of African oak, in sizes from 20 to 36 inches and in 12-feet and up lengths, both hewn square and in the round. Reports show that there is an abundant supply.

The transverse section displays to the naked eye an unusual and pretty pattern. The rather sparse pores, single, double, and in triplicate, are mostly plugged with a bright shining gum (?), with very pronounced wavy belts of light tissue, crossed at right angles by clear, fine, parallel medullary rays, which show on the radial section in tiny dark and light flecks. On the transverse section the prominence of the rather open pores is accentuated by the light clear streaks of sparkling gum (?).

Borassus flabellifer Linn.

Weight 49–50 lbs. (Gamble). India, Burma, Ceylon, Africa.

VERN—*Tál, tála, tár, taduka,* Hind.—*Tál,* Beng.—*Tád, tamar,* Mar.—*Potu tádi, penti tádi,* Tel —*Panam, pannie, panei,* Tam.—*Pana,* Mal.—*Tali, talé,* Kan.—*Tad,* Guz —*Tál,* Cingh.—*Tan,* Burm.

This, the " Palmyra palm," is one of the most important of the very large number of different palms, providing for uses far more important and numerous than that of merely timber, although the very hard blackish-coloured outside wood of the tree has been used for inlay and other fine cabinet work in many places. Only the outside of the tree produces any wood which is fit to use, and generally little more than 3 or 4 inches in width. Zon and Sparhawk report it as providing the " valued ' ago beam ' for building."

Boswellia serrata Roxb.

Weight 42 lbs. India.

VERN—*Salhe, salai, sálgá,* Hind.—*Guggar, salaia guggar,* Kumaon—*Salla, bor-salai, ganga,* Gondi—*Luban, salai,* Beng.—*Kungli, gúgúlu, kúndrikam, morada,* Tam.—*Anduka, anduga, parangi,* Tel.—*Salai, salphullia,* Mar.—*Chitta,* Kan.—*Sálgá,* Sonthal—*Saler,* Jeypore.

A dirty-brown coloured wood, with a fairly close, but hard grain, taking a smooth surface from the tool. Unlikely to repay the costs of export.

The pores are numerous, regular, and mostly open. The medullary

rays are rather fine, very numerous, and show in small flecks on the radial section.

BOX, GREY. *Eucalyptus hemiphloia* F. v. M.
Weight 68½ lbs. South and South-east Australia, New South Wales.

Known as canary wood, grey, white, and yellow box, gum-topped box, white gum, Local—*Narulgun*, Aborig.

Apparently the name box has been given because of the appearance of the bark of the tree. The unfortunate inclination of Forest Officers and others to choose a name for a wood on account of the appearance of the bark is illustrated in this case, because nothing could be more misleading than the name of "box" applied to the wood of *Eucalyptus hemiphloia*. In India some Forest Officers proposed the name of "rock bark wood" for one tree, and "monkey slipwood" for another, the last because the tree has a bark difficult to climb. While it is natural that the forester should have in his mind the bark of the tree, it is both unsuitable and almost ridiculous to name a wood because of the bark.

The nomenclature of woods presents a most difficult problem, but it is better to leave the choice of names to those who understand the wood itself and its uses, and not to let it be confused with the botanical name or the growth of the tree as a tree. The colour of grey box is a light nut-brown, with the customary hard, close grain of the Eucalypt, closely resembling the timber of *E obliqua* only of a darker colour. Highly suitable for heavy, and all descriptions of work where toughness, strength, and durability are required.

The very small, somewhat scarce pores are ranged in small belts, or irregular bands, with strange thin lines of light-coloured tissue crossing at irregular intervals the fine medullary rays, which are not very prominent.

BOX, SWAMP. *Tristania suaveolens.*
Weight 55 lbs. (Swain). Queensland.

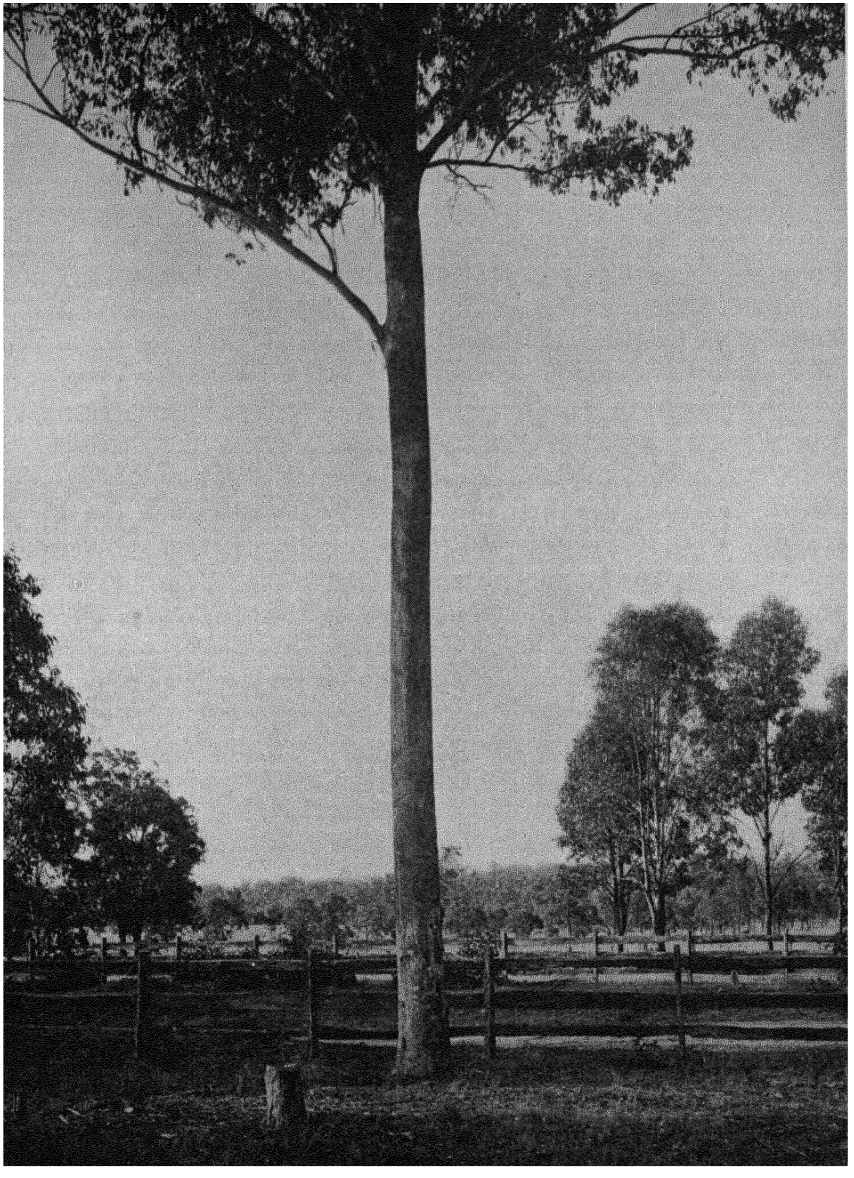
Often called swamp mahogany. Swain reports this as "a moderately heavy red hardwood, of fine and even texture. . . . It is firm but mellow to cut, saw, turn, and dress . . . durable in and out of weather and ground . . . reputed to be white ant resistant, and one of the best known timbers for resisting the attacks of marine borers."

It makes a good flooring, and a general building timber if fully seasoned, but not very strong ; it is used also for mallets.

BOXWOOD. Sources various.

Ordinary genuine boxwood is derived from the evergreen shrub or tree *Buxus sempervirens* Linn., which is familiar as a shrub in English gardens,

but also occurs in sunny places in this country as a wild plant. Extend-



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ing over a large part of Europe from Norway to the Mediterranean, thence across Asia as far as Japan and the Himalayas in India, it is mainly a

shrub in the northern situations, but attains a tree form in countries bordering the Mediterranean and the Black Sea, the Himalayas and, remarkable to mention, in England at Box Hill in Surrey, and other places. While the commercial wood is of all the following kinds, British, Mediterranean, Turkish, Abasian, Persian, and Himalayan, yet the main supplies come from the countries bordering on the Black Sea. All these woods will be described under the general heading of European and Asiatic boxwood. How considerable has been the trade in Caucasian and Persian boxwood is seen from the quantities exported to England, France, and Turkey, which are reported in *Trees of Great Britain and Ireland* (Elwes and Henry). From the Caucasus between 1883 and 1887 there was a yearly average of 2340 tons, and from Persia in 1906, 1560 tons. Since 1890 the Caucasian trade has diminished, and in 1895 the total export had fallen to 1200 tons.

In addition to these European and Asiatic varieties genuine boxwood of another kind, the product of *Buxus Macowani* (*q.v.*) comes from South-west Africa and is known as African or East London boxwood. This name is also given to the dangerously poisonous wood of another South African tree, *Gonioma Kamassi* E. Mey, also known as Knysna boxwood (*q.v.*) and Kamassi wood. Other so-called boxwoods, which are not products of *Buxus* and lack some of the qualities of true boxwood, are the West African, West Indian, Ceylon, and Australian boxwoods. Of these the West Indian is the only variety which has yet occupied any important place in commercial usage.

The wood is light yellow, very hard and heavy, of dense, most uniform texture, and very fine grain. This unique and homogeneous wood has, when fully seasoned, the further valuable property of non-splitting, and of yielding a fine surface when turned or planed. It has, therefore, special uses in the manufacture of wood-engraving blocks, rulers, mathematical instruments, handles of tools, planes, shuttles, wood wind instruments, combs, and inlay work. During the European war, although many other descriptions of wood were tried, boxwood alone was found capable of resisting the great strain of hammering the load into shells, and was so used in the form of what are termed " punners " or " stemming rods." These are circular rods $1\frac{1}{4}$ inches in diameter, and varying in length from 14 inches to about 3 feet. The rod is struck by hand with a mallet with considerable force. Of the different varieties used the British and African (*Buxus Macowani*) have proved to be the strongest. The West Indian has given fairly satisfactory results, but although less wasteful in conversion, has not proved so strong.

In some cases the trees exhibit loose growth, and the wood in drying splits spirally. Exposed to damp, it is very liable to deteriorate, undergoing discoloration and a form of decay. During seasoning it is very apt

to split. For this reason large logs are sometimes quartered, or the square log is cut down the middle of its four faces. In France, according to Bouverie (*Les Bois Industrielles*, Paris, 1910), special precautions are taken to prevent splitting, the wood being either stored during seasoning in a dark room or cellar until ready for use, or immersed for twenty-four hours in cold water, in which it is afterwards boiled for some time. It is then wiped and dried, and protected from light and air by being kept in sand or bran.

About a hundred years ago, the workmen in Scottish factories where shuttles were made, kept the wood stored for two years in dry pits slightly below the level of the ground, and covered with dry straw or hay. When they were ready to use it, it was steamed for about twenty-four hours in a steam chest, and was then roughed out to approximately the size required, after which it was found to stand perfectly.

The result of these natural defects is that the trade in boxwood is very speculative. For instance, before the war, if a block of boxwood were split, it would sink in value from £60 to £4 per ton.

Abasian boxwood for wood engraving purposes for the best work is perhaps the sole kind for which a satisfactory substitute cannot be found. Formerly pieces of boxwood found unsuitable for engraving were utilised in the manufacture of various articles, including shuttles, but the introduction from the United States of persimmon and cornel wood, which are adequate substitutes in the weaving trade, has caused a heavy decline in the demand for Abasian and Persian wood. The sawdust is used for cleaning jewellery, and is much in request since the war, realising as much as £9 and more per ton.

The transverse grain reveals with the aid of the lens very little structure. The tree grows very slowly, so that the annual rings are narrow and more or less inclined to be sinuous, and though recognisable to the naked eye, are not very sharply marked. The medullary rays are so fine as to be only just visible; sometimes, indeed, they are invisible to the naked eye in transverse section. The pores are so minute, that even with a lens the wood might be mistaken by a novice for a very hard, coniferous wood.

BOXWOOD. *Eucalyptus goniocalyx* F. v. M.
Weight 54 lbs. (Baker). Tasmania, South-eastern Australia.

Known as mountain gum, grey box, blue gum.

The colour is a pale whitish-yellow, and the grain very hard, tough, and straight, reported as being very durable.

The wood is used for a variety of purposes in its native country, but has not been exported on a commercial scale.

BOXWOOD, AFRICAN. *Buxus Macowani* Oliv.
Weight 54 lbs. 11 oz. South Africa.

An alternative name, which is sometimes used, is East London boxwood.

The colour is a bright yellow, very similar to the Turkish variety, but a little brighter, and with a slight tendency to be flecked with small black marks. The wood is firm, dense, hard, and very strong, and compares favourably with the Turkish. It is imported in logs ranging from 3 to 20 feet in length and 1¼ to 9 inches in diameter, with a few larger pieces. The timber is available in apparently unlimited quantities. It is slightly more wasteful in conversion than the other kinds, as it develops small faulty places, knots, and wens. It stands well, and is not so liable to split in the log, as either the Persian or West Indian wood. It is desirable, however, that the same care should be taken in storage as with other kinds of boxwoods.

The structure of the wood most resembles that of the British, with which it compares favourably. The medullary rays are slightly less noticeable and numerous.

BOXWOOD, BUFF. *Celastrus dispermus*
C. bilocularis.
Weight 52 lbs. (Swain). Queensland, New South Wales.

Known as orangebark in Queensland, and yellowbark in N.S.W. It is reported by Swain to be " ivory-toned, plain and unfigured, except for a minute silver-grain on the quarter " ; tough, non-aromatic, close, even, and straight in grain, easy to work, takes stain readily, and is capable of a high polish.

Suitable for turnery, also woodcuts for printing, very fine engravings being made on the end grain ; makes an excellent flooring. Possesses considerable strength and durability and is free from borers.

BOXWOOD, EUROPEAN and **ASIATIC.** *Buxus sempervirens* Linn.

(*a*) **BRITISH.** Weight 70 lbs.—This can be obtained in diameters from 1 inch to about 4 inches, with a few larger pieces which measure perhaps up to about 7 inches. The intrinsic quality of the wood compares favourably with the best known Abasian, and it seems probable that its present unfavourable reputation is largely due to want of care in the manner in which it is harvested. It is important that it should only be cut down during the month of January. Immediately after the felling of the trees, the wood should be placed in a dry pit a little below the level of the ground,

and covered with dry straw. If possible it should remain in this position for two years before use. It should then be removed only as required, and in no circumstances should it be taken into a hot work-room and be allowed to remain there for even a few hours. It should then be shaped roughly to the required pattern and placed in a steam box, and thoroughly steamed. After this process it can be used for the most difficult work without fear of splitting. It is whiter than the other sorts, and a little more liable to a bluish discoloration. In the early part of the eighteenth century British boxwood was in great demand. Elwes and Henry mention that as much had been cut down at Box Hill within a few years (of A.D. 1712) as amounted in value to £3000. Now, however, the report says that only £1 per ton can be obtained, and " even at that low price no one seems to want it." Since the war it has been more in request, and it is to be hoped that in the future its undoubted value may be recognised once more and greater care taken in its preservation and use. Holtzapffel says : " It is more curly in growth than the Turkey boxwood . . . preferred by brassfinishers for their lathe-chucks, as it is tougher than the foreign box, and bears rougher usage."

(*b*) **ABASIAN.**—This wood is unrivalled for use in the making of engraving blocks, for which purpose the diameters required are 4½ inches and upwards (formerly the minimum demanded was 6 inches, but the tendency has been to reduce this). Curiously enough, this most costly boxwood is demanded for printing on the cheap paper used in the thousands of illustrated catalogues now issued so extensively from shops. Cheaper boxwood, such as Persian, would produce a blurred illustration on a cheap paper, and it is found more economical to use poor paper and good boxwood, than the reverse. It is imported in clean, straight, round pieces from about 2 inches up to 8 inches, though it is sometimes received in larger dimensions : it is generally very sound and free from defects. The price of good average parcels of Abasian boxwood before the war was from £15 to £20 per ton. Specially selected pieces, however, were sold at as high as £50 to £55 per ton ; on the other hand, a good deal of the small split wood was sold at from £5 to £7 : 10s. per ton. For a wood which is so slowly grown and is of such a close texture, the shrinkage in seasoning is considerable. A test case showed that on the radial growth the shrinkage in drying, measured on a diameter of 1¼ inches, amounted to $\frac{1}{16}$ inch, but on the tangential growth it was as much as $\frac{1}{16}$ inch.

(*c*) **JAPANESE.** *Buxus sempervirens* Linn, var. *japonica*.—In Japan, boxwood, or asame-tsuge which is the Japanese name, is used for the best kind of engraving, but cherry (*Prunus Pseudo-cerasus* Lindl. var. *spontanea*), of which the native name is yama-zakura, is also used, as it is more plentiful and less costly than boxwood.

BOXWOOD, INDIAN. *Buxus sempervirens* Linn.

Weight 54–60 lbs. (Gamble). India, Burma, Ceylon.

VERN—*Shanda laghúne*, Afgh.—*Chikri*, Kashmir—*Papri, papar, paprang, shamshad, shumaj*, Pb.—*Shibsashin*, Byans.

The true boxwood flourishes in Northern India, and, according to Gamble, " attaining over 5 feet in girth, while trees of over 3 feet in girth are not uncommon, but the growth is usually very slow."

The wood apparently is practically the same as that which is grown in Europe, but the cost of transport now prohibits its export. Gamble quotes shipments made in 1880 realising £30 per ton ; in 1882, £15 per ton ; in 1884, £20 per ton. Some sent from Naini Tal in 1880–81 realised £30 per ton. He also says, " the cost of extraction and freight come to about £10 per ton." The competition of other woods which have been imported, even including import of Gardenia species, has prohibited any further export of true Indian boxwood.

For trade purposes the term " boxwood " has been used for any wood of a whitish-yellow colour, hard and close in the grain, possessing what might be termed " boxwood " qualities, but not necessarily of the same botanical species. After the war the supplies of boxwood of the ordinary kinds had been used up, and prices rose to a very high level. Shipments were then made from India, consisting of small-sized logs of East Indian satinwood (*Chloroxylon Swietenia*), and two varieties of Gardenia sp., viz. *Gardenia latifolia* and *G. turgida* ; in appearance the wood of these two is similar.

Another Indian wood known as " Ceylon " boxwood is the produce of *Canthium didymum*.

The pores (*Buxus sempervirens*) are exceedingly small and are only discernible under the lens. The medullary rays are very fine and numerous.

BOXWOOD, KNYSNA. *Gonioma Kamassi* E. Mey.

Weight 52 lbs. 8 oz. Africa.

The wood is a reddish-brown, rather deeper in colour than that of other boxwoods ; it is sometimes stained a browner tint towards the sap edges. Of recent years a considerable quantity has been imported, in straight, clean, well-grown logs, in diameters varying from 5 to 12 inches, and sometimes a little more, many of the butts being fluted ; it converts into sound, clean pieces of good lengths. It is favourably reported on for many purposes for which other boxwoods are used, but it causes some trouble to those who work it. Either the dust or some other objectionable quality inflames the nose and eyes, and causes feverish symptoms. The workmen seem to recover quickly and are not attacked a second time,

although there is always a certain tendency to inflammation of the eyes.

In growth and characteristics it resembles the West Indian boxwood, except that the medullary rays are straight and not wavy.

BOXWOOD, WEST INDIAN. *Casearia praecox* Gris.

Weight 59 lbs. West Indies, Venezuela, Colombia.

VERN—*Zapatero, sapatero, naranjillo, lima, limoncillo,* Venez.—*West Indian, Venezuelan,* or *Maracaibo boxwood,* Trade, gen.—*India boxwood,* Eu. trade—*Buis d'Amérique,* Fr

The West Indian so-called boxwood, known also as Maracaibo boxwood, has been generally supposed to be produced by *Tecoma pentaphylla* (see Stone and others), but Professor Record states that this is a mistake, and that the wood sold under these names is *Casearia praecox.*

The colour is yellowish-white, rather brighter than that of the Turkish or British boxwood. The grain is close, firm, and smooth. It is a beautifully grown wood, the trees often attaining the height of 70 feet, practically free from a single knot throughout its length. At the extreme top, the tree branches out into a tuft of foliage Large supplies are available within easy reach of the shipping ports. It is generally shipped cut into lengths of 7 feet or 2 metres and from about 6 to 14 inches diameter, while occasionally there are larger pieces. This variety of boxwood is the only one for which the world's demand is increasing. In France and Germany, besides other uses, it is extensively employed for making small combs. In this country it is used for inlay work and banding in cabinets, and for marquetry ; for handles of all kinds of tools, brush backs, mathematical instruments and rules, barometer backs, and many kinds of turned work, but it is not sufficiently strong and tough to be satisfactory for shuttles. It is sometimes stained and used as a black wood, for which it is very satisfactory. A very large quantity was consumed during the war for making " punners " or ramming rods for loading high-explosive shells, for which work it possessed the necessary tensile strength to make it very satisfactory.

It is liable to become rather discoloured or blue-stained if kept long in the log. The desirable method of storing this wood is to have the logs sawn up the middle and cross-piled in an airy position, or even in the open, with the bark or round side up. It is a great mistake to store it in cellars or damp, airless places, and it should never be removed from one position to another while seasoning.

The pores are exceedingly small and ill-defined, the growth being very dense. The medullary rays are very fine, close, and parallel, but wavy and ribbed.

BOXWOOD, YELLOW. *Sideroxylon Pohlmanianum.*
Weight 58 lbs. (Swain). Queensland.

According to Swain the colour of this wood is a rich creamy yellow; texture extremely close and even, non-fissile, compact, tough and firm, easy to work. It is suitable for all the purposes for which the boxwoods of commerce are used, including engraving blocks.

BRAZIL-WOOD. *Caesalpinia echinata* Lam.
" Eastern Brazil from the vicinity of Bahia southwards " (Record).

VERN—*Brazilwood, Pernambuco, Fernambuco, Pará,* or *Bahia wood, peachwood,* Trade—*Fernambukholz, brasilienholz,* Germ.—*Brésil,* Fr—*Palo brasil,* Sp.—*Legno del Brasile, legno rosso, legno di Santa Marta, fernambucco, pernambucco, verzino,* Ital—*Páo brasil, ibiri pitanga, ymirá piranga,* Braz.

This is the true brazil-wood, but more than one botanical species bearing this name having been supplied, much confusion has resulted. Holtzapffel gives brazil-wood as above, sapan wood as *C. sapan*, and brazilletto as *C. brazilensis*. Messrs. J. Gardner & Sons, who probably have the best available information at present, say that brazil, brazilletto, and Pernambuco wood have always been regarded as the same.

The wood of these varieties is of a rich, bright-red colour, and is mostly used as a dyewood, while the best pieces are selected for turning and for violin bows. For this last purpose, although many different kinds of timber have been tried, there is nothing that will yield the same result as the Pernambuco or brazil-wood, and many players will use no other kind on account of the peculiarly strong, resilient spring only to be found in this wood. When planed it has a bright, metallic, lustrous surface, and shows fine, snake-like ripple marks.

A fairly satisfactory substitute has been found in tapang (*q.v.*), a Borneo wood. Although much lighter in colour, it resembles brazil-wood in many respects, even possessing the same ripple marks.

BRIAR-ROOT. *Erica arborea* Linn.
Southern Europe.

The briar-root, universally known because of the familiar pipe, and immortalised by the numberless odes which have been written to the *briar*, is not, as commonly supposed, the rose briar, but the wood of a heath which is common to Southern Europe and Algeria; originally only supplied from the South of France, but of later years more largely from Algeria, or Northern Africa.

The name is a corruption of the French *bruyère* (heath). This heath provides one more of the remarkable illustrations of how Nature has

provided us with one wood, which surpasses all others, for a particular purpose for which we require it, because, in spite of world-wide efforts to find a suitable wood from which to make tobacco pipes, there is nothing comparable with the wood of *erica arborea*.

I have a specimen from a tree grown at Powerscourt Castle in Ireland, the wood of which is a bright yellow colour, with a very close, hard, dense grain, much lighter in colour than the appearance of the usual root wood, showing the medullary rays in small flecks on the radial section.

The numerous, tiny pores are open, varying in size from very small to minute, with strong, bright, thick medullary rays not numerous, not continuous, which show faintly on the radial section.

Bridelia retusa Spreng.

Weight 52 lbs. India, Burma, Ceylon.

VERN—*Pathor, mark,* Pb—*Khaja, kassi, gauli,* Hind—*Gaya, dhaulo, gauli,* Garhwal—*Katganja, kulgaya,* Kumaon—*Ekdania,* Saharanpur—*Karjara,* Jeypore—*Lamkana,* Ajinere—*Angnera,* Banswara—*Asana, asauna, kanta, kanchi,* Mar—*Geio,* Nep—*Pengji,* Lepcha—*Nanda,* Rajbanshi—*Katabuchi,* Mechi—*Kashi,* Gáro—*Kamkúi,* Chittagong—*Kosi,* Uriya—*Káj,* Monghyr—*Kadurpala,* Sonthal—*Kharaka, kaka,* Kól—*Karika,* Bhumij—*Kanj, kaji,* Kharwar—*Kosi, rugendi,* Khond—*Anepu,* Palkonda—*Anap,* Reddi—*Mulu-vengay, kamanji, mullu-maruthu,* Tam.—*Koramau, dudi maddi, koramadi, duriamadi, kodari, bonta yepi,* Tel.—*Kassei,* Gondi—*Karka,* Kurku—*Gunjan, kati ain,* Mar—Bhil, *Asuna, goje, mulla honné, guorgi,* Kan.—*Mullangayum,* Mal.—*Adamarathu,* Tinnevelly—*Seikchi,* Burm.—*Keta kala,* Cingh.

This is a dull, pale, greyish-brown wood which is very much like American butternut. The grain is close and fairly firm, but it is rough, and does not clean up nicely from the tool. Gamble says that it stands well under water. The growth of the concentric layers is rather irregular, and this in conjunction with a rather coarse grain, is probably the cause of its liability to warp and twist in drying.

The concentric layers are well defined, and are marked by dark- and light-shaded lines quite apparent to the naked eye. The pores are small and are disposed in groups between the fine, thread-like, parallel medullary rays.

Bruguiera gymnorhiza Lank.

Weight 61 lbs. (Pearson & Brown). India, Burma, Andamans.

VERN—*Kakra, kankra,* Beng.—*Thuddu ponna, wurrurada,* Tel.—*Sigappu kakandan,* Tam.

Pearson and Brown, in *Commercial Timbers of India,* report this wood to be " uniform light red to red when first exposed, ageing to reddish-brown . . . straight-grained, even and fine-textured. . . . The timber is

durable . . . very hard. . . . It can be classed as a heavy construction timber, and might possibly also be suitable for tool handles."

BRUINHART or **BROWNHEART.**

See ACAPU.

BRUSH-BOX. *Tristania conferta* R. Br.

Weight 60 lbs. Northern Australia to New South Wales.

For the first time (1930) this timber has appeared in the markets of the United Kingdom. The colour is a reddish-yellow, with a hard, firm texture, but not smooth on account of the contrary hard and soft layers which make the working costly. Baker reports it as " one of the best hardwoods for mallets . . . carriage and wheelwrights' work . . . wharf superstructure . . . wedges . . . said to resist the attack of white ants." The Forestry Commission, N.S.W., report that " owing to its toughness it is used for . . . chisel-handles, planes, etc." It is to be tried in England for pier sides and general planking, camp sheeting, capping, etc.

The pores are very numerous, from very small to medium size, mostly plugged, with exceedingly fine medullary rays, hardly discernible under the lens.

BUA BUA. *Guettarda speciosa* L.

Indo-Malayan region.

VERN—*Ketapang-ketek*, Malay—*Seacoast teak.*

The colour is yellow with a red tinge, the wood is very durable, said to last forty years in the ground, works well, and is a good furniture wood.

" Pores small, often in radial lines. Pith-rays moderately broad and very fine " (Foxworthy).

BUBINGA. *Brachystegia* sp. ?

Weight 47–48 lbs. Western Africa.

Ever since the establishment of the import of West African mahogany into England, one or two logs have been seen of a wood which until lately had no regular name. At one time it might be called furniture wood, at another African rosewood, and in England only just lately (1930) has the wood been identified as bubinga.

In colour and figure it closely resembles that of the Andaman and Burma padauk, sometimes with the Andaman characteristics, and at others the Burma. The grain is hard, close, works well, and is capable of a fine surface from the tool, standing well under all conditions. The logs are mostly figured, containing generally a narrow or broader stripe, caused by layers of hard and soft growth, and often very strong broken roe and splash mottle, and all those classes of figure, including the dark streaks,

which are met with in the padauks. The dark streaks are ornamental, and not detrimental to the wood, *i.e.* they do not deteriorate into shakes, in the same way as those which are commonly called gum streaks in mahogany, etc.

Individual specimens when polished so closely resemble individual specimens of Andaman padauk that a superficial examination would not be sufficient to enable, even the expert, to pronounce which was which The merits of this wood are so great that its failure to create universal demand is another illustration of the conservatism which prevents people taking advantage of beautiful woods, just because they have never heard of them before.

In a note in *Tropical Woods*, No. 3, published in 1925, Professor Record quotes Chevalier, who states that " bubingà, imported into Europe under the name of ' faux bois de rose du Congo,' for use in cabinet work, originates in the Fernan-Vaz region, where the trees attain a height of 80 to 100 feet, with trunks 24 to 32 inches in diameter, and free of limbs for upward of 65 feet." He describes the wood as follows : " Bois d'un beau rouge amarante, avec des zones longitudinales plus foncées, dense Aubier d'un blanc rougeâtre, assais épais. D O 851." " The tree is classified as *Brachystegia* sp. ? "

In the same article Record claims a resemblance to Brazilian tulip-wood, but it would appear that on a further examination he negatived this opinion

The pores are scarce, irregularly placed, fairly uniform in size, some completely open, while a few are plugged. The medullary ray is very strongly marked, clean-cut, and crossed at right angles by very fine bands of similar light-coloured rings, at irregular intervals.

Buchanania latifolia Roxb.

Weight 31–36 lbs. (Gamble). India, Burma.

VERN—*Chirauli*, Pb.—*Piál, payála, muriá, katbhilawa*, Garhwal—*Piár, peirah, perua*, Oudh—*Achár, chár, chironji*, C P.—*Saraka, herka*, Gondi—*Taro*, Kurku—*Charu*, Uriya—*Paróp*, Sonthal—*Char*, Merwara—*Kat maá, aima, morála*, Tam.—*Chara, chinna moral morli*, Tel.—*Charwari*, Hyderabad—*Nurkul, murkalu*, Kan — *Sir*, Bhíl—*Pyal, charoli*, Bombay—*Jaru mamidi*, Palkonda—*Tarúm*, Kól—*Piál*, Bhumij—*Peea*, Kharwar—*Múngapera*, Mal — *Mora kangi, múra*, Trav. Hills—*Lônbo, thitsiba*, Burm.

An inferior soft wood of a dirty brownish-grey colour, with a grain somewhat similar to that of balsa wood. Liable to attack by a large-sized beetle, boring a hole more than $\frac{1}{8}$ inch in diameter. The wood is of little importance.

The pores, which are very regular in size and position, are evenly distributed, but very scarce ; the medullary rays somewhat coarse, but very numerous.

BUCKEYE, OHIO. *Aesculus octandra* Marsh
Ae. glabra Willd.
Weight 28 lbs. (Hough). Eastern United States.

The timber of this tree, which is very similar to the English horse-chestnut, is probably the mixed product of *Aesculus octandra*, *Ae. glabra*, and perhaps also of *Ae. octandra hybrida*. Apparently this tree was favourably considered by the horticultural world a hundred years ago, as specimens may be seen which were planted about that time in various parts of the country, and especially in public and private gardens around London.

It is not known commercially in the United Kingdom, but it is in considerable use in America, for the same purposes for which horse-chestnut is in demand in this country. Gibson says: "Many an Ohio statesman of former times boasted that as a baby he was rocked in a buckeye sugar trough for a cradle." The same authority also mentions the use of this wood by the makers of artificial limbs, who consider it one of their best materials.

Bucklandia populnea R. Br.
Weight 42–43 lbs. India.
VERN—*Pipli*, Nep—*Sindliang*, Lepcha—*Dingdah*, Khasia.

The colour is a nut-brown, with innumerable tiny specks of shining gum, and a grain resembling kauri pine or New Zealand rimu. It is reported as being in considerable demand in Darjeeling for door and window frames, for which purpose the wood is undoubtedly suitable.

The innumerable tiny pores are mostly open, and lie between faint medullary rays difficult to distinguish under the lens.

BULL OAK. *Casuarina Leuhmanni* R. T. B.
Weight 74½ lbs. (Baker). Australia.

The colour of this wood is a very rich, deep red plum, with a very hard, close grain, taking a fine polish. It displays very large and thick medullary rays on the radial section, resembling shee oak, but with a larger pattern.

The exceedingly numerous, minute to small pores, mostly plugged, are crowded between the exceptionally wide, very wavy medullary rays.

BULLET TREE. *Terminalia Buceras* L.
Weight 57–58 lbs. British Honduras, West Indies, Central America.
VERN—*Black olive tree*, Fla—*Júcaro, júcaro de playa*, Cuba—*Búcaro, ucar*, P.R.—*Pucté, pukté*, Mex.

According to Record this timber is known in Cuba as jucaro, and used locally for a great variety of purposes, where strength and durability are required. The wood is a brown-grey colour, with a very close grain,

capable of a smooth surface from the tool. The trees, according to Record, attain a height of 70 feet with 30 to 40 feet clear of limbs, and a diameter up to 26 inches; but the specimen which has been sent to me shows a maximum width of only about 8 inches, and possesses no quality sufficient to make it attractive for the export market.

The small pores are regular in size and position, mostly plugged, with strongly defined wavy medullary rays, following parallel lines, and crossed at irregular intervals by similar white lines, which may or may not denote the annual layers.

BULLET WOOD. *Humiria floribunda* Mart.

Weight 53–57 lbs. (Record). Tropical America.

VERN—*Bastard bullet wood, bastard bully, towanero, tauronıro, tourameıra, hoorıhee, hoorıhea, hurıhí,* Br. G.—*Houmırí, boume houmırí, houmırí boumıer, boıs rouge tısane, boıs rouge, boıs d'encens, turı, racıne, gommıer de montagne, boıs à flambeau, trıane, omıry, homıry, umıry, umırı balsamo, couranoura, caramura, arbre à brai, toweroenıerou,* Fr. G.—*Umırı, umıry, umıry de cheıro, umıry de casca cheıro, couramıra, turamıra, tourameıra, nıerı,* Braz.

Known as "bastard bullet tree," and used locally for all those constructional purposes which require a strong, durable wood. Not generally known in commerce.

Bursera serrata Colebr.

Weight 46 lbs. India, Burma, The Andaman Islands.

VERN—*Murtenga,* Ass—*Soruputrı moı,* Uriya—*Urmú,* Sonthal—*Sarı,* Mal Paharı—*Saradı,* Khond—*Chıtreka,* Tel—*Thadı, yıtpadı,* Burm

The wood is of a dull reddish-brown, about midway between the colour of teak and mahogany, with a close, even texture, a straight grain, and rather a shiny surface, which becomes quite smooth from the tool. It should be useful for furniture and general cabinet work, and would make a good substitute for mahogany.

It was chosen as the best material for carving a handsome mirror frame, a copy of a fine old model, for the exhibit of the Government of India, at the Empire Timber Exhibition in London in 1920. The craftsman, an excellent carver, considered it to be one of the finest woods for carving. As only fresh shipped logs were available, the best results could hardly be expected. The wood has stood the unfair test admirably. It would be suitable for any fine decorative work, and especially for chairs of a high-class character.

The concentric layers are marked by light, thin bands. The pores are very small, numerous, and regular. The medullary rays are exceedingly fine and small, and are only just visible with the lens (+12).

Butea frondosa Roxb.

Weight 36–42 lbs. (Gamble). India, Burma, Ceylon.

VERN—*Dhák, phulla,* Kashmir—*Dhák, palás, kakria, kankrei, chichra,* Hind.—*Chalcha,* Bandelkhand—*Chiúla, puroha,* C.P.—*Palás,* Beng—*Palási, bulyettra,* Nep.—*Lahokúng, porásu,* Uriya—*Palashu,* Mechi—*Murút,* Kól—*Pharsa,* Baigas—*Parás, farás,* Behar—*Murúp,* Sonthal—*Chora, shora, khakra, kankra,* Merwara—*Murr,* Gondi—*Pharsa,* Kurku—*Porasan, parasu,* Tam.—*Modugu, mohtu,* Tel.—*Muttuga, thorás, muttala,* Kan—*Parás, phulás, gas-kéla,* Mar.—*Phullas kakria,* Guz—*Palásin samatha,* Mal.—*Pupalásu,* Trav. Hills—*Gas-kála,* Cingh.—*Pauk, pawpan, shanggan, mai-kao, flame of the forest,* Burm.

To those who have seen this tree in all its beauty displaying a blaze of brilliant orange-scarlet flowers, it seems almost unfair to report on the wood it produces, especially as it is of very little account. It has a soft, woolly grain, incapable of a smooth surface, except by dint of unusual exertion, and the wood is not one which can be recommended for any but the commonest uses.

The radial section displays a very unusual and remarkable pattern. A very few pores are regularly and evenly scattered over the surface, and give an impression rather of worm-holes, than of pores in the wood; they are also strangely arranged in a pattern not unlike that of the pointer stars. The medullary rays are coarse and numerous, and crossed at right angles by smaller light-coloured lines, the whole forming a pretty pattern like that of the scales of the snake.

BUTTERNUT. *Juglans cinerea* Linn.

Weight 25 lbs. North America.

This wood, apart from its colour, which is a yellowish-grey, resembles black walnut, *Juglans nigra* (*q.v.*), in all respects. Some years ago it formed a regular supply in the United Kingdom, but latterly this has been discontinued. It does not appear likely that it will play any important part in the supplies of the future.

CABBAGE BARK. *Andira inermis* H. B. K.

Weight 46 lbs. British Honduras, West Indies, Central and South America.

VERN—*Cabbage-bark tree, bastard cabbage, tree cabbage, wild olive, dog almond, wormbark, angelim, partridge wood, pheasant wood,* Eng.

This strange-looking wood has the colour of Honduras mahogany, with a very peculiar rough grain, more suggestive of a palm growth than that of ordinary wood. A very sharp plane is required to secure even a moderately smooth surface, and even then a fine ridgy effect is produced by the very close, and yet obstinate, contrary grain.

Dark wavy belts of growth, crossed by very definite fine and strong medullary rays, show on the transverse section, in what is perhaps the prettiest pattern it is possible to obtain. On this section the pores show as solid, although marked, but on the tangential section they show as open and sometimes filled.

CABILMA or **CABIRMA.** *Cedrela angustifolia* Moc. & Sesse (?).
San Domingo.

This little-known timber from San Domingo is very similar to mahogany from the same region, and resembles it both in weight and texture; it is browner, though not of the same brown tint as sabicu. It has been and is still rarely imported, but would be useful for high-class chairs, as it is strong and durable, and stands well when thoroughly seasoned. (My tentative reference of this wood to the member of the mahogany family, *Cedrela angustifolia*, rests on the authority of a correspondent from San Domingo.)

CABO DE JUCHO. Source unknown.
Weight 49 lbs. Brazil.

This is a close-grained, dense wood of the colour of boxwood (*Buxus sempervirens*), and liable to have bluish streaks of stain.

Record speaks of a timber Cabo de hacha, *Trichilia alta* Blake, which is probably the same, although his description gives it as light reddish-brown.

CALIGOA. Source unknown.
Weight 59 lbs. Brazil.

This wood is a nut-brown colour, with dark irregular lines showing on the tangential surface. The medullary rays show in exceedingly fine flecks on the radial section. My small specimen contains a fine pin worm-hole, which suggests that the wood is liable to this defect.

The pores are very small and numerous. The medullary rays are very fine and rather obscure.

CALOPHYLLUM SPP.

India, Burma, The Andaman Islands.

C. Inophyllum Linn.
Weight 39–40 lbs.

VERN—*Sultana champa*, Hind., Beng.—*Pinnay, punnai*, Tam.—*Poonang*, Uriya—*Undi*, Mar.—*Wúma, hona, pinekai*, Kan —*Púna, púnás*, Tel.—*Domba, tel-domba*, Cingh.—*Pônnyet*, Burm.—*Bintangor, penaga laut*, Malay.

C. tomentosum Wight.

Weight 42–43 lbs.

VERN—*Poon, poone,* Mal.—*Pongu, malampunna,* Tam.—*Nagari,* Mar.—*Surhoni, siri, poone, kuve, bobbi,* Kan.—*Punnapay,* Mal.—*Viri,* Trav. Hills—*Kina,* Cingh.

C. spectabile Willd.

Weight 38–39 lbs. (Gamble).

VERN—*Pantaga,* Burm.—*Dakar táládá,* And.—*Lal chuni,* Hind. (from Andamans)—*Domba-kina,* Cingh.

The above three species have been produced on a commercial scale during the last few years (1931). The result of a careful examination fails to reveal sufficient differences to warrant their being treated commercially as different timbers. A further variety in Ceylon is *C. Burmanni* Wight, but no commercial experiment has yet been made in England with the produce of this wood.

C. Inophyllum.—This is the Alexandrian laurel. According to Pearson and Brown in *Commercial Timbers of India,* this timber is known by the name of Poon, as also is that of *C. tomentosum.* Of a rather dark reddish-brown mahogany colour, generally with handsome wavy grain, with a firm, close, compact texture, perhaps slightly harder and denser than the wood of *C. tomentosum.* Some very handsome panelling has been made, which bears an attractive appearance similar to mahogany, but having a characteristic all its own. It finishes and polishes well from the tool, and has been greatly admired. Gamble's report of it as being " valuable for some purposes in shipbuilding," and that of Kurz, as being " good for masts, spars, railway sleepers, machinery, etc.," do not give the wood sufficient credit. Gamble is better advised when he quotes Sebert in *Les Bois de la Nouvelle Calédonie,* who says that it is a " magnificent wood for cabinet-maker's work." In the panelled work referred to above, the produce of *C. tomentosum* was also introduced, and it was found impossible to identify the one from the other.

The pores are small and irregular, and joined together by wavy bands of loose tissue. The medullary rays are very fine and numerous, rather indistinct, and show on the radial section in minute flecks.

C. tomentosum.—This is the timber which gives the poon spar of commerce, but for which there appears to be now little or no demand. Mr. D. A. Thomson, late of the Indian Forest Service, informed me that formerly the Moors used to come across to select poon spars for their dhows, and the price to be paid by them was determined by placing rupees along the length of the spar, the number necessary to reach from end to end being the price that was paid. In India the wood is used for building and bridge work. In England it has been employed in those works for which mahogany is generally used. Some shipments of logs in

the round, boards and planks, have been received, the last from the Mysore district, mostly securing fair prices, and having given satisfaction.

The pores are very variable in size, they appear in groups, sometimes joined together. There are distinct concentric lines of loose tissue appearing at wide intervals. The exceedingly fine and numerous medullary rays are scarcely discernible.

C. spectabile.—A small shipment of this wood secured attention and gave satisfaction in use, resembling very closely the qualities and appearance of the two foregoing varieties.

The pores in this wood are rather larger and more evenly distributed. The medullary rays are difficult to discern.

C. Wightianum.—No commercial use of this wood has been noted. For identification see *C. Inophyllum.*

C. Burmanni.—No commercial use of this wood has been noted.

The pores are scarce, mostly plugged, irregularly placed in belts, with numerous faint medullary rays.

CAMASSARY. Source unknown.
Weight 64 lbs. Brazil.

The specimen rather resembles Barba timao (*q.v.*), though it has a more reddish tint. The surface is very smooth.

The pores are very variable in size and much scattered, they are interspersed with wavy bands of loose tissue. The medullary rays are faint and indistinct. Dark lines mark the concentric layers.

CAMASSARY DE CARUNXO. Source unknown.
Weight 71 lbs. Brazil.

The specimen suggests that it is a small tree, and that it is of little importance commercially. It is similar to the foregoing (Camassary) but is slightly darker, and is streaked with dark brown. It appears to agree with the " camasey " reported by Record as Miconia.

The pores are small and are generally joined in fours and fives. The medullary rays are so faint as to be almost indistinguishable.

CAMPHOR, EAST AFRICAN.
See *Ocotea usambarensis.*

CAMPHOR, NEPAL. *Cinnamomum glanduliferum* Meissn.
India.

VERN—*Malligiri, marisgiri,* Nep.

Reported as a strong, brown-coloured, durable wood.

CAMPHOR-WOOD. (True Camphor.) *Cinnamomum Camphora* Nees & Ebern.
Laurus Camphora Linn.

Weight 40 lbs. 11 oz. China, Formosa, Japan.

The wood is of a light yellow-brown colour, with dark and light streaks, and has a fairly hard texture ; also it has a very strong scent of camphor, which is persistent even after hundreds of years. There is very little demand for the wood and it is extremely difficult to obtain. In 1911 a large shipment was imported, but it was afterwards discovered that 75 per cent of the planks were of the cinnamon tree, probably *Cinnamomum zeylanicum* Breyn, which warps, twists, shrinks, and swells , however long it may be kept, it has a strong scent of paregoric, or balm of aniseed, and is altogether inferior to camphor-wood, but can easily be mistaken for it. The well-known seamen's trunks which have been made in China, and sold even to-day in the Eastern bazaars, are passed off as being entirely constructed of camphor-wood, but the tops, bottoms, and backs are made of this inferior wood, and the remainder only is of the true camphor-wood.

In 1912 Henry John Elwes collected in Formosa some exceptionally fine burrs of very large size, ranging up to 4 feet square, very handsomely figured, quite unique, unlike anything seen before or since.

Some fine quality Formosan camphor-wood was displayed at the Japanese Exhibition at the White City, which was slightly less streaky, slightly browner in colour, harder in grain, and of better quality than the usual supplies.

It is very difficult and costly to obtain the wood, and it has been said that capital punishment is the penalty for cutting down the camphor tree throughout China or Formosa.

Pores uniform in size, excepting for irregular large-sized pores which follow the line of concentric layer in the early growth, generally plugged. Medullary rays irregular, parallel, and rather confused, which show faintly on the radial section.

CAMPHOR-WOOD, BORNEO. *Dryobalanops aromatica* Gaert.

Borneo, Sumatra.

VERN—*Kapur barus, Borneo camphor-wood.*

Although Foxworthy refers to some species of *Cinnamomum* in Borneo and the Philippine Islands, the wood known in the United Kingdom as Borneo camphor-wood is considered to be that of *Dryobalanops*. He says : " The Borneo camphor wood is obtained from species of *Dryobalanops*, of the family of *Dipterocarpaceae*, and does not have an odour like camphor, except in the neighbourhood of the camphor deposits." Dr. Hose, who lived in Borneo for many years, says that the natives call the wood " padji," and the name " kapor," which they pronounce " karpaw," was probably introduced by the Malays. He says that the real camphor tree

of Borneo and Sumatra is *Dryobalanops aromatica*, and is known to the Malays as kapor barus, and several species of *Dipterocarpaceae* resembling the camphor tree are usually known as kapor. Kapor-paya is a swamp tree growing in low country, and resembling the swamp variety in every way except in durability. He adds that these timbers continue to shrink more than the timber of *Dryobalanops*, and also that the different varieties of *Dipterocarpaceae* are so numerous and so much alike that they are almost bound to become confused.

The timber is of a dull, light, reddish-brown colour and has gummy pores. It has an aromatic scent, but not that of camphor. After exposure to light and air it darkens somewhat to the colour of teak. Having a hard surface it works with a good finish from the machine plane, in which respect it resembles yang, eng, and gurjun. It has been said that it will not be used by engineers and builders in this country, as the timber is defective, but this cannot be substantiated. The supplies, on the contrary, have been of faultless quality. It is this, and also the fact that large squares and long lengths can be obtained, which gives it its present important position as a useful and much inquired-for timber. As with the other species of *Dipterocarpaceae*, the principal trouble is the difficulty of seasoning it satisfactorily. Boards 1 inch by 4 inches cut for flooring have shrunk with kiln seasoning, after being seasoned previously for six years. The best results have been obtained by air-seasoning for two years or more, and then kiln-drying. The wood contains a kind of gum similar to that of gurjun. Any contact with iron or steel, if all moisture is not excluded, causes an unsightly black stain, and it is not safe, therefore, to use iron nails or screws if the work is to be exposed to damp. In England it appears to be durable in exposed work, but so far sufficient time has not been allowed for any reliable test. In such work the grain does not wear to a ridgy surface as with some hardwoods, and there is not such a marked difference between the soft and hard grain. In this respect it is excellent for floorings. The grain is not fibrous, and its hard but not too slippery surface withstands the wear of shuffling feet or of nailed boots. It is also a valuable timber for general constructional work. One or two authorities in Borneo report it as a good wood for all purposes, and it is much valued in its native country, where, if it were not subject to the attack of white ant, it would be much more extensively used.

The pores are regular in size and position ; the medullary rays are well-defined and parallel.

CAMPHOR-WOOD, FORMOSAN. *Machilus Thunbergii* S. & Z.

Weight 41 lbs. Formosa.

This wood must not be confused with the true camphor of Formosa (*Cinnamomum Camphora*), from which it is very different. It is of a

rather dirty-brown colour, but with a very bright lustrous surface which, with its lighter and darker marking, gives it a pleasing appearance. It possesses a slightly aromatic scent, though not that of camphor, and would be useful as an attractive cabinet or decorative wood, for in colour and appearance it is quite unusual. Mitsui & Co. give its estimated quantity (1920) available as 5,000,000 cubic feet.

The pores are small, very regular in size and position, and very clean and clearly defined. The medullary rays are fine, clearly defined, parallel, and equidistant.

Campnosperma zeylanicum Thw.

Ceylon.

VERN—*Aridda*, Cingh.

The colour of this wood is a dirty yellow-grey, with a very smooth grain, rather soft. Not unlike the New Zealand kauri, though not so hard. Gamble reports it as of little use except for tea-boxes, but from the specimen I have, and that which I have seen in Ceylon, it would seem to contain properties which should make it more valuable for other purposes.

The pores are very numerous, exceedingly small, invariably plugged. The medullary rays minute, scarcely visible under the lens.

CAMWOOD.

See BARWOOD.

CANALETE. *Cordia Gerascanthus* L.

Weight 51 lbs. 13 oz. West Indies, Central America.

VERN—*Bocote, barl*, Mex.—*Pardillo del monte*, Venez.—*Baría, varía, véria negra, véria prieta*, Cuba.

Professor Record, in *Timbers of Tropical America*, gives the source as *Cordia gerascanthoides*, but in a private letter (1931) corrects this and says it should have been given as above. He says the genus Cordia is a very large one, with about 350 species, and it is difficult, if not impossible, to be definite.

The wood is dense and hard, and has been imported in round pieces from 6 to 10 inches in diameter. The heart-wood is of a deep purplish-lilac colour, marked with thin black streaks running with the grain, and having a bright metallic lustre; fairly sound-hearted, free from cuppy shakes, it stands well, and for some purposes is a good substitute for lignum-vitae; also useful for tool and knife handles, turnery and walking-sticks, and the butt ends of billiard cues. The sap-wood, which is from ¾ to 1¾ inches wide and sometimes more, is bright yellow.

The growth is marked by alternate concentric bands in which pores

are more or less numerous. These are invisible, but their position and scattered arrangement are indicated by a white halo surrounding the groups, slightly linking them tangentially. The numerous fine medullary rays are visible to the naked eye by reason of their light colour and sharp lines.

Canarium sikkimense King.

Weight 19 lbs. (Pearson & Brown). India.

VERN—*Goguldhup*, Nep.—*Narock-pa*, Lepcha.

Pearson and Brown, in *Commercial Timbers of India*, report this wood as " White and very lustrous when first exposed, turning grey on exposure . . . straight-grained, even and extremely coarse-textured. . . . A perishable timber if left exposed. . . . Not worth cultivating."

Canarium zeylanicum Bl.

Weight 28 lbs. (Gamble). Ceylon.

VERN—*Pakkilipal*, Tam.—*Kekuna*, Cingh.

The colour is a dirty white-grey, with a rather soft, fine texture, like Indian dhup.

It is reported that the wood contains an abundance of balsamic gum resin, with a fragrant scent, which is not persistent.

The pores are mostly plugged, uniform in size, not very numerous. Medullary rays confused, irregular, showing faintly in minute flecks on the radial section.

CANELLA. *Nectandra* spp.

Weight 40–50 lbs. Brazil.

There is great difficulty in classifying the many varieties of wood known as canella. The Handbook issued by the Ministry of Agriculture (Rio), mentions over twenty different kinds growing in the Brazilian States. Record mentions as the three most noteworthy : Canella parda (*Nectandra amara* Mart.), C. preta (*Nectandra mollis* Meissn.), and C. Sassafraz (*Octoea pretiosa* Nees). The colour appears to vary from pale yellow to a brown so dark as to be almost black. The following two varieties are in my collection.

Canella batalha.—This is a close-grained wood with a bright lustrous sheen, of a rather pale colour resembling satinwood, for which it would form a good substitute. The pores are exceedingly numerous, and are generally plugged. The numerous medullary rays are placed between the pores.

Canella limao.—This is of a dark greyish-brown colour with a lustrous sheen, and a smooth, even texture. It is reported as having medicinal

value for lung complaints. The structure is similar to that of *C. batalha*, though the pores are more scarce.

Canella preta.—*Nectandra mollis* Meissn., of which I have no specimen, is described by the Ministry of Agriculture (Rio) as of some importance, being a first-rate timber for work in damp situations and all kinds of building construction. It is strong, compact, and much used for ceilings and panels.

CANELLA IMBUIA or **EMBUIA.** *Phoebe porosa* Mez.

Weight 43–57 lbs. (Record). Southern Brazil.

VERN—*Imbuia*, Braz.—*Imbuia, embuia, Brazilian walnut*, U S.A.

The colour varies from dark yellow to almost black, with a coarse, even grain, generally plain but sometimes beautifully figured, with a satiny lustre. According to *Tropical Woods*, No. 18, this is one of the best known hardwood timbers of Southern Brazil, used as a substitute for walnut, producing timber that can be found to match any specimen in colour. It works easily, keeps its shape, and is a high-class furniture and cabinet wood. The sawdust is said to cause irritation to the skin of some workmen.

CANGERANA. *Cabralea cangerana* Sald.

Weight 34 lbs. Brazil.

VERN—*Cancharana, canchorono, canchorena, caxarana, cedro macho, cedrora*, Arg—*Cangerana, canterana-mirim, canjarana, cajarana, conjerana-assu, cedro*, Braz.

The wood is straight-grained, and of a bright red mahogany colour, with a wide sap line which is of a bluish-red hue. It resembles the plainer and commoner sorts of South American mahoganies. It is reported as being used in Brazil for doors and windows, and being particularly notable in that it does not shrink, warp, nor bend, which good characteristics are upheld by its appearance and texture.

The pores are small and ill-defined. The medullary rays are not traceable even with the aid of the lens (+ 12).

Canthium didymum Roxb.

Weight 50–57 lbs. (Gamble). India, Ceylon.

VERN—*Tolan, pita koluchia, dhalasingha*, Uriya—*Neckanie, vatchikoran, yerkoli, irambaratthan*, Tam.—*Nalla balasu, nakkani*, Tel.—*Abalu*, Kan.—*Jor*, Kól—*Pita kolaria*, Khond—*Konda, kolinu*, Palkonda—*Atika*, Reddi—*Pana karawu, gal-karanda, pandaru*, Cingh.—*Myauklaung*, Burm.

Gamble says: " In Ceylon, its resemblance to boxwood has caused it to be called Ceylon boxwood. . . . Wood white (Ceylon) or light brown

(India), hard-, close-, and even-grained." It is now rarely seen in England, and indeed has never been procurable except in small quantities. It is well grown ; from 6 to 18 inches in diameter and about 3 feet long. It was used in the past to some extent for engraving, but was not found hard enough to yield good results. On account of its size, large shuttles were made of it, particularly those which were used in the manufacture of silk.

The annual rings are clearly marked by darker coloured wood. The very numerous pores are minute, with also very fine, numerous medullary rays.

CAPE SANDAL.

See *Excoecaria* sp.

Carallia calycina Benth.

Weight 51 lbs. (Gamble). Ceylon.

VERN—*Ubberiya*, Cingh.

The colour of the wood is a light reddish-yellow, with a hard but rather rough grain, liable to split badly. Very similar, and perhaps indistinguishable from *C. integerrima*.

The pores extremely scarce, mostly plugged, always coarse ; large medullary rays which give a strong splash on the radial section.

Carallia integerrima DC., syn. *C. lucida* Roxb.

Weight 46 lbs. India, Burma.

VERN—*Kierpa*, Beng —*Palamkat*, Nep.—*Kujitekra*, Ass —*Júr*, Kól—*Shengali, panasi*, Mar —*Varanga, vallayam*, Mal.—*Karalli*, Tel.—*Andipunar, andamargal*, Kan.—*Punschi*, Bombay—*Dawata*, Cingh.—*Bya*, Arracan.

C. lucida.

VERN—*Maniawga*, Burma.

For some years previous to 1920 there was a small import which consisted of pieces nailed together in the shape of a square open tube, the pieces being used as ventilation pipes for carrying grain cargoes, which are sold on arrival as firewood, to clear the ship. In that year certain shipments were made for Exhibition purposes, and since then there has been a steady, but small, import. The wood is hard and very similar in texture to British-grown live oak, except that it has a strong red colour. The silvery plates of the medullary rays which show on the radial section give a similarity to wainscot oak which is remarkable, and it would make a very handsome panelling. It seasons well and does not warp, but is somewhat liable to crack. The timber should always be cut on the quarter.

The medullary rays are of two kinds, those which are strong and prominent and which cause the silver grain, and the others, very fine and numerous, which lie between these. The pores vary in size and are often subdivided ; they are frequently filled with resin.

Carapa moluccensis Lam.

Weight 41–49 lbs. (Gamble). India, Burma, Ceylon.

VERN—*Poshúr, pussur, dhundul,* Beng.—*Kundalanga, somunthiri,* Tam.—*Pinleon, kyat-hnan, kyana,* Burm.

My specimen came to me under the name of Kyat. In both colour and grain the wood resembles American black walnut, but with rather a purple tinge. It is capable of a very smooth surface from the tool, with an attractive appearance, which renders it suitable for high-class decorative woodwork.

The pores are rather numerous, irregularly placed and very small. The medullary rays exceedingly fine, numerous, and crossed at right angles by well-defined light lines, which may or may not represent concentric layers of growth.

CARCAUNDA. Source unknown.

Weight 58 lbs. Brazil.

This dull, orange-yellow coloured wood, appears to take a smooth surface from the tool.

The pores vary in size and are sometimes joined. The medullary rays are clearly marked though very fine.

Careya arborea Roxb.

Weight 50 lbs. India, Burma.

VERN—*Kumbi, kumbh, khumbi,* Hind.—*Pilu,* Banda.—*Gumar,* Mandla, Balaghat — *Kumri,* Chhindwara — *Gummar,* Gondi — *Boktok,* Lepcha—*Dambel,* Gáro—*Ijar,* Monghyr—*Kúmbi,* Uriya—*Kumbé,* Khond—*Asunda,* Kól—*Kúm,* Bhumij—*Budatare,* Koya—*Darepi,* Reddi—*Ayma, pailae, poota-tammi,* Tam.—*Budá-durmi, buda darini, dudippi,* Tel —*Kumbia, kuba,* Mar.—*Kaval, gaul, ganjal,* Kan.—*Pera, udu,* Mal.—*Poyn,* Trav. Hills—*Gavuldu,* Mysore—*Bambwè,* Burm.—*Kabooay,* Taleing—*Tagooyi,* Karen—*Kahatta,* Cingh.

A dark red, even-grained wood, which can be obtained in squares up to 25 feet by 12 inches. It is durable, seasons well, and stands well under water. Pearson and Brown in *Commercial Timbers of India* report the wood as being difficult to season ; indeed, that it is questionable whether it can be satisfactorily seasoned. But it is said to be satisfactory in the United Kingdom, and to polish well. It is used for gun-stocks, building, house-posts, planking, and furniture, and is obtainable in large quantities.

The pores are fairly numerous, medium in size, and often subdivided. The gently undulating medullary rays are exceedingly fine and very numerous. Dark-coloured concentric rings appear at irregular intervals.

Caryota urens Linn.

Weight 45 lbs. (Gamble). Eastern and Southern India, Ceylon.

VERN—*Rungbong, simong,* Lepcha—*Tamadong,* Bhutia—*Bara flawar,* Ass.—*Salopa,* Uriya—*Solopo, sarta,* Khond—*Jiluga,* Reddi—*Mhar, mardi, mari, jirugu,* Tel.—*Conda-panna, erim-panna, utali-panna, tippilipana,* Tam.—*Bhyni, beina, baini, bugani, bagni,* Kan.—*Berli,* Mar.—*Shundra pana, erimpana, chundapana, olathi,* Mal.—*Kitul, nepora,* Cingh.—*Hlyamban,* Magh.—*Minbaw,* Burm.

Gamble says: "This splendid palm is remarkable for its much-cut leaves and wedge-shaped leaflets. . . . The leaves give the 'Kitul' fibre, which is very strong, and is made into ropes, brushes, brooms, baskets, and other articles." It is more useful for other purposes than for its wood; nevertheless it produces a strong and durable material, which Gamble reports as "used for agricultural purposes, water conduits and buckets . . . plough-shafts and for rafters in house-building." As in most palms, the inner wood is soft and pithy and useless, while the outer layers are excessively hard, yielding a maximum width of sound wood of not more than from 3 to 4 inches at most.

The colour is black with brown streaks, and the wood has been used to a moderate extent for cabinet work, inlays, and bandings.

Cassia fistula Linn.

Weight 61 lbs. India, Burma, Ceylon.

VERN—*Amaltas,* Hind.—*Kinjál, krinjal,* Kashmir—*Alash, ali, karanzai, karangal, kiár, kanidr,* Pb.—*Királa,* Dehra Dún—*Sinára,* Garhwal—*Raj briksh, kitola,* Kumaon—*Chimkani,* Sind—*Gurmala,* Guz—*Sundali, bandarlati,* Beng.—*Shongrál,* Sundarbans—*Sandari, sunari,* Uriya—*Kitwáli, kitoli, itola, shimarra, sím,* N.-W. Prov.—*Warga, urga,* Oudh—*Jaggarwah, raila, hirojah, karkacha,* C.P.—*Jaggra, jagarua, kambar, rera,* Gondi—*Hari,* Kól—*Dunrás,* Kharwar—*Raella,* Baigas—*Kirmalia,* Merwara—*Pundali,* Khond—*Rela,* Reddi—*Banag, bangru,* Kurku—*Bahawa, boya, bawa,* Mar.—*Raj birij,* Nep.—*Sungyen,* Lepcha—*Sonalu,* Gáro—*Bonurlati, bonurlauri, persar,* Palamow—*Sunaru,* Ass.—*Bandolat,* Cachar—*Kone, sirikone, kavani, tirukontai,* Tam.—*Reylu, rela, suvarnam, konay,* Tel.—*Konnei,* Mal.—*Kaki,* Tam.—*Kakke,* Kan.—*Ehéla,* Cingh.—*Ngu, pwabet, ngugyi,* Burm.

This very hard, heavy, close-grained wood is the produce of the Indian laburnum, which, when in flower in the early part of the hot season, is one of the most beautiful trees in the Indian jungles. Sir George Hart says that it occurs over a very wide area, but only as scattered individual trees,

so that he considers the timber is hardly likely to be of much economic importance in England. It is of a brick-red colour, darkening on exposure. According to the reports, it is obtainable only in small size, and is rather brittle and apt to split, but would be a useful wood for turning, inlay, and fine cabinet work.

The pores and the medullary rays are exceedingly fine and small, with short, light-coloured ripple waves following irregular lines.

This species also grows in Brazil, and gives a pale reddish-brown wood, which has a fine grain and takes a smooth surface from the tool. It strongly resembles the supplies from India and Burma, although it has not the same colour or general attractiveness, while neither the Brazilian nor the Indian varieties compare favourably with our laburnum (*Cytisus laburnum* Linn.). Although the Indian *Cassia fistula* is known as laburnum, neither that nor the Brazilian wood appear to have any attributes which would justify the name, as it is generally understood in Europe.

In the Brazilian timber the pores are fairly large and are often subdivided ; they are surrounded by patches of lighter coloured tissue. The very numerous medullary rays are fine though clearly marked. Dark concentric bands follow the line of growth.

Cassia kotschyana.

The Sudan.

The native name of this wood is " ingartu." It is of a pale yellowish-salmon colour, with a very hard, tight, close grain, producing a very smooth surface from the tool.

The not very numerous pores are very small and open, situated between numerous prominent medullary rays.

Cassia marginata Roxb.

Weight 59 lbs. (Gamble). India, Burma, Ceylon.

VERN—*Urimidi, uskiamen,* Tel.—*Vakai,* Tam.—*Ngoomee,* Burm.—*Ratu-wa,* Cingh.

An attractive dark brown wood with black streaks, much like Indian laurel, but with a closer, firmer, smoother grain. A very handsome wood for high-class decorative cabinet work.

Gamble reports it as well adapted for articles of turnery, such as naves of wheels and handles of instruments ; but the wood is far too valuable and attractive to use for such purposes.

The pores, surrounded by belts of light tissue, are very small, and appear to be completely plugged ; but they are open on the tangential surface, which shows a pretty ripple ray. The medullary rays are very numerous, but confused, and not clearly discernible under the lens.

Cassia siamea Lamk.

Weight 43–58 lbs. (Gamble). Burma, Ceylon, India, Malaya.

VERN—*Beati, manje konne, vakai,* Tam.—*Kassod,* Mar.—*Mezali,* Burm.—*Wa, aramana,* Cingh.

A streaky wood, with light, rather golden stripes, in shades varying to almost black. It possesses a hard, smooth, tight grain, resembling that of the palm. A highly decorative wood for inlay or the best class of cabinet work.

The pores are exceedingly scarce, arranged in banded groups of light tissue, forming under the lens a pretty, minute pattern like a tiger's skin. Medullary rays hardly discernible under the lens.

Castanopsis brevi-spina Hay.

Weight 41 lbs. Formosa.

The wood is of a light nut-brown colour, marked with a pretty pattern caused by the pores. It takes a very smooth surface, showing the clash of the medullary ray when cut on the quarter. With a very nice texture, it has every quality for standing well without shrinking or warping, but has never been imported into England.

The pores are rather scarce and irregular. The medullary rays are numerous and fine, and joined at right angles by similar white lines, giving the appearance of a fine spider's web.

Castanopsis Hystrix A. DC.

Weight 42 lbs. (Pearson & Brown). India, Burma.

VERN—*Hingori,* Ass —*Katus, Dalné-katus,* Nep.—*Sirikishu,* Lepcha.

Pearson and Brown, in *Commercial Timbers of India,* report this wood to be " White when first exposed, turning light grey or greyish-brown with age, the sap-wood scarcely distinguishable from the heart-wood ; . . . more or less irregularly interlocked-grained, medium and uneven-textured . . . should make up into useful fumed furniture of the cheaper class."

Castanopsis indica A. DC.

Weight 43–45 lbs. (Gamble). India, Burma.

VERN—*Banj katús,* Nep.—*Kashiorón,* Lepcha—*Serang,* Ass.—*Charang,* Gáro—*Tailo,* Cachar—*Nikari, gol-shingra,* Sylhet—*Thitè, thitègyin, gônthitè,* Ruby Mines, Burm —*Indian chestnut.*

A very attractive wood, of a yellow-brown colour, with a lustrous surface and a hard figury grain, resembling a dull-coloured Mexican prima vera, for which timber it might be substituted without fear of detection. The pores show rather too openly on the tangential grain.

A sample taken from a plank which was sent over for the 1924 Exhibi-

tion displays the marked features accompanying spiral growth, which indicate that the genus is liable to this defect in India, as it is in England.

The scarce, open pores are very irregular in size and position, almost conveying the impression of being worm-holes, many with small bright specks of brilliant shining gum. Medullary rays hardly discernible under the lens.

CATALPA. *Catalpa speciosa* Warder.
South Central America.

The tree is prominent as an ornamental tree in London gardens, notable specimens of which can be seen in the grounds of the House of Commons.

According to Elwes and Henry, the origin of the name is Catawba, the name of an Indian tribe of Georgia and the Carolinas. The tree does not attain to any size sufficient to make it serviceable for use in this country, but it is used for various purposes in its own native countries. A tree grown at Ballarat, Australia, produced a specimen which bears out the description given above.

The wood is brown, light, soft, not strong, brittle, coarse-grained, durable, especially in contact with the soil. It is used for posts and fencing, but is suitable for internal fittings, and is now being much planted.

CATINGUEIRA. Source unknown.
Weight 71 lbs. Brazil.

This greyish-brown wood is streaked and marked with deeper coloured bands, rather resembling the English laburnum. It is a fine, firm timber which takes a good surface from the tool, and would form a useful medium for inlay veneer work. It has been suggested that two of the Brazilian specimens in Colonel Gamble's collection have been incorrectly marked, and that the woods marked respectively " coracao de negro " and " catingueira " should have their names reversed. The catingueira very closely resembles coracao, both in general appearance and in structure, while the coracao de negro is totally unlike either.

The pores are very numerous, seldom appearing singly, but in more or less long linked chains of pores. The medullary rays are so fine as to be scarcely discernible even under the lens (+ 10). The concentric layers are clearly marked by alternate lighter and darker coloured rings.

CAUCASIAN WING NUT. *Pterocarya Caucasica.*
The Caucasus, Persia, Armenia.

The colour of the wood is pinkish-white, with a rather soft grain. It is light in weight, somewhat resembling that of the lime tree, and is chiefly used for making boxes and packing-cases. Elwes states that it " is one of

the most ornamental hardwoods that we have ; and is well worth planting in warm and sheltered positions in the south of England, where it thrives from Kent to Devonshire."

CEDAR.

Under this commercial name a motley collection of woods is included. In the first place comes the true cedar, a coniferous genus, *Cedrus*, of which there are three species or varieties : the cedar of Lebanon, the deodar, and the Mount Atlas cedar. Another coniferous type, the Port Orford cedar (*Cupressus Lawsoniana*), should more correctly be termed a cypress, for the tree is familiar in gardens under the name of Lawson's cypress. The pencil cedars, being the wood of several American species of *Juniperus*, are truly junipers and likewise conifers. All these woods possess a very fragrant scent. It is not surprising that the name cedar has popularly, and hence commercially, been attached to the cigar-box cedar, a West Indian wood derived from a tree (*Cedrela odorata*) which is in no way allied to *Cedrus*, but is a member of the mahogany family (*Meliaceae*). Other species of *Cedrela*, including the Indo-Australian *C. Toona* and *C. australis* and the Paraguayan cedar *C. braziliensis*, are more or less fragrant and receive the name cedar.

The wood of *Cedrela* in many respects resembles mahogany, and has to some extent similar characteristics, so that the name has been extended to various American, African, etc. woods, which more or less resemble in appearance those of *Cedrela*, though not necessarily possessing any fragrance or strong scent. Some of the woods belong to the mahogany family, some do not, while the sources of still others are unknown. Then again there is in British and Dutch Guiana the so-called cedar, the product of *Protium altissimum*. The tree is not a cedar, nor has it any of the characteristics, and it is entirely without the fragrant scent usually associated with that wood.

Further confusion arises owing to the fact that between mahogany and cedar woods of the *Cedrela* type there exist transitional forms, which are termed mahoganies or cedars according to the will of the vendor. Indeed in some of these mixed species from the West Coast of Africa, it has been found that even in the produce of one tree, and even on one side only, cedar characteristics are noticeable which were absent in the remainder. (See WEST AFRICAN CEDAR.)

Beyond these commercial woods lie others, locally termed cedars, though unfamiliar in the English market : among such are the American conifers, red cedar (*Juniperus occidentalis*) and white cedar (*Libocedrus decurrens* and *Cupressus thyoides*), the red cedar (*Cunonia capensis*) of Cape Colony, the red cedar (*Acrocarpus fraxinifolius* Wight) of Sikkim, and the New Zealand cedar pahautea (*Libocedrus Bidwillii*). According

to Dr. Foxworthy, the names " white cedar " and " bastard cedar " have been given to the wood of *Chickrassia tabularis*.

CEDAR, AFRICAN PENCIL. *Juniperus procera* Hoch.

Weight 40 lbs. East Africa.

VERN—*Mutarakwa.*

During 1910, according to the *Kew Bulletin* (No. 2193), 31,000 logs of this timber were imported into Germany from East Africa. The wood is of a dark red or rose colour, harder, more brittle, and slightly heavier than that of *J. virginiana*. Though it has the fragrance of the latter, perhaps a little fainter, the wood has not been so favourably received in the United Kingdom, but on account of the inferior quality and scarcity of supply from other sources it is probable that its use will largely increase. For such work as panelling, provided that reasonable-sized pieces free from defects were forthcoming, it would be superior to any other pencil cedar yet imported, as it is of a closer texture. The quality is exceedingly good, and it takes a sharp edge for either surface or mouldings.

" The outlook for this trade appears to be bright, provided only carefully selected, accurately sawn, and thoroughly seasoned slats are shipped and the price is moderate. A process has been developed in England for rapid treatment of the slats, which appears to be successful in seasoning, and at the same time slightly softening the wood. The process promises to be a valuable one, which should help the trade considerably. If the slats are carefully selected and thoroughly air seasoned, *i.e.* scientifically stacked under properly regulated conditions of air and moisture for, say, twelve months, the wood appears to be entirely suitable for pencil manufacture, without artificial treatment.

" There are very considerable quantities of pencil cedar in the Colony, but the survey of these is still very incomplete. The existing saw-mills with cedar concessions can supply any immediate demands, and it is hoped in the near future to have other areas ready for exploitation " (*Tropical Woods*, No. 22, p. 43).

When cut on the quarter the medullary rays are strongly marked, as in beech, and the surface of the wood presents a slightly lustrous appearance. The concentric layers are marked by thin dark lines, and the medullary rays are clearly and strongly marked.

CEDAR, BRAZILIAN. *Cedrela brasiliensis.*

Weight 30 lbs. Brazil, ? Paraguay.

VERN—*Cedro amarello, cedro aromatico, cedro batata, cedro branco, cedro caopiúva, cedro cheiroso, cedro do Amazonas, cedro rosa, cedro vermelho,* Braz.

In Colonel Gamble's collection there are three so-called cedars, marked " cedro (Cedrela)," "cedro," and " cedro rosa." There is very little

difference in these three specimens; they seem to be only variations of the same wood. The specimen " cedro " has a strong mottle figure, and a good firm texture, rather resembling the Paraguayan cedar but not so hard or heavy. That marked " cedrela " is paler in colour and of a milder character. " Cedro rosa " is deeper in colour, harder in texture, and heavier. In structure they are similar, and like *Cedrela odorata.*

During the last few years (1931) several shipments of Brazilian cedars have come into the markets of America, the Continent, and the United Kingdom. These supplies have varied in quality, colour, and weight; and still more so in that some shipments have been entirely free from an exuding gum or resin, which has been very prevalent and persistent in others. The explanation of this feature is not yet forthcoming, so that it is impossible at present to decide whether it is caused by a difference in the tree, the situation in which the tree has been grown, or the time of year when the tree has been felled. The appearance, grain, etc., of the three kinds display no variation.

In each case the pores vary considerably in size and are irregularly placed. The medullary rays are very fine and numerous, and the concentric layers are marked by bands of paler coloured tissue.

CEDAR, CENTRAL AMERICAN. *Cedrela odorata* Linn.
C. Mexicana Roem. and probably other species of *Cedrela.*
Weight 27 lbs. 9 oz. and 33 lbs. 1 oz.
Honduras, Mexico, Cuba, West Indies, Panama; Central America generally.

The wood is imported in square hewn logs and in the round, ranging from 6 to 40 feet in length and over, and from 10 to 40 inches in squares. The timber from the different sources above mentioned is sufficiently alike to classify it under one description. Logs from Honduras or Tobasco are generally larger and supply the largest dimensions; those from Jamaica and Cuba provide the smallest.

The wood is light red in colour, generally straight in the grain, open, porous, soft towards the heart, of light weight and rather brittle. Some logs are beautifully figured, with wavy, curly, and mottled grain, which resembles the roe and mottle and fiddle mottle figure found in mahogany. It exhales a very fragrant, agreeable scent which is remarkably persistent.

The wood works easily, shrinks only moderately, and stands exceedingly well when seasoned. On account of its reliable nature and light weight it is valuable for veneering on, for yacht fitments, especially when built for racing, where it has been used both for plain or decorative work, the more figured wood, either solid or veneered, giving exceedingly handsome

effects. It is also used for pattern-making, modelling, carving, and many kinds of furniture work, especially for the linings and drawers of cabinets, where the fragrant scent is agreeable, and is a protection from the attack of moth or any insect. The loftier trees are much sought for to provide boards for planking dinghies, racing and pleasure boats, where comparative strength and lightness of weight provide all that is required. It is used for wide panels for railway coaches, especially where curved, as it is pliable and can be safely bent for this purpose without splitting ; also for the arms of telegraph poles on railways, where this wood appears to be the most suitable to stand the required strain. Formerly the figured wood, and especially the curls or crotches, were much used in veneers for panels for wardrobes, bookcases, and cabinets ; in a great many of the panels of grandfather clocks beautifully figured cedar will be found. By far its largest use, however, is for cigar-boxes. There is no doubt that it was originally chosen for this purpose to the exclusion of all other woods, partly on account of the scent harmonising with that of the tobacco leaf, but principally because its porous nature, whilst allowing the moisture in the wet cigar to free itself, also admits moisture from without when the cigar is becoming too dry, thus keeping the tobacco in its best condition. The cigar merchant, however, seems to have strangely forgotten this advantage, and having begun by pasting a label on the box, has gradually increased the use of paper and gum, until in many cases the valuable wood is entirely covered with a single or even double lining, rendering the box impervious to moisture either from within or without, and under such conditions wood of almost any other kind would be equally serviceable. Mr. Oakhill, of the Imperial Tobacco Company, says that there is a maggot which in the tobacco-producing States of America will attack a bundle of leaves of tobacco in their dry state, and pierce through many layers downwards. This maggot will attack tobacco boxed in other woods, but has not been known to touch any tobacco in cedar boxes, and if the maggot is already in the tobacco leaf when so boxed, it will not develop.

In transverse section concentric rings are marked by thin, light, concentric lines, within each of which typically is a distinct pore-zone of loosely arranged large pores. These rings may be tolerably even in thickness, or some (in Cuba cedar at least) may be excessively narrow, but even in the latter case the light line is succeeded externally by large pores ; moreover, some of the broader rings may, at least locally, be devoid of a pore-zone. These cedars in both respects approach in structure to mahogany from the same regions. In transverse section the pores are instantly visible to the naked eye, by reason of their large size, whereas the medullary rays are fine and only just visible. They are not arranged in tiers.

CEDAR, FORMOSAN. *Chamaecyparis formosensis* Mats.
Formosa.

This wood is of a light yellow colour, a little deeper in shade than that of Swiss pine (*Pinus Cembra* Linn.) or Port Orford cedar (*Cupressus Lawsoniana*), the woods of which it resembles in other respects, except that the fragrant scent usual in cedars is absent. It is a straight-grained, mild, soft wood, capable of a very smooth surface from the tool, and it should be very suitable for sounding-boards for pianofortes, violins, or other musical instruments. There is no doubt but that this timber would become much in demand if a regular supply could be maintained. Messrs. Mitsui & Co. recorded in 1920 that a supply of 40,000,000 feet was available.

The concentric layers are very clearly defined and the rings are very close. The medullary rays are very fine indeed, yet show clearly on the radial section in a manner similar to, but finer than beech.

CEDAR, GUIANA. *Protium altissimum* Marsh.
Weight 42 lbs. (fresh). British, Dutch, French Guiana.

Twelve logs of this timber, which in France is known as "cèdre-blanc," were imported from Surinam into London in 1914, being intended either for France or Germany, probably the latter, and diverted to England on account of the war. Although supplies are apparently available from British and Dutch Guiana, this import is the first on record for the United Kingdom, at all events for a great many years. The colour is a light nut-brown, with rather a satiny lustre, which darkens considerably on exposure; it has a close, smooth texture and a straight grain.

This is a useful timber and stands well under all conditions, it should be better known, when its undoubtedly good qualities would soon bring it into favour.

The pores are regular and uniform, and are of moderate size. The medullary rays are numerous, clearly defined and parallel, and are easily discernible with the naked eye. There is a liability for the wood to develop very fine cracks on the line of the medullary ray.

The so-called "cedar" or "white cedar" is the produce of *Icica altissima* Aubl., a timber used in Guiana for making canoes.

CEDAR, MOULMEIN. *Cedrela Toona* Roxb.
Weight 29–40 lbs. (Gamble). British India, Australia.

VERN—*Tún, túni, lím, maha ním,* Hind.—*Túni, tún, lúd,* Beng.—*Maha limbu,* Uriya—*Mahlun,* Satpuras—*Drawi,* Pb.—*Túni, bobich,* Nep.—*Simal,* Lepcha—*Somso,* Bhutia—*Poma, henduri poma,* Ass.—*Goria ním,* Melghat—*Grawa,* Khond—*Mahalimo,* Saora—

Kujya, Tippera—*Katangai*, Kól—*Madagiri vembu*, Madura—*Santhana vembu*, Tam.—*Mathagiri vembu*, Mal.—*Vedi vembu*, Trav. Hills—*Súli*, *máli*, Salem—*Kal kilingi*, Nilgiris—*Sandani vembu*, Tinnevelly—*Tundú*, *kempú gandagheri* Kan.—*Nogé*, *belandi*, Coorg.—*Devdari*, *todu*, *mahaním*, *huruk*, *kúruk*, Mar.—*Chikado*, *tseetkado*, Magh—*Shurúzbed*, Chakma—*Thitkado*, *tawtama*, *ni*, *kashitka*, Burm.

This tree, which is of considerable value, is known in most parts of India as "Toon," and in Burma as "Thitkado." It is soft, red, and fragrant, and in India is largely used for furniture because it seasons easily, works well, and is ornamental, taking a good polish. It must be well seasoned before use, otherwise it warps badly. In England and Europe generally it resists the action of moths and boring insects.

This wood is indistinguishable from Central American cedar (*Cedrela odorata*). For general purposes in the domestic arts it might be used in lieu of the better kinds of cedar from Cuba and Mexico, whenever these are scarce in the market. It is also used for cigar-boxes and for packing tobacco. As Laslett found in his time that the supplies were not mild enough for pattern-making, it would appear that later shipments have yielded a milder wood, as many samples have been seen of late, which were eminently suited for this purpose. It is subject to heart- and star-shakes, and in seasoning is very liable to split from the surface if left long in the round or unconverted state.

In Australia this wood was formerly the "red cedar" (*q.v.*), widely used in building and the manufacture of furniture.

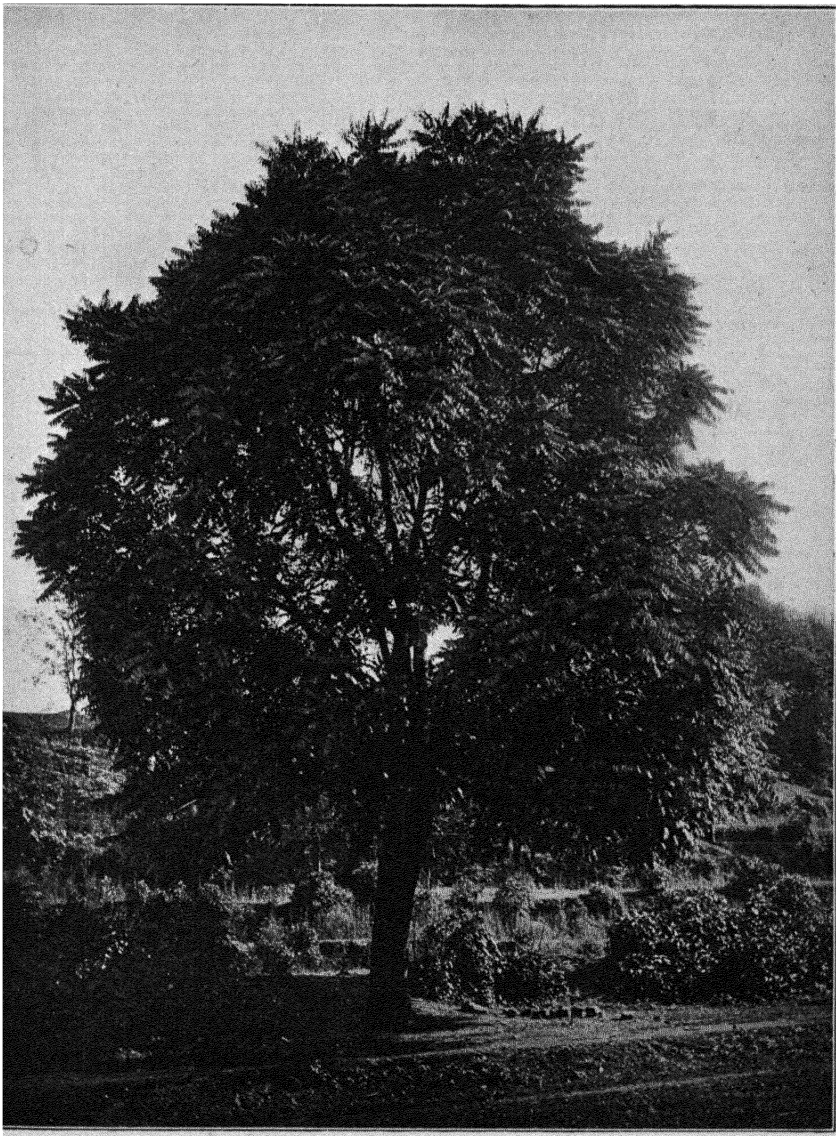
The annual rings are clearly marked by bands of wide and numerous pores forming the spring-zone, outside of which the more scanty vessels are scattered. There are no concentric light lines meeting the rays at right angles. The large pores and fine medullary rays are visible to the naked eye in cross-section, and the rays produce a pleasing silver grain in the quartered wood.

CEDAR, PARAGUAY. Source unknown.

Weight 31 lbs. 15 oz. Paraguay.

Somewhere about the year 1899 one or two cargoes of a wood styled "Paraguay cedar" were put on the London market. The supply was in the form of hewn square logs, from 10 to 30 feet in length and about 12 to 30 inches or more in width. The logs were generally sound and of good quality, with the grain of mahogany but having cedar characteristics, and a strong aromatic cedar-like scent. The wood was harder and heavier than any of the usually known product of *Cedrela* sp., and quite different from the supplies of Brazilian cedar which have come into the London market rather freely during the last few years (1931), and which are now reported as coming from Paraguay as well as Brazil. The wood belonging

to the earlier shipments was found to stand well, but great difficulty was experienced in persuading people to use it, as cedar buyers complained



Photograph by Basti Ram

MOULMEIN CEDAR

Received from U.P. Exhibition, Allahabad Exhibition, 1910-11

that it was too hard and too heavy, and mahogany buyers that it was cedar, because of its scent.

In transverse section the annual rings are well marked by a zone of large pores, within which is a thin light line (in the specimen the rings are all wide) ; the pores are visible to the naked eye, mostly open, but some contain a glistening dark substance ; the medullary rays are visible and somewhat wavy.

CEDAR, PENCIL. *Juniperus virginiana* Linn.

Weight 34 lbs. 11 oz. (very variable).

United States, especially in the eastern region.

J. barbadensis Linn.

J. bermudiana Linn.

Georgia, Florida, Jamaica, and other islands of the West Indies.

VERN—*Juniper, red cedar, pencil cedar, savin,* Eng.—*Cedro, cedro colorado, enebro, sabino, tascate, taxate, yutnu-itne,* Mex.—*Enebro criollo, sabina de costa,* Cuba—*Sabina,* S D

The woods of the above species are all practically identical in appearance and properties, and are used almost entirely for pencil-making.

The timber is generally imported in the form of square hewn logs or billets, but sometimes in the round, the sizes and quality of which have deteriorated steadily with time, so that it is now only possible to obtain small-sized faulty wood. Formerly large-sized pieces yielding panels 2 feet wide were procurable. The present supplies come mainly from Jamaica, Alabama, and Georgia. The northern-grown wood is unsuitable for pencil making. This very fragrant timber (heart-wood) varies in colour from yellowish to purplish-red, often recalling the tints of faded rose-petals. Under the plane it yields a surface rivalling in smoothness that of marble, and in this possibly surpassing any other commercial wood. As it is soft and easily cut, and has a regular and even grain in all directions, it is eminently fitted also for carving. Pencil cedar has been used for panelling and decorative work, and in times past for many well-appointed buildings. A superb example of work in this wood is seen in the Reception Hall of the Skinners' Company in Dowgate Hill, which was executed shortly after the great fire of London (1666). Its fragrant scent is preserved to the present day, and is noticeable when one enters the Hall. Another old building in Coleman Street, pulled down by Messrs. Colls & Sons about 1902, contained some handsome panelling in pencil cedar, as well as two very fine carved mantelpieces and overmantels all in Jacobean style. Some of these panels of sound, clean timber measured 2 feet in width.

When used out of doors in contact with the soil, the wood is extremely durable, and was formerly used for posts, shipbuilding, and so forth ; but the southern-grown pencil cedar is now far too costly to be used for purposes other than the making of pencils, and, to a limited extent, for

furniture and decorative work, linings of cabinets and cases (in order to keep moths away, or for its aromatic scent).

The annual rings are distinct, but the medullary rays are invisible, and the resin passages are lacking.

CEDAR, PORT ORFORD. *Cupressus Lawsoniana* Murr.
Chamaecyparis Lawsoniana Sarj.
Weight 33 lbs. 5 oz. Oregon, California.

In England this tree is familiar under the name of Lawson's cypress. In Oregon and California, as the trees often attain a height of 200 feet and a diameter of 12 feet even above the dilated base of the trunk, timber of large size is obtainable in the form of long boards or planks, free from all defects. The wood is light yellow or nearly white, with a glossy, satiny sheen darkening on exposure, and with a close, compact, but rather soft grain. It is difficult, though possible, to produce a smooth surface, on account of a certain gumminess, or toughness of the grain. The adhesive contents of the wood clog the tool so that it must be continually sharpened, otherwise the fibres are liable to be torn out. It is very strong for its weight, is straight-grained, stands well under all conditions, and is exceedingly durable. The wood is very fragrant and is stated to keep clothes-moths at bay. I have a wardrobe the linings and drawers of which are made of this cedar, and regard it as a very great luxury. The delicate and agreeable scent appears as strong as when the wardrobe was first made about twenty-one years ago (1932).

It has been imported into England on a commercial basis, in boards and planks since 1911, but has probably never yet been estimated at its real value. Mr. F. R. S. Balfour has used a considerable quantity in fitting and joinery in his house in Scotland. It has been used to a small extent for boat- and shipbuilding, and since the war has been imported for aircraft construction, but for this purpose it would not appear to be approved. In the western United States it has been used for buildings (including floorings), fence-posts, boats and ships, but Sargent states that on the Pacific coast it is employed almost exclusively for matches. Durable in all situations, it is particularly so in contact with the soil; and has been used for railway sleepers. Elwes mentions the fact that a certain tree was perfectly sound though it had fallen more than two hundred years previously, and had been overgrown by a huge spruce tree, whose trunk was 7½ feet in diameter, and whose roots were "extending like the claws of a parrot around each side of the (cedar) tree and locking underneath."

The annual rings are marked by the contrast between the wide, white spring wood, and the narrower, reddish summer wood, the former changing gradually into the latter. As this is a coniferous timber no pores are

present, nor do resin passages occur, though resin and fragrant essential oil do occur in this wood. The medullary rays are excessively fine and almost invisible, though causing a general indistinct radiating pattern on the cross-section.

CEDAR, RED.

There are many timbers which are known under this name, chief amongst which are the following: *Cunonia capensis* Linn., Cape Colony. *Cedrela Toona* Roxb., India (this is the Moulmein cedar, *q.v.*). *Acrocarpus fraxinifolius* Wight, Sikkim, Western and Southern India, Burma. *Thuya gigantea* Nutt., and *T. plicata* (*q.v.*), Western North America. *Juniperus occidentalis* Hook, Western North America.

These, with the exception of Moulmein cedar, are not in ordinary commercial use in the United Kingdom.

CEDAR, RED AUSTRALIAN. Source dubious.

Weight 52 lbs. 4 oz. Australia.

The wood is of a red colour, strongly resembling the American cedar (*Cedrela odorata*) but of a brighter hue, and is heavier, a little harder, generally more curly in the grain, more figured, and less strongly scented. It has been imported in boards, planks, and logs, and some handsome furniture and fittings have been made of it. Professor Groom says: "The red cedar of Australia is usually described as being derived from the Toon-tree, *Cedrela Toona* (see CEDAR, MOULMEIN), and it doubtless was so at one time. But the supply of the wood has greatly decreased,[1] and I have no doubt that much of the 'red cedar' now supplied is not wholly derived from the Toon-tree. Stone, for instance, was supplied officially with authentic specimens of 'red cedar,' and describes them: his description convinces me that the specimens were not the wood of *Cedrela Toona*. Quite certain it is that our commercial specimen is not from that species. I rather suspect that it may be derived from a *Dysoxylon*, which belongs to the same family, and may even be *D. Muelleri* Benth., the 'red bean,' of which I have not seen authentic specimens."

Professor Groom's doubt seems to be justified, as it is evident that former shipments were of both *C. australis* and *C. Toona*, and even *Dysoxylon Muelleri*, without discrimination.

The Forestry Commission, N.S.W., reports the timber as resembling mahogany, with only half its weight, and that it produces some figured pieces of great beauty, and remarks upon the ease in working, as well as its durability; they add, "it would be difficult to exaggerate the good qualities of this valuable timber."

[1] Baker's *Cabinet Timbers of Australia*.

Baterden's remark in reference to Toon that this is a " true cedar " is, of course, incorrect.

The wood is somewhat cross-grained, shows no distinct annual rings or growth-rings. In transverse section it reveals to the naked eye innumerable thin, concentric light lines ; the pores are just visible, but the medullary rays are invisible.

CEDAR, TRUE. *Cedrus Libani* Barrel
C. Deodara London
C. atlantica Manetti.
Weight 36 lbs. 7 oz. Europe, Asia, Africa.

There are three different kinds of true cedars belonging to the genus *Cedrus*. The differences between them are so slight and fluctuating that all three are frequently included under one botanical name, *C. Libani* ; sometimes, however, each is given a separate name as above. All are mountain trees ; the first-named growing on Mount Lebanon, in Cyprus, and the Orient ; the second being Himalayan, and the third African and growing on the Atlas Mountains. All these are grown in English gardens. The timbers of the three kinds are almost indistinguishable. An easy way of identifying the three varieties has been mentioned to me, though it should be taken as general and not absolute. L. for Libani, l. for level (the branches extend from the tree in a more or less horizontal manner) ; D. for Deodar, d. for drooping (the branches generally droop) , A. for atlantica, a. for ascending (the branches generally slope upwards).

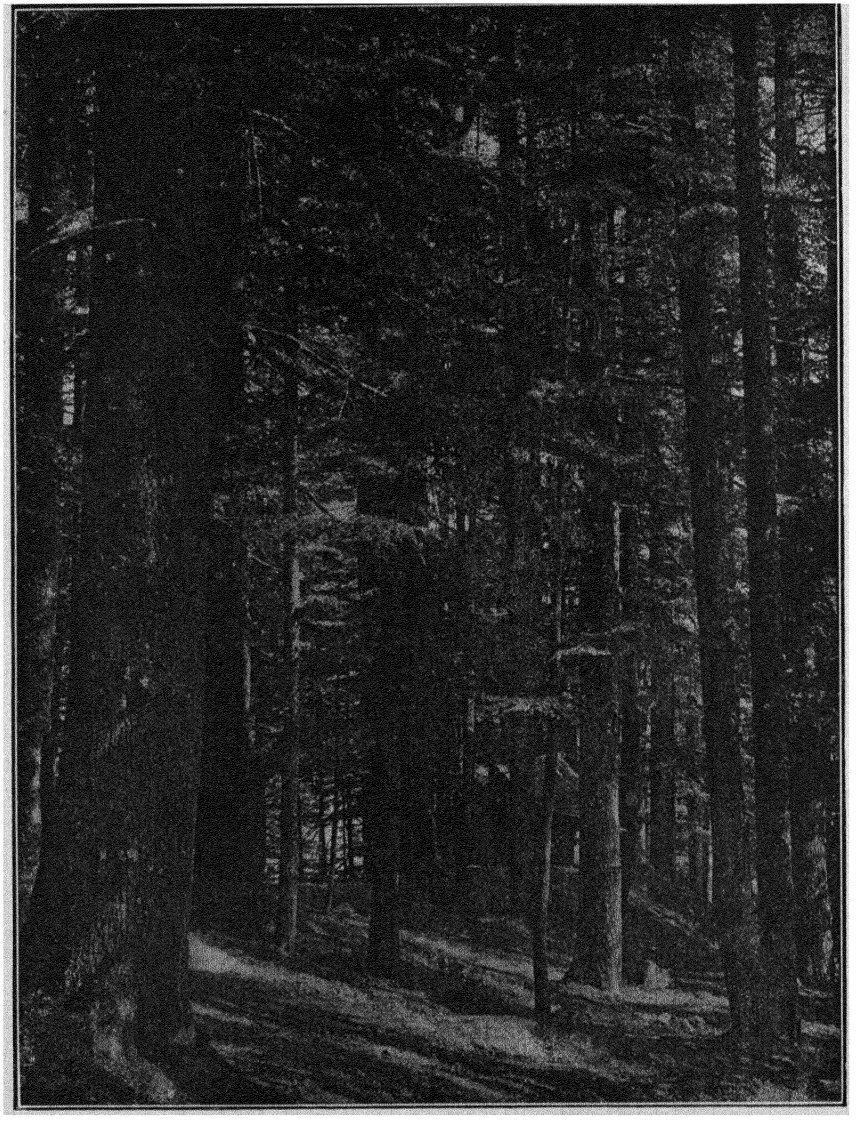
The actual date when this tree was introduced into England is apparently undetermined, but, according to Prideaux Selby, Aiton in the *Hortus Kewensis* fixes it as being 1683.

The sole supplies in England have consisted in those derived from the few fallen trees (of all three kinds) and one shipment of *C. atlantica* from Algeria in 1909.

In a letter R. S. Pearson wrote concerning the deodar : " This is one of the three most important timbers of India, the others being teak and sal. This timber is too valuable in India ever to find a market in Europe." We can thus look for practically no supplies from that source.

The light yellow timber yields under the tool a beautiful surface, rivalling in smoothness that of the pencil cedar. Often, though not always, the wood is fragrant, and the aromatic scent of the burning wood may at times be so potent as to induce dizziness and headache. While the sap-wood is perishable, the heart-wood is remarkably durable. In this connection Gamble writes : " Deodar wood is very durable, probably, with Cypress, the most durable of Himalayan woods. Stewart mentions the pillars of the Shah Hamaden mosque at Srinagar in Kashmir, which date from A.D. 1426, and are now consequently (1901) 475 years old, as

having been quite sound at the time he wrote. It resists the wet, also white ants, and apparently does not suffer much from dry rot." In the Palace at Versailles there is a richly carved gateway, above which is



A GROUP OF DEODAR TREES IN THE HIMALAYAS

inscribed: "L'Hôpital des Chevaliers de St. Jean de Jerusalem dans l'Isle de Rhodes." It is made of cedar of Lebanon, and despite its indubitable antiquity, is in a state of perfect preservation.

The timber also possesses considerable strength, and Pearson mentions that it is used in India to make oars, bridge ladders, frames of parallel bars, and axle-beds of transport carts (for the Ordnance Department). With these valuable qualities it is a pity that the wood derived from the fallen trees is in this country generally burned or wasted. Mr. H. J. Elwes, however, mentions one instance in which a cedar blown down on a lawn was most successfully used by the owner to supply the flooring and panelling of a good-sized drawing-room. Many years ago in the well-known Chelsea Physic Garden, formerly belonging to the Apothecaries Company, there were one or two well-known cedars which were blown down, and the Master in Court ordered that from the timber one chair should be made for the Master, and two others for the Wardens. For many years these chairs have been in continual use at the Apothecaries Hall in the City. By the kind consent of the Company they were shown at the Empire Timber Exhibition at Holland Park in 1920, when they attracted universal interest and admiration.

According to the publication in the Annual Report of the Imperial Forestry Institute, Oxford, for 1930–31, two woods taken from the shrines outside the sarcophagus of Tut-ankh-amen (*circa* 1356–50 B.C.) have been identified as true cedar (Cedrus sp.) and a species of *Zizyphus* (*q.v.*). Both timbers are reported to be in a remarkably fine state of preservation, having survived over 3200 years. It is stated that this is explained by the fact that it had remained absolutely dry, and the lack of moisture had prevented disintegration. There appears little doubt that the cedar is the true produce of *Cedrus Libani*.

As *Cedrus* is a conifer, the wood shows no pores, nor does it possess any resin passages (though in certain specimens spurious resin passages are induced). The annual rings are clearly marked, but the medullary rays are invisible.

CEDAR, WEST AFRICAN. Sources various.

Weight 39 lbs. 11 oz. and 40 lbs. 12 oz.

West Coast of Africa.

Among the many kinds of woods exported from the African West Coast, and having the scent and some other characteristics of cedar, there is one type that can be distinguished from all the rest by reason of its considerable resemblance to the cedar of Central America. The logs are imported in lengths varying from about 12 to 30 feet or more, and in squares of from 20 to 40 inches or more, either round or hewn square. The wood is of a light reddish-brown colour, rather redder than Cuban cedar, also heavier and "stronger" in character. Being somewhat cross-grained, the wood shows a special type of banded figure and requires a sharp plane to obtain a smooth surface. The logs are liable to star-shakes in the centre,

making it difficult to obtain sound wide boards, though they are almost entirely free from the " cross-breaks " so common in West African mahogany. As this type of cedar stands well without warping or twisting, and has been obtainable at prices lower than that of American cedars, it has been used to a considerable extent as a substitute for the latter, despite its greater weight. A few finely figured veneer logs have realised very high prices (up to fifty-four shillings per cubic foot), but the wood is not so favourably regarded for this purpose as mahogany, as, after cutting, the veneers of cedar are apt to crack up in drying.

The botanical sources of this type of cedar are not known. Professor Groom says : " We may perhaps hazard the guess that species of *Pseudocedrela* are such, for it is known that African cedars are largely derived from this genus. Other genera (see Mahogany) also supply African cedars and mahoganies. To distinguish between the cedars and mahoganies of Africa should not in reality be difficult, though customs of the trade have made it so. Several so-called mahoganies have the same kind of thin, sinuous light lines shown in cross-section ; among them are Sapeli, Warri, Jameson River, Sekondi, and one variety of Bonamba. Of these, the first two are scented , in fact, Sapeli ' mahogany ' is stated to be derived from *Pseudocedrela*.

" The wood does not show in cross-section any distinctly marked annual rings or similar belts (though certain darker bands divide the surface into ring-like zones) ; but very numerous fine concentric sinuous lines are visible to the naked eye and cross the medullary rays at right angles ; the pores are visible but rays invisible to the naked eye."

CEDAR, WESTERN RED. *Thuya plicata* Don.

Weight 20–21 lbs. British Columbia.

The colour is a brownish-yellow, very similar to that of a Scotch pine after exposure to the light and air. It is light, somewhat brittle, easily split, and inclined to contain spiral shakes. Sargent says in earlier times " the Indians split the planks used in the construction of their lodges, carved the totems which decorate their villages, and hollowed out their great war canoes , and from the fibres of the inner bark made ropes, blankets, and thatch for their cabins." It is in great demand throughout the west coast of America (and indeed largely all over that continent), and is used for a multitude of purposes, being possibly the most generally used timber for a wide range of uses.

Sargent's romantic description of the manner in which the native Indians used the timber, calls attention to the remarkable qualities it possesses, as, although in weight it is among the lightest of woods, it yet has considerable strength. An unusually smooth surface can be obtained with the lightest movement of one touch of the plane, and its fragrant

scent added to these qualities make the wood of Western Red Cedar unique and remarkable. It has only been introduced into commercial use in the United Kingdom during the last few years (1930).

The stump end next the root of a Thuya tree growing at The Beacon, Ewhurst, Staple Cross, Sussex, provided a burr from which, when cut into veneer, several small occasional table-tops were made. When finished and polished the wood showed a fine colouring and splendid figure, comparable with any of those Thuya or Amboyna burrs which have been imported from overseas, thus proving that Thuya trees grown in England can produce valuable furniture wood.

CEDAR, WHITE.

The following, all of which come from the United States, are the timbers known in commerce as white cedar. They are, however, seldom seen in this country, and are of little commercial value :

Libocedrus decurrens Torrey (known also as incense cedar).
Cupressus thyoides Linn.
Thuja occidentalis Linn. (See ARBOR-VITAE.)

CEDAR, YELLOW. *Cupressus nootkatensis* Hook.
Weight 20 lbs. (Boulger). United States, Canada.

This wood, which should be more correctly termed cypress, is of a light yellowish-red, and has sometimes a very handsome grain. It is not known commercially in the United Kingdom, but is generally reported as being exceedingly durable.

CEDRELA. *Cedro vermelho. Cedrela* spp.
Brazil.

This wood is so similar to that of Honduras and Cuba that it hardly needs any description. It is slightly stronger, harder, and heavier. More information is required regarding the woods of *Cedrela* sp. coming from South America ; some shipments have proved to be of the quality displayed by my specimen, while others produce a gum, or resin, which on this account makes the wood unsuitable for those purposes for which cedar is used.

The pores are irregular in size, very small to very large, also irregular in position, and the medullary ray is confused, and difficult to discern under the lens. Transverse section on the whole much resembles that of the Honduras, *Cedrela odorata.*

Cedrela multijuga Kurz.

Weight 36 lbs. (Gamble). Burma.

VERN—*Taungdama*, Burm.—*Nee*, Karen.

The colour is nut-brown, with a very nice close, compact grain, yielding a fine surface from the tool. Gamble compares it to the produce of *C. Toona*, but the texture is very much closer and finer, freer from open pores, and more satiny ; and altogether it is a more valuable timber. Its agreeable colour and nice working qualities would make it very much appreciated in all classes of work where a high, fine figure is required.

The concentric layers are marked by a thin dark line, very pronounced. The exceedingly minute and numerous pores are evenly distributed, with faint and not well-defined medullary rays.

Cedrela serrata Royle.

Weight 33 lbs. (Gamble). Western Himalayas, Ceylon.

VERN—*Drawi, dalli, dál, dauri, khishing, khinam, durla*, N.W. Him —*Soni*, Kumaon—*Darlú, darli, darloi*, Jaunsar—*Taung-dama*, Burm.

This wood is similar to that of *C. Toona*, but softer, probably far more quickly grown, and less useful or valuable. The fragrant scent is also much less noticeable. Gamble reports it as having been introduced into Ceylon as a shading tree for the tea plant, and he refers to its rapid growth, " sometimes as fast as two rings to the inch of radius." My specimen gives two rings to $2\frac{5}{8}$ inches.

The pores are very scarce, excepting on the edge of the concentric layer where they are larger and open. Medullary rays confused, hardly discernible under the lens.

Cha-ch'ai. China.

Professor Record says this is *Gordonia* sp. The colour is a light, rather olive-brown, with a hard, dense grain resembling that of the apple. The specimen is from a very small tree, showing a slightly pithy heart, and the medullary rays in very small flecks on the radial section.

The concentric layers are exceedingly close, and marked by light bands. The pores and medullary rays are extremely fine, and almost indistinguishable.

CHAMP *Michelia Champaca* Linn.

M. excelsa Bl.

M. Kisopa Ham.

Weight 28–42 lbs. (Gamble). India, Ceylon.

VERN—*Champa*, Hind.—*Oulia champ*, Nep.—*Tita sopa*, Ass —*Champa, champaca*, Beng.—*Shimbu, sempangam, chambagam*, Tam.—*Champakamu, sampenga, kanchanamu*, Tel.—*Sampige, kola sampige*, Kan.—*Kud champa*, Mar.—*Champakam*, Mal.—*Saga, sanga, sagawa*, Burm.—*Sapu, hapu*, Cingh.

M. excelsa.

VERN—*Bara champ, safed champ, seti champ,* Nep.—*Sigugrip, penré,* Lepcha—*Gók,* Bhutia.

M. Kisopa.

VERN—*Banchampa,* Kumaon.—*Champ, chobsi,* Nep.

The timber produced by the above three varieties may be treated under one description, on account of their similarity, but the product of *M. Champaca* is perhaps superior. A valuable and useful timber, not yet appreciated in India at its true value, and almost unknown in the markets of the world. It is not a native of Ceylon, but has been planted there to a not inconsiderable extent. When first cut it is a yellowish-olive blue, and rather variegated, resembling the American poplar, *Liriodendron tulipifera,* which wood it also resembles in grain and character. After exposure to light it deepens to a more regular tone of light bluish-brown. It takes a smooth surface from the tool, and has a close, compact grain, giving sharp, good edges to mouldings.

Although not brought into general use in most parts of India, because of its easy working and lighter weight, it is in common use in Darjeeling, and other places difficult of approach, for many purposes, and especially for joinery in houses and shops. Gamble's reference to its use for beads for necklaces is a good testimony to its general good character.

A plank of this timber was presented to Viscount Powerscourt in 1861, who caused an entire table-top to be made. This table is now in the large hall at Powerscourt Castle, Enniskerry, Ireland, and bears on it a brass tablet with the following inscription: "Single Plank of Sampage or Chumpa Tree 11 ft. $4\frac{1}{2}$ long by 4 ft. $6\frac{1}{4}$ broad by $2\frac{1}{8}$ inches thick. Given to Viscount Powerscourt by Major F. Cunningham at Bangalore, Madras, India. March 1861." (Major Cunningham was the Resident at Bangalore at that time.)

The plank is a magnificent specimen of a splendid wood, and has that figure customarily found in West Coast of Africa mahoganies, showing also a strange mark which divides the figure, and abruptly changes its nature. It is probable that this curious marking was caused by a creeper growing round the tree.

Besides the unusual size and perfect quality of the single plank, another feature is noticeable, viz.: that whereas the colour of this wood when first cut is quite light, as light as that of American poplar, *Liriodendron tulipifera,* the colour of the table-top has become a deep, warm brown, as deep as a dark coloured Sapeli mahogany, again supplementing the list of Indian timbers (such, for instance, as jackwood, sissoo, padauk), which continue to darken in colour steadily during a great number of years. For instance, a cabinet made for the 1920 Exhibition at Holland Park of Bengal sissoo, which was originally as light as satinwood, in ten years has darkened by degrees to the colour of dark rosewood.

The pores are regular and small. The medullary rays numerous and very fine.

Chang-chai.

China.

Professor Chung's specimen, submitted to Kew, is marked as above, and this specimen is one of the true camphor-wood (*Cinnamomum camphora*), similar in grain, colour, weight, and all characteristics, to the Formosan wood.

CHEESEWOOD. Species unknown—probably *Erythrina.*

Central America.

The name cheesewood was given to some logs of timber imported into Liverpool a few years ago. On arrival the timber was found to be exceedingly heavy, and as it was impossible to dispose of the logs, they were sent to Messrs. M'Arthur's saw-mill to be converted into planks, as it was thought that in this form some use might be found for them. Mr. M'Arthur says that the sawyer was violently ill all night after sawing the logs, and his assistant more or less similarly affected. The planks were stacked in the usual manner for drying, and were found to be excessively heavy to handle, measuring only about 25 feet to the ton. Some time afterwards, being ordered to remove the pile, the men, to their great astonishment, found the planks lighter in weight than anything they had previously handled, the change having occurred in the drying. A sample of this wood measuring $2\frac{1}{4}$ inches in thickness, 5 inches in width, and $5\frac{1}{2}$ inches in length, weighs only $4\frac{1}{2}$ oz., and is probably the lightest piece of timber on record.

Notwithstanding the light weight, this wood possesses some considerable degree of strength, and stands firm under a fair amount of pressure. It might be described as " the softest timber of commerce." With only light pressure the finger-nail can be inserted to a considerable depth. On account of its strength and softness it should be useful for many purposes, but up to the present time its chief use has been for entomological cases.

The concentric layers of annual growth are clearly marked, and measure in places $\frac{5}{16}$ inch in thickness. The medullary rays can be distinguished by the naked eye as parallel and uneven. There are wide-open pores, not very frequent, only situated between the medullary rays, sometimes wide apart, occasionally close together. Bright specks of gum shine out very white, only between the pores.

CHEESEWOOD, TASMANIAN. *Pittosporum bicolor* Hook.

Tasmania, Victoria, New South Wales.

An alternative name is whitewood.

" This wood is yellowish-white, very hard, and of uniform texture and

colour. It was once used for clubs by the aboriginals of Tasmania. It burns well, and should be tested for wood-engraving" (Irons, Reports London International Exhibition of 1862). "It is much esteemed for axe-handles, billiard cues, etc. Specific gravity 874 (Mueller); dia. 6½ inches; height 20-40 feet" (extract from *Useful Native Plants of Australia*; Maiden). (From private note 22/12/13 from Royal Botanic Gardens, Kew.)

CHERRY, WILD. *Prunus Avium* Linn.
Weight 33–49 lbs. (Boulger). Great Britain, Europe, Asia Minor.

This wood when first cut is light red or pink, darkening on exposure to a deeper tint. It has a close, firm texture, and is capable of a very smooth surface from the tool. Although little valued for many years, it was growing in favour before the war, and since then has been in great demand for many purposes, particularly for chair-making and for the backs of brushes. According to Holtzapffel. "When stained with lime, and oiled and varnished, it closely resembles mahogany; it is much used for common and best furniture and chairs, and is one of the best brown woods of the Tunbridge turners. The wood of the black-heart cherry tree is considered to be the best."[1]

Mr. H. J. Elwes has panelled a room with cherry at Rapsgate Park, near Colesborne, which presents in all respects a very good appearance, equal to mahogany. In *Trees of Great Britain and Ireland* (p. 1540) he mentions "that the pews in the church at Gibside, Northumberland, which were made in 1812 of cherry wood, have not warped or shrunk in the least, the joints being as good as when made," although, as the quotation goes on to say, "the sap-wood in some places is worm-eaten, the heart-wood is almost free from this defect," and this disadvantage of the sap-wood must be borne in mind.

The concentric layers are very conspicuous. The pores are exceedingly fine and numerous. The medullary rays are very strongly marked, and show clearly on the tangential as well as on the radial section.

CHERRY, AMERICAN BLACK. *Prunus serotina* Ehrh.
Weight 36 lbs. North America.

At one time this wood was second only to black walnut among the valuable hardwoods of the United States, but the supplies have been running short for some years past. Gibson says that it has no figure, and that its value is due to its colour and lustrous appearance, and its comparative freedom from checking and warping.

[1] Holtzapffel gives the source as *Cerasus avium*, but from his description it is probable that he confounded the dwarf cherry with the wild.

The wood is often stained to imitate mahogany and is used for furniture work, for interior finishing, and for many minor purposes.

CHERRY, VIC.

Australia.

The timber has a very hard, close, compact grain, and takes a very fine surface from the tool. While in colour resembling that of the European cherry, in grain it is very much harder and of a difficult character. The appearance of the wood gives an expectation that it would split both before and after being worked. As a wood for turnery it might be of service, but it possesses no suitable quality for decorative woodwork.

The pores are extremely numerous and minute, and the very fine medullary rays are hardly discernible under the lens.

CHESTNUT. *Castanea vulgaris* Lam.
C. dentata Marsh, syn. *C. vesca*, var. *americana* Michx. (North America).
Weight 28 lbs. 10 oz. Europe, North America, etc.

This wood is known as Spanish or sweet chestnut and it should not be confused with the horse chestnut, *Aesculus*. Park, grove, avenue, or coppice grown trees provide straight, large, clean boles, which yield good timber for large, long beams, scantling boards, and panelling timber. In colour and grain the wood resembles the appearance of oak so closely that it is most difficult of identification, and in finished work impossible.

Arising from the practice in Northern France and elsewhere, many historical works, including the Westminster Hall roof, have been supposed to be a mixture of chestnut and oak. As a result of the work lately completed at Westminster Hall, it has been stated authoritatively that none of the wood employed was chestnut, but even still a doubt exists, on account of the refusal of the authorities at the time of the repair work to allow inspection. Only if a section of the transverse grain is examined under the lens can a certain decision be arrived at. British-grown trees, especially if park-grown, are very liable to suffer from spiral growth and heart,- star-, and cup-shakes, the last-named defect being the most serious, and these defects render the wood wasteful in conversion. The wood is very durable in all forms of constructional work, either within doors or exposed to the weather, and almost invariably withstands the attack of insects, boring worms (beetles), and fungus. Elwes mentions a park fence of oak and chestnut, where after twenty years the oak was found much wasted, while the chestnut remained as sound as when put in. A large trade is carried on in split chestnut palings for fences, for which

purpose it provides a durable and satisfactory wood, as also for gate posts, piles, and hop-poles. It is also used for the backs of all kinds of domestic brushes.

There is reason to believe that before the sixteenth century, on the Continent, the craftsmen in wood were already aware of the manner in which the use of chestnut mixed with oak formed a preservative to the oak, and the two woods are generally found mixed; if the occurrence is accidental, it is remarkable. The beautiful carved stalls and panels in

SWEET CHESTNUTS AT COWDRAY PARK, SUSSEX
By kind permission of "The Times"

the choir of the cathedral at Amiens are of mixed oak and chestnut, as also is the woodwork of the church of St. Ouen at Rouen. The wood has also been used for other carved work, for which it is very suitable. Elwes quotes Sir George Birdwood as stating that "the late Mr. T. Blashill, who was architect to the London County Council, pointed out in a letter to *The Times* that the only instance he knew of chestnut wood in English mediaeval carpentry is that of the chancel screen of the church, formerly of the Knights of St. John, at Rodmersham, in Kent. The Rev. A. H. J. Massey, Vicar of Rodmersham, tells me, however, that the chancel screen is a modern one of oak, with portions of an ancient screen of chestnut wood

worked into it; but the screen separating the Lady Chapel from the chancel is composed entirely of chestnut wood."

The large beam in the common room of Peterhouse, the oldest College in Cambridge, is generally supposed to be of chestnut, and the utmost examination possible without cutting out, confirms the opinion. The panels taken from the wainscoting of a hall in Ireland were found to be throughout of mixed oak and chestnut, and indistinguishable except on examination with the lens.

Occasionally trees are found which are affected by the same brown colouring which is to be found in brown oak. Elwes refers to one tree which produced some very beautiful wood, used for the doors and overmantel of a room at Rapsgate Park, Colesborne.

The annual layers of growth can be clearly distinguished with the naked eye. The wide, open pores are duplicated, and are occasionally seen in rows of three in the spring wood; they contain small specks of bright shining gum. There are very minute pores in the autumn wood, though they are scarcely visible. The medullary rays can hardly be distinguished even with the lens (+12).

Castanea dentata.—A very similar tree, which provides very large supplies of timber in America. Unfortunately these trees are attacked by fungus and a boring worm, so that of late years large areas of the timber have been destroyed. The wood, the weight of which Gibson gives as 28 lbs., resembles the English chestnut. In America it is used for a great variety of purposes, including fencing posts and rails and railway sleepers. Gibson says: "The largest use by any single industry is probably by the manufacturers of musical instruments, though the honour may be divided with furniture, interior house finish, and coffins and caskets."

A large quantity of this timber is liable, as already noted, to be riddled with small worm-holes. This is sold under the term "wormy chestnut," and has been imported into London and Liverpool, where it has been used for various purposes, such as for cheap furniture, coffin boards, and for veneering on.

CHESTNUT, HORSE *Aesculus Hippocastanum* Linn.
Weight 36 lbs. Great Britain, Europe.

The tree, according to Prideaux Selby, was introduced into Europe about the middle of the sixteenth century. He quotes M. Bom. St. Hilaire, who said that it was brought from the mountains of Thibet to England in 1550.

If the tree be cut down in early winter, promptly sawn into boards, etc., and carefully stored, wood of extreme whiteness may be obtained. If, however, the trunks are felled later in winter, or are allowed to lie for any length of time, the wood assumes a yellowish-brown tint. It is of

moderate weight, soft, fine-grained, but perishable ; used for making soap-bowls, brush-backs, in turnery, and occasionally for veneers. Even with the developments which have occurred since the war, supplies of horse chestnut are not sufficiently valued or appreciated. In Southern Europe it is said to have been used for fruit-storing shelves ; the porous nature of the wood absorbs the moisture from the fruit, the preservation of which is thereby assisted.

The annual rings are marked by a thin boundary line ; the pores are almost invisible and scattered ; the medullary rays are so fine as to be invisible to the naked eye.

CHICARON. *Comocladia.*

Weight 63-64 lbs. Mexico, Central and Southern Australia, West Indies.

VERN—*Guao*, Cuba—*Bressilet franc, chicarrón*, S.D.—*Carrasco, maiz tostado*, P.R.—*Chinil-té, hincha huevos, pata de pava, tatatian, tatatil, teclatilla, tetlate*, Mex.

The colour is a very attractive olive-green brown, with a very hard interlocked grain, showing irregular layers of hard and soft grain, with a rather strong wild pattern. It would form a highly attractive decorative wood.

Record gives the name of Chicaron to *Comocladia*, and Chicarron to *Guazuma ulmifolia*. The description of the latter wood is quite different from the specimen in my collection, which I have identified below.

The pores are open, varying in size, largely duplicated and triplicated, joined together by indistinct wavy belts of light lines, which cross exceedingly numerous fine medullary rays.

Chickrassia tabularis Juss. or *Chukrasia tabularis* Juss.

Weight 49 lbs. India, Burma, Ceylon, Andaman and Cocos Islands.

VERN—*Chikrassi*, Beng.—*Boga poma*, Ass.—*Aglay, agal, eleutharay*, Tam.—*Madagari yembu*, Tel.—*Ganti malle*, Salem—*Dalmara*, Kan.—*Pabba, lál devadari*, Mar.—*Main*, Hyderabad—*Mallei vepu*, Trav. Hills—*Saiphra, sey barasi*, Magh—*Chegarasi*, Chakma—*Yinma, tawyinma, kinthat-putgyi*, Burm.—*Arrodah*, And.

This wood has been called " Burma almondwood " in England, and sometimes " Chittagong " wood in India. Boulger attaches the last name to the produce of *Chukrasia tabularis* and also that of *Cedrela Toona*. If the latter has ever been supplied from any part of India as Chittagong wood, either for a foreign destination or within India itself, it must have been through ignorance, as there is no resemblance between the two woods, each possessing a distinctive value of its own.

Chickrassia tabularis is of a rather dark brown colour, with a lustrous surface and a firm, close texture, sometimes with thin dark gum veins following the line of the concentric layers. While the grain is generally straight, some trees are found possessing beautiful figure of a similar character to that which is found in mahoganies, consisting of roe and mottle, broken roe and mottle, and splash mottle. It is an attractive wood under all conditions, suitable for decorative woodwork, panelling, and furniture, possessing the unique quality of retaining its colour without either bleaching or darkening unduly. Samples were shown at the Empire Timber Exhibition in London in 1920, and the Wembley Exhibition in 1924; but with the general decline in the exploitation of Indian woods brought about by the cessation of those efforts which were made between 1920 and 1924, no headway has been made with this wood in later years.

The concentric layers are marked generally by thin, pale lines, but occasionally by dark blood or gum veins. The pores are small and irregular; the medullary rays are invisible on the transverse grain, but show in very fine flecks on the radial section.

Ch'i-hsii.

China.

Professor Record thinks this is *Daphniphyllium*. This is another wood resembling Pien-ch'ai, like a somewhat discoloured New Zealand kauri pine. It is close-grained, with a very smooth texture and nice quality; Professor Chung's specimen is marked "good for carving Chinese seals"

For identification see *Pien-ch'ai*.

Ch'i-lin. Source unknown.

China.

The colour is a dirty, stainy yellow-brown, with a close, compact grain, and with small, strong, broken stripes of harder and softer tissue, comparable with that of Satin walnut, *Liquidambar* sp., which wood it resembles except in colour. It is liable to warp and twist.

The tiny pores are very numerous, with confused irregular medullary rays, which show in minute flecks on the radial surface.

Chin-ch'ai. Source unknown.

China.

This is a dirty, bluish-straw coloured wood, of fairly hard texture and close grain, resembling the so-called Panama cedar.

The pores are irregular in size, from very small to fairly large, and irregularly placed. The very fine medullary rays are very numerous, and difficult to distinguish through the lens (+10).

CHINGAL. *Balanocarpus Heimii* King.
Weight 65 lbs. Borneo, Federated Malay States, The Straits Settlements.

VERN—*Chengai, penak bunga, penak sabut, penak tembaga.*

The colour of the wood is a warm brown, with a very hard, dense texture, capable of a very smooth surface from the plane, and showing glistening marks of gum in the open pores. It is reported as being used for constructional work and other purposes where durability is essential. Foxworthy says that "this has often been considered the best timber of the Peninsula," but although it is undoubtedly a useful wood, and preferred by the Chinese and native Malayan workmen on account of the ease with which it can be worked, it is unsuitable for decorative woodwork, and very liable to the attack of a small boring worm, so that while it may be very popular in Malaya, it is by no means one of the best of the Malayan woods. It is one of those tested by Foxworthy and Woolley, and survived five years of that test (see PYINKADO).

The medullary rays are fine, clearly marked, and parallel. "It is very much the same as yacal, but may be distinguished from that wood by the fact that the tangential section always shows distinct parallel transverse lines (ripple marks)" (Foxworthy). The pores are numerous and irregular, and are largely filled with a gummy substance which shines brightly.

Ch'i-sha. Source unknown.
China.

A yellow-brown coloured, close-grained wood, with density and texture similar to good African mahogany.

The concentric layers of growth are marked by prominent white lines. The pores, mostly plugged, are numerous and irregular in position; the medullary rays indistinct, but showing on the radial section in tiny flecks.

CHOOI. *Sageraea elliptica.*
Weight 57 lbs. Assam, Chittagong, The Andamans.

The wood is famous under the name of "chooi." Pearson and Brown, in *Commercial Timbers of India*, call it Andaman "bow wood" and give the vernacular as *chai*. It is so strong, and yet pliable, that it has been used by the native Andamanese (a friendly tribe) and the Jaruwahs (a hostile tribe) for the bows from which they shoot their poisoned arrows. The colour is a straw yellow, with an exceedingly hard, bony grain, and the wood is very tough. The combination of exceptional strength, toughness, and elasticity in a wood which is very light in weight, gives to chooi a value that is unique. Pearson and Brown suggest that "it should certainly be tested for hammer and pickaxe handles, picking arms, and

similar purposes. . . . In Port Blair it is used for ribs of boats." But this wood is far too valuable to warrant its use for such purposes as pickaxe handles, for which many far less valuable timbers could be found.

The numerous, very small pores are ranged in waves between innumerable, well-defined medullary rays, forming parallel, but not straight, lines and crossed at right angles by fine lines of light tissue, forming a network pattern.

Chu-mu.

China.

Professor Record says this is *Libocedrus* sp. It resembles Swiss pine, with a canary-coloured tint, is fairly close-grained, and hard. The specimen shows very slow growth, and a medullary-ray appearance on radial section.

Cinnamomum cecicodaphne Meissn.

Weight 36 lbs. (Pearson & Brown). India.

VERN—*Malligiri, marisgiri,* Nep.—*Rohu,* Lepcha—*Gunserai,* Mechi—*Gondhori, gondri, gondserai,* Ass.—*Gundroi,* Cachar.

Pearson and Brown, in *Commercial Timbers of India,* report this wood to be " yellowish or olive-grey in the outer layers, grading to light brown towards the centre of the tree, often with darker lines or bands traceable to seasonal growth and interlocked grain, more or less lustrous, working smooth. . . . The wood is durable, both when placed in exposed positions and when in contact with water. . . . A valuable timber . . . highly prized for furniture. . . . A species to be encouraged and cultivated."

Cinnamomum inunctum Meissn.

Weight 42 lbs. (Troup). India, Burma.

VERN—*Karawé,* Burm.

There is no European name for this wood, which has not yet been imported on a commercial basis. It has the same general appearance as real camphor-wood (*C. Camphora*), with similar black streaks, but it is of an orange-red colour and has a bright sheen. It possesses all the necessary characteristics of a first-rate wood which will stand well under any conditions without warping or twisting. A few logs were imported some years ago, but being entirely unknown their value was unrecognised.

Gamble reports it as being used in India for house-building and for shingles, but Troup says it is suitable for cabinet-making, and with the latter opinion I agree ; if employed for constructional work it would be a wasteful use of a fine wood. It possesses a slight, pleasant aromatic scent.

The pores, which are not very clearly defined, are irregular in size, and are partially plugged with bright, shining gum (?). The medullary

rays are rather ill-defined, although regular and clearly apparent. According to Gamble, the rays give a good silver grain. They are not apparent in my specimen.

Cinnamomum zeylanicum Breyn.

Weight 40–43 lbs. (Gamble). India, Burma.

VERN—*Dalchini*, Hind.—*Karruwa, lalsingh, lavunga*, Tam.—*Ohez, bojewar*, Mar —*Sanalinga*, Tel —*Eringolam, elavangam, vayana*, Mal. —*Lavanga*, Trav. Hills—*Kurundu*, Cingh.—*Hmanthein, thitkyabo*, Burm.

This is the cinnamon tree. It must not be confounded with the wood reported as cinnamon from St. Vincent (*q v.*).

When fresh cut it is of a yellow straw colour, but on exposure to light and air it tones down to a whitish straw colour with rather a dirty appearance. The grain is fine and smooth, finishing with rather a silky effect from the tool, but the wood warps and twists badly; even after being thoroughly seasoned it has been found that it will not keep its shape in any position, so that it is entirely unsuited for ordinary works where a wood of such appearance might be employed.

This is the wood spoken of as being included to the extent of 75 per cent in the shipment of what was supposed to be true camphor-wood which was received from Formosa. It has a strong scent of balsam of aniseed. It can be identified as mixed with real camphor-wood in the well-known Chinese seamen's trunks, and is to be found forming the tops and bottoms, and even sometimes all, except perhaps one side. I have not found it in the older made trunks, but it is largely used in those offered for sale in the Eastern bazaars to-day. A wardrobe in which the sides and doors were made of this wood, improperly used instead of camphor-wood which was demanded, continues to shrink and expand, warp and twist, with every change in the weather.

The pores are rather small and numerous; there are concentric bands showing in fine white lines at irregular intervals, which are easily seen with the naked eye. The numerous parallel medullary rays show rather faintly under the lens (+12), and although not apparent to the naked eye on the radial section, they show quite clearly under the lens.

CINNAMON. Source unknown.

St. Vincent.

A specimen of cinnamon-wood, said to have come from St. Vincent, is in my collection. It is of a heavy, dense, hard, close-grained texture, taking a very smooth surface from the tool. It has a faint scent somewhat like that of cedar. The colour is a dull brown, shading generally to a dark walnut colour. The wood should be excellent for turning.

Both pores and medullary rays are exceedingly fine and obscure.

COACH WOOD. *Ceratopetalum apetalum.*
Weight 56 lbs. (Baker). New South Wales, Queensland, and North Coast of Australia.

Baker says: "Coach wood has a distinctive aroma of 'Courmarin,' this alone being quite sufficient for identification." But the ordinary reader may not know what courmarin is. The colour is a slightly reddish-grey brown, with a grain which displays a delicate softness in appearance and touch, very smooth, and not unlike kauri pine. The wood is not yet commercially known, but during the last year (1930) there have been a few inquiries for it.

The pores are numerous and minute, in tiny wavy belts. The medullary ray is exceedingly minute, and shows on the radial section in the tiniest flecks, presenting a somewhat lace-like appearance to the surface of the wood.

COCAO. *Erythroxylon Coca* Lam.
Weight 69 lbs. Brazil.

VERN—*Aroba, aroba colorada, jibá de costa,* Cuba—*Coca, ayuelo,* Col.—*Clavito,* Venez.—*Arco de pipa, cataúba, catauba, fructa de pomba, fructa de tucano, ipadú, mercurio do campo,* Braz.—*Ajicillo, coca del monte,* Arg.—*Coca, cuca,* Peru.

The colour of this wood is a yellowish nut-brown, and it has a very firm, close texture. *Brazilian Woods* recommends it for turning, for which purpose it appears to be admirably suited. The tree, the leaves of which are chewed by the Peruvian Indians, is probably better known for its product, cocaine, than for its timber uses.

Record states that it serves locally for fencing, telegraph poles, railway ties, and sometimes for turnery and cooperage.

The pores are exceedingly small and very numerous. The medullary rays are so fine that even under the lens (+10) they require a strong light to be distinguished. The concentric layers are marked by narrow dark bands.

COCOBOLO. *Dalbergia retusa* Hemsl.
Weight 85 lbs. 14 oz. Tropical South and Central America (Nicaragua, Panama, and Costa Rica).

VERN—*Cocobolo* or *cocobola,* Trade—*Nambar, ñambar de agui, ñamba, nnambar, rosewood, cocobolo ñambar, cocobolo negro,* C.R.—*Nambar ñambar legitimo, rosewood,* Nic.—*Cocobolo, cocobolo prieto,* Pan.—*Granadillo,* Mex., Hond.—*Melón,* Salv.—*Cocoboloholz,* Germ.—*Red foxwood.*

The supplies of this wood are imported in the form of short cylindrical logs, half-flitches, and pieces of various shapes and sizes which are from one to three feet in length, gnarled and twisted, and include knots, worm-

holes, decayed heart, and other defective patches. The striped heart-wood shows alternate bright orange and deep red bands, the latter being often streaked with dark or even black veins. Its rich, handsome appearance sometimes has the effect of tortoiseshell, both as regards colour and marking. It is hard and heavy, yields a fine surface from the tool, and is especially suited for turnery. When planed or turned the smooth face is cold to the touch, like fine marble. Well polished this is a brilliant wood, and is used for the backs of brushes and hand glasses, handles of knives, forks, and tools, and in fancy cabinet work. Cocobolo wood deserves much wider use, but is insufficiently known. Supplies of good quality are scarce, and the demand is irregular.

From Central America and Mexico two species have been identified as *Dalbergia hypoleuca* Pittier and *D. Granadillo* Pittier. The species in Panama and Colombia is *Dalbergia retusa* Hemsl. (Record).

In transverse section indistinct layers are seen which may or may not represent annual rings. The pores are large, visible to the naked eye, scattered and not numerous, and have glistening contents. The extremely fine medullary rays are invisible, but with the magnifying glass stand out as light lines which are very numerous (being closer together than the width of the large pores). Linking the rays at right angles are very numerous similar light thin lines, so that the field is divided into countless minute squares. The tangential section shows transverse striped pattern, indicating that some of the constituents are arranged in tiers.

COCUS WOOD. *Brya Ebenus* DC.

Weight 69 lbs. West Indies.

VERN—*Cocus* or *cocos wood, granadillo, green, brown, American, West Indian,* or *Jamaica ebony, torchwood,* Eng.—*Amerikanische ebenholz,* Germ.—*Legno granadillo,* Ital.—*Granadillo,* Span.—*Granadillo, ojo de perdiz,* Cuba.

Supplies of this wood come in a somewhat irregular manner in round logs from 2 to 8 inches in diameter. There is some confusion as to the source of the supplies, though the probability is that shippers and merchants supply any botanical variety they can find which is sufficiently alike to be given the name. Some of the wood known by the name of canalete would have passed for cocus wood. It is hard and very heavy. The sap-wood is a very light yellow, and the heart-wood of a brown yellow. It somewhat resembles a brownish-yellow Coromandel wood. It is used for policemen's truncheons, flutes, bagpipes, brush backs, handles of knives and tools, and all kinds of turnery and inlay.

The pores are very small and obscure ; the medullary rays are exceedingly fine and even ; they are parallel and so regular that they would almost appear to be artificial.

CONCHA SATINWOOD.
See HAREWOOD.

CONDURU. Source unknown.
Weight 69 lbs. Brazil.

This handsome orange-red wood with its firm texture and smooth grain is very like a bright Spanish mahogany, though it appears to lack the contrary hard and soft grain characteristic of that wood. It would probably prove to be a good chairmaker's wood.

The rather small pores are scanty and irregularly distributed; they are generally plugged. The medullary rays are fairly numerous and are irregular in size and position. There is a strong ripple ray on the radial section.

COPIE. *Goupia glabra* Aubl.
Weight 51–55 lbs. (Record). British Guiana, Brazil.
VERN—*Cupiúba, cupiúva,* Braz.—*Copie, copi, couepi, coupi, goupi, koepi, kopie, cabacalli, kabukalli, kaboekalli,* Guianas.

The colour of the wood is a light reddish-brown, or grey, with a close, coarse grain, and an unpleasant odour when fresh cut. Used for sleepers, paving blocks, boat building, and furniture, and also for native canoes.

The pores are rather large and readily visible, numerous, well distributed, mostly solitary, without definite arrangement, open. Medullary rays very fine and numerous, almost invisible except on the radial surface.

CORACAO. Source unknown.
Weight 59 lbs. Brazil.

The colour is reminiscent of the deepest kind of dark-coloured Italian walnut, relieved with lighter and darker coloured streaks. It has a smooth even texture, and would probably make a fine cabinet wood.

The very numerous pores are irregular in size, though they are generally fairly small; they are mostly plugged, and are so joined in threes and fours as to form a kind of pattern. The medullary rays are very fine and are indeed hardly discernible. Bands of darker coloured wood show the concentric layers.

CORACAO DE NEGRO. Source unknown.
Weight 74 lbs. Brazil.

The colour is brick red, with so close and tight a grain that the wood presents a wonderfully marble-like appearance. The Handbook of the Ministry of Agriculture describes the wood as useful only for common and

inferior work, but my specimen suggests that it would be an excellent medium for the finest cabinet work. There is little resemblance between this wood and the sample marked *Coracao* (*q.v.*).

The pores are very minute. The medullary rays are sharply defined, wavy, and very numerous; they show in small flecks on the radial section.

CORAL WOOD. *Adenanthera pavonina* Linn.

Weight 56 lbs. India, Burma, The Andamans, West Indies.

VERN—*Rakta-chandan, ranjana,* Beng —*Ani kundamani,* Tam.—*Bandi gurivenda,* Tel.—*Manjati,* Mal —*Thorlaganj,* Mar.—*Manjadi,* Kan.—*Gung,* Magh.—*Ywegyi, ywgee,* Burm.—*Rechedá,* And.—*Madatiya,* Cingh.—*Bois de corail,* Fr.

The first shipments of this wood on a commercial scale were made in 1920, for the Empire Exhibition at Holland Park. Yet this species was mentioned by Holtzapffel over seventy years ago as being used by the French, who called it " bois de corail," and it is under the English equivalent of " coral wood " that the timber is now known in commerce. The French supplies, however, were certainly not received from British territory, but possibly from either Indo-Chin or from French possessions in the West Indies, where the tree is also found. Charpentier, for instance, reported it from Martinique.

When first cut, the wood is gamboge yellow with a touch of brown, but after exposure it matures to a bright golden red, or to a coral shade, so that it might easily be mistaken for a Spanish mahogany. It possesses very rich mahogany figure, and is one of the most decorative timbers. An electric-light standard in Indian coral wood was shown at the above-named Exhibition, which was greatly admired; the wood has since been used successfully for cabinet-making and turnery. The following exhibits in coral wood were also shown: two small settees in French style, made by Mellier, Ltd.; French type ornamental pedestal for vase, made by Mellier, Ltd.; four chairs, in French style, designed and made by Mellier, Ltd.; also a pair of electric-light table standards, and table, of French design, made by Mellier, Ltd.

A block of wood recently (1932) taken out of the old Woolwich Dockyard, which is supposed to have been in the building for 150 to 200 years, upon examination seemed to agree with the identification of *Adenanthera pavonina*, the structure of the wood being almost exact. No other botanical variety comes near to it, and Prof. Record, to whom I submitted a sample, agreed with me that it was almost an absolute certainty. A specimen of wood over 150 years old is not altered in its wood structure, but the characteristic evidences under the lens become somewhat

obscured. I think the wood is certainly *A. pavonina*, in which case it was probably brought from the Andamans.

There is some confusion among the botanists about this timber, as the botanical name has undoubtedly been given to two different woods. Holtzapffel (1852) quotes Bergeron: "Coral wood was named from its colour. When first cut it is yellow, but soon changes to a fine red or superb coral. It is hard and receives a fine polish. The Coral Tree, so called from the colour of its flowers, is *Erythrina Corallodendron*; but the *Bois de Corail* of the French is the wood of *Adenanthera pavonina*, which is hard, reddish-coloured, and sometimes confounded with red sanders wood."

The pores are fairly large, and often surrounded by a ring of loose tissue. The medullary rays are straight, exceedingly fine, and very numerous.

CORDIA SPP.

Weight 28–56 lbs. (Gamble). India and Burma.

According to Gamble there are "thirteen species fairly evenly distributed over the country, some of them having useful woods, deserving of being better known and more in use, especially for furniture." Of these species only two have been noticed as a commercial proposition, namely, *Cordia fragrantissima* and *C. vestita*. Specimens of *C. Macleodii* show that the wood of this variety is indistinguishable from the others, and equal, if not better, in quality, colour, and style. The grain is hard and capable of a very smooth surface from the tool. It seasons, works, and polishes well, and produces a most attractive and valuable decorative wood for all high-class works of art. The colour is a dark reddish-brown, with darker streaks.

The woods of all the Cordia species have a fragrant scent, more pronounced in some than in others. The scent, however strong when the wood is being worked, does not remain persistent in the finished article, as in the case of many other woods.

The commercial import of *C. fragrantissima* was made under its Burmese name of "sandawa," and the instance provides an example of the disadvantages of the use of a local vernacular name for a wood, as it was found impossible to interest any of the usual buyers of fine woods.

The wood of *C. Myxa* is much inferior in every respect, and possesses no quality sufficiently attractive to make it worth remark. The colour is a dirty brown, and the wood is far softer.

C. fragrantissima.—The pores vary in size, in roundish patches, which are joined by occasional broken concentric lines. Medullary rays rather distant, moderately broad, with a well-marked and rather handsome silver grain.

C. vestita.—Description similar to the above.

C. Macleodii.—Description similar to the above.

C. Myxa.—The pores are somewhat scarce and very irregular both in size and position. The rest of the marking is in all respects similar to that of the Cordia spp. as named above, excepting that it is on a minute scale, being rather less than half the size throughout.

Brazil produces several varieties of Cordia, but I have only two specimens in the Brazilian collection, one named Louro (*Cordia frondeus*) and the other Louro cheirozo.

Louro, C. frondeus.—The pores are very small, rather sparse, and plugged ; medullary rays hardly discernible under the lens.

Louro cheirozo.—The concentric layers are marked by darker and lighter lines, otherwise similar to the preceding.

CORKWOOD. *Ackama Muelleri* Benth.
Weight 38 lbs. Eastern States of America.

Known also as brown alder, sugar bark, and pencil cedar. *Tropical Woods* reports this as a " pinkish-brown to reddish-brown wood, fine-textured, without distinctive figure, requires care in seasoning. Suitable for joinery, flooring, mouldings, carving, brush stocks, boot heels, etc."

CORKWOOD or MARARA. *Weinmannia rubifolia* F. v. M. (Forestry Commission, Sydney).
Weight 43 lbs. New South Wales.

The colour of the wood is a light straw yellow, with a firm, fairly mild grain, capable of a smooth surface from the tool.

Tropical Woods reports this wood as *Weinmannia lachnocarpa* F. v. M., and as being " used for heavy coach and carriage construction, general building purposes, mallets, chisel handles, golf-club heads, machinery bearings, etc."

The concentric layers of growth are clearly marked by lighter and darker lines. The exceedingly scarce pores are very small, and mostly open. Medullary rays are confused, difficult to locate, with continuous wavy belts of fine tissue following the layers of concentric growth.

CORNEL.

See DOGWOOD.

COROMANDEL or CALAMANDER WOOD. *Diospyros* sp.
Weight 70 lbs. 5 oz. India, Burma, Ceylon.

D. quaesita.

VERN—*Kalumédiriya,* Cingh.

D. Melanoxylon.

VERN—*Tendu, temru, timburni,* Mar.—*Tumi, tumki, tumida, timmurri, damádi, tuki,* Tel.—*Balai,* Kan.

D. Kurzii.

VERN—*Pecha-da,* And.—*Teakah, thitkya,* Burm.

Diospyros sp.

VERN—*Buey,* Malay.

This name is one by which several different species of ebony (*Diospyros*) are known, when they possess a particular kind of marking and colouring. According to Holtzapffel, Coromandel or Calamander wood is *Diospyros hirsuta,* but Gamble gives it as *D. quaesita.* The description given by Holtzapffel is as follows: "The figure is between that of rosewood and zebra-wood; the colour of the ground is usually of a red hazel-brown, described also as chocolate brown, with black stripes and marks." He further adds that there are three varieties, "the Calamander or Coromandel, which is the darkest, and the most commonly seen in this country, the Calemberri, which is lighter coloured and striped, and the Omander, the ground of which is as light as English yew, but of a redder cast, with a few slight veins and marks of darker tints."

Certainly of later years it is exceedingly doubtful whether supplies of Coromandel wood have been confined to one, two, or even three varieties. Similarly marked and coloured wood has been obtained from several different sources and from different varieties, all of which have been described for commercial purposes as ebony when first marketed, and as Coromandel wood when sold in the converted form, either as boards or veneers. Of these the supplies from Macassar have produced the largest sizes and the best colouring.

When I visited Ceylon early in 1922 I made every effort to see a Coromandel or Calamander tree growing, but although it was thought that one could be shown, after travelling many miles it was not forthcoming, and the Forest Officer told me that he doubted whether it would be possible to find one. I was able to purchase one exceedingly small piece, about 5 inches in diameter, which was all that could be found of this timber.

Taking authentic specimens of three different sorts, (1) Macassar, (2) *Diospyros Melanoxylon,* (3) *D. Kurzii,* the face appearance is so similar that they might all have been taken from the same tree. The Japanese variety *D. Kaki,* which is much lighter in weight, is often very similar, but the marking is on a smaller scale, and the light colouring is of a more yellow shade. There is also a slight difference between these three varieties in the transverse grain.

Macassar.—The pores are irregular in size and position, and are often

filled with a bright, shining gum. The medullary rays are very indistinct, exceedingly fine and irregular.

Diospyros Melanoxylon.—The pores, which are smaller, are more scarce than in the Macassar wood, also often filled with shining specks of gum ; the medullary rays are stronger and more clearly defined.

D. Kurzii.—The pores are minute and very numerous, and the rays very indistinct.

Yet another source of supply of so-called Coromandel wood has been found in some occasional trees of Ceylon ebony (probably *D. Ebenum*, *q.v.*), which show the same marking and colour. If, therefore, at some much earlier date the name was applied only to the produce of a distinct variety, it has now become the common term for a particular form of marking and colour, produced by several different species of *Diospyros*.

The wood is used for decorative furniture in various fashions. Beautiful tables and cabinets, pianoforte-cases, small ornamental boxes and jewel-cases, have been made with this wood, which has also been used for shop-front decorations and fitments. In the Victoria and Albert Museum at South Kensington is a handsome armchair of Dutch manufacture, dating from the early eighteenth century, which is made of walnut and Calamander wood.

For description see EBONY, *Diospyros*.

Cotoneaster frigida Wall.

Central and Eastern Himalaya.

VERN—*Hurunay*, Badaga (?).

A shrub yielding a whitish-yellow straw-coloured wood, with a very close, smooth grain, not unlike boxwood, very hard and suitable for turning.

Concentric layers clearly marked by a thin white line. Pores exceedingly small, hardly discernible under the lens. Medullary rays numerous, in wavy belts, and showing in the tiniest flecks on the radial section.

COTTONWOOD. *Populus deltoides* Marsh and other spp. of *Populus*.

Weight 25 lbs. The United States.

This is the cottonwood of commerce, and should not be confounded with the cotton tree of India (*Bombax malabaricum*) (*q.v.*). The supplies are the produce of several species of *Populus*, of which the above-named is the principal. The wood owes its name to the cotton-like coma which is to be found on the seeds of the tree. The wood is of a creamy-white colour, and has a smooth, even texture, slightly lustrous in appearance.

Gibson says that cottonwood is made into nearly every kind of box that goes on to the market, from the cigar-box to those in which pianos

are shipped. Amongst its other uses he mentions interior finish, bank and office fixtures, musical instruments, vehicle tops, and furniture. It is largely used for ply-wood in this country.

The very numerous pores are exceedingly small and are only visible under the lens. The medullary rays are fine and very numerous. Dark concentric lines mark the annual rings.

COW-TREE.

See MESSARANDUBA.

CRABWOOD. *Carapa guianensis* Aubl.

Weight 38–46 lbs. (Stone & Freeman). British Guiana.

VERN—*Crabwood, andiroba, British Guiana, Demerara,* and *Brazilian mahogany,* Trade—*Crabwood, white crabwood, lowland crabwood, highland crabwood, caraba, white caraba, karaba, karapa, British Guiana mahogany,* B.G.—*Crappa, crapa, krappa, crappo, karapa, krapaboom,* Sur.—*Carapa, carapa jaune, carapa rouge, carapa blanc, crapo, andiroba carapa, bois caille,* Fr. G.—*Bois rouge carapat,* Guad —*Andiroba, andiroba branca, andiroba-saruba, andirova, angiroba, nandiroba, nandirova, yandiroba,* Braz.—*Caoba,* C.R.—*Osuabise, osokoru, asoroa,* Gold Coast, Africa—*Crabbaum,* Germ.—*Batteo* ? Pan.

This wood has only been imported in small quantities and in boards and planks, although it would appear to be available in long logs up to 60 feet, and of wide squares up to 3 feet in cross-section. It is of a dull brownish-red mahogany colour, and assumes a glossy, lustrous surface from the tool. It has a hard grain which, running in reverse directions, tears up under the plane, so that a smooth surface is obtained with difficulty. Being inclined to warp, it could only be used as a substitute for cheap mahogany, which can generally be produced from elsewhere at a less cost ; it has little to recommend it for general use.

It has sometimes been incorrectly termed South American mahogany. A legitimate alternative name is carapa, which is derived from the native Guiana name caraipi.

The pores are small and irregular, and show bright specks of shining gum. The medullary rays are fine, and parallel but irregular.

Crataeva Adamsonii.

The Sudan.

The native name is " dubker." A gamboge yellow-coloured wood with a hard, close, bony grain, producing a smooth surface from the tool. Probably only small sizes are obtainable, but information is lacking.

The very small pores are exceedingly fine ; medullary rays hardly discernible under the lens.

Crataeva Roxburghii Br.

Weight 33–47 lbs. (Gamble). India, Burma, Ceylon.

VERN—*Brarua, bárua, bilási, bila, biliana,* Hind.—*Barún, tikto-shak,* Beng.—*Barmál,* Melghát—*Varana, barana,* Jeypore—*Purbong,* Lepcha—*Tailadu, bunboronda,* Mechi—*Maralingam, marvilinga, navala,* Tam.—*Uskia, usiki, ulimidi, urumatti, tella voolemara,* Tel.—*Nirvála,* Kan., Mal.—*Bitúsi,* Kan.—*Kúmla, karwan,* Mar.—*Nirujani,* Coorg—*Kadat, kadet, kon-kadet,* Burm.—*Luna-warana,* Cingh.

A bright, yellowish-white wood, with a smooth, close grain. Gamble says: "The smooth wood is used for drums, models, writing-boards, combs, and in turnery, but is anything but durable and very liable to the attacks of boring beetles." Trimen says it is planted in Ceylon for its bitter leaves, which are used as a stomachic.

The concentric layers are marked by lighter and darker lines. The pores very numerous, small and plugged. Medullary rays very strong, thick, irregular, and in wavy lines, showing on the radial section in fine flecks.

CRAVO DO MARANHÃO. *Dicypellium caryophyllatum* Nees.

Weight 40 lbs. Brazil.

This wood is of a pale straw colour and has a lustrous surface. There is not much to recommend it for decorative woodwork. *Brazilian Woods* reports that the tree attains a diameter of 1 to 2 metres, and is used for all kinds of works which require great strength, such as parts of hydraulic wheels. This authority also speaks of the wood as being scented, but my specimen has no scent.

Concentric layers are conspicuously defined by a dark band. The pores are small and numerous, and the medullary rays are very fine.

CROWSFOOT ELM. *Tarrietia argyrodendron* Benth.

Weight 57 lbs. New South Wales, Queensland.

The wood is of a rather bright brick-red mahogany colour, with a smooth, fine grain, yielding a very clean, smooth surface from the tool. A very attractive wood which stands well, and would be useful for decorative woodwork, furniture, desks, chairs, etc. Baker reports it as seasoning quickly but liable to deteriorate if left in the log, and says it has been used for interior panelling in some of the Queensland railway carriages, and ships' cabins, also for brush backs, ornamental boxes, turnery, furniture, etc. If this wood can be provided on a competitive basis with mahogany it should have a good future.

The pores are irregularly placed, small to medium in size, mostly open, with rather coarse, pronounced medullary rays very numerous and showing

in a small pattern of flecks on the radial section. The medullary rays are crossed at right angles by wavy, thin lines, causing a network pattern.

Crypteronia paniculata Blume.

Weight 39 lbs. (Pearson & Brown). Lower Burma.

VERN—*Ananbo*, Burm.

Pearson and Brown, in *Commercial Timbers of India*, report this wood as "light yellowish-red to light red when first exposed, ageing to a uniform light reddish-brown; heart-wood not distinct, . . . straight-grained, fine and even-textured. . . . Used for building, as planks and boards. . . . It yields a good board very suitable for flooring."

CUARUBA. *Vochysia* sp.

Weight 31–32 lbs. Brazil.

The name "quaruba" is given to a number of varieties of *Vochysia*. My specimen, marked as above, is pinkish-brown in colour, showing a wide red gum vein, with a soft, rather open, coarse grain, and a slight lustre. Record reports that the woods of *Vochysia* sp. as a whole are light and soft, tenacious and strong for their weight, easy to work, and suitable for the purposes to which the softer grades of non-durable conifers are now employed.

The scarce, widely scattered pores, from very small to rather large, are mostly open. The medullary rays are somewhat coarse, with secondary rays rather obscure.

CUDGERIE. *Flindersia Schottiana* F. v. M.

Weight 42 lbs. (Swain). New South Wales.

Known as silver ash in Queensland. The wood of this tree should not be confused with that of the Queensland cudgerie or bolly gum (*Litsoea reticulata*) or with *Flindersia australis* (*q.v.*), which also goes by the name of cudgerie, both these timbers having very different characteristics.

F. Schottiana is of a greyish-white or tawny colour, the wood is firm, tough, strong, straight and open-grained, and works well but is not durable in the ground; it is reported as being used for various works in Australia, including house-building, etc., and standing well. Supplies are fairly plentiful.

Cullenia excelsa Wight.

Weight 31–42 lbs. (Gamble). India, Ceylon.

VERN—*Malai-konji, aini-pillao, vedupla*, Tam.—*Katu-boda, kabodda*, Cingh.—*Karani*, Kader—*Kar ayani*, Trav. Hills.

A dirty-coloured uninteresting wood, of little value, reddish-grey in colour, soft and light. Gamble says the wood seems good, but he quotes

Bourdillon, who gives the weight as 34 lbs. and says it is worthless, with which opinion I am in agreement.

The pores are scarce and small, partially plugged, in belts. Medullary rays confused, hardly discernible under the lens on the transverse section, but showing faintly on the radial section.

Cunonia capensis Linn.

South Africa.

A brown-red coloured wood, strong and close-grained. In use in Cape Colony and South Africa, but not met with in commerce. Named by the Dutch " Rood Els," and, incorrectly, cedar.

CUNURU or CUMARU. *Dipteryx odorata* Willd.

Brazil, Guiana.

VERN—*Tonca bean, tonka bean, tonga bean, tonquin bean, tonkin bean,* Eng.—*Cuamara, kumara, gomorrow,* and preceding names, B.G —*Tonka, tonka boon, comarre, quamare, groot locus,* Sur —*Gaiac, gayac, gayac male, gayac de Cayenne, faux gayac, fevrier tonka,* Fr G —*Bois de coumarouna,* Mart.—*Gayac de Cayenne,* Guad —*Sarrapia,* Venez , Col —*Cumaru, cumaru amarello, cumaru do Amazonas,* Braz.—*Koemarie,* Hol.—*Cumary, camiri,* Ital.—*Coumarounaholz, gaiacholz,* Germ.

This is described by Record as one of the most beautiful trees of northern South America, the tree which bears the well-known tonka bean, which is universally known as used " in flavouring snuff, cigarettes, cigars, cocoa, confectionery, etc.," and this bean thirty to forty years ago was largely carried on account of its pleasant scent.

Record also states: " A clear yellow oil, known on the market as cumarú, is also obtainable from the seeds and is used medicinally."

The timber is hard and heavy, with a close interlocked grain, strongly resembling lignum-vitae ; capable of a very smooth, close-textured surface, and with a distinctly oily feeling to the touch. The colour is a warm yellow-brown, somewhat streaky.

The wood has not been seen in commerce in the United Kingdom. In a private letter from Brazil the writer, having referred to its usefulness as a substitute for lignum-vitae, corrects himself by saying that the word "substitute" is wrong, as it is even more useful for many of those purposes for which lignum-vitae is unique, and has been found superior in the construction of stern-tube bushes.

If this report is to be relied upon there should be a future for cunuru, as Record reports that the trees are " found 150 feet high and over 3 feet in diameter," good sizes could be obtained, and supplies of large-sized lignum are diminishing.

The very small pores are irregularly placed in wavy belts, always

plugged. The medullary rays are very numerous, but so fine as to be difficult to discern under the lens (+ 10), and crossed at right angles by similar very fine light lines, making a delicate network pattern.

Cupressus Macrocarpa Gord.

Western and Southern Europe, California, South America, New Zealand, Australia.

The "Monterey cypress." The wood of this tree, while harder than that of the wood of *Thuya plicata*, in other respects resembles it so closely that a separate description is unnecessary.

Sargent reports it as heavy, hard, and strong, very durable and close-grained. Trees in England produce knotty and coarse growth, but if sound pieces could be obtained without loose or rotten knots, it would become useful for furniture, panelling, or fittings, having much the same appearance as pencil cedar.

Cupressus torulosa Don.

Weight 38 lbs. India.

VERN—*Devi-diár*, Ravi—*Deodar*, Kulu, Bhajji—*Gulla, gulrai, kallain*, Simla—*Leauri, leori*, Jaunsar—*Raisalla, sarai*, Kumaon—*Rasúla*, Garhwal—*Dhúpi*, Dotiál—*Sarrú, súrahvyu, surin*, Tibet—*Himalayan cypress.*

The wood is of a pale yellow-salmon colour, with a straight smooth grain; it resembles pencil cedar (*Juniperus virginiana*) but is slightly lighter in shade. It has a strong and agreeable, fragrant scent. As with the timbers of other varieties of cypress, it appears to be very durable, Gamble reporting it as even more "durable than deodar, as is shown by the results of buried sleepers of the wood at Dehra Dun. These pieces were put down in 1881 and taken out in 1892, and the Cypress wood was found to have resisted best of all . . . is frequently employed for temples in the Himalaya, as well as for images and poles to carry the sacred arks." It is reported that the wood is not common and unlikely to be of commercial importance.

The concentric layers are marked by a strong dark vein, which is also conspicuous in the radial and tangential sections. The medullary rays are hardly discernible with the lens (+ 12).

CURUPAY. *Piptadenia Cebil* Grisebach.

Weight 73 lbs. 13 oz. South America.

VERN—*Curupay, curupay negro*, Arg.—*Curupay*, Braz.

In 1894 a cargo of hewn square logs of good length and size was imported into Liverpool from Rosario in the Argentine. The wood varies in colour from orange-grey to greyish-brown, with dark streaks and veins;

some of it is reddish-brown, while much is handsomely marked with a wavy, curly grain. It has a faint aromatic scent, and the same cold, rather sticky feeling that is found in pyinkado (*Xylia dolabriformis*), to which wood, in other respects, there is some similarity. The timber has been used satisfactorily as a substitute for African oak for dock work, while some of the finely marked pieces have been converted into veneers, which give a beautiful decorative appearance.

Baterden says that curupay has " been a good deal used for piles and jetty work in the Argentine, and in such situations has lasted over thirty years."

The concentric layers are marked by very dark and light wavy bands. The pores are uniform, and the medullary rays parallel and regular.

CUSHIMUCHO. *Michelia compresa* Max.

Weight 38 lbs. Formosa.

This wood has an unusual and attractive appearance, being of a rich golden-brown colour, somewhat like that of a dark-coloured honey, with a lustrous sheen, and as it has a close grain with a firm texture, and is capable of a smooth surface, it would make a useful wood for decorative cabinet work.

The pores are exceedingly small and numerous, and are generally plugged. The medullary rays are equidistant and parallel, and show very finely on the radial section.

Cynometra ramiflora Linn.

Weight 58 lbs. (Gamble). Southern India, Burma, Ceylon, The Andamans.

VERN—*Shingra, shingar,* Beng.—*Irapu,* Tam.—*Gal mendora,* Cingh.—*Myin-ka, yeminga,* Burm.

The colour is a golden brown, the wood having a very close, smooth grain, not unlike greenheart. It is valuable for high-class decorative woodwork and cabinet-making, banding, inlay, turnery, and a good substitute for greenheart, lancewood, and other similar woods.

Gamble quotes Skinner that " the wood is used for house- and cart-building, and that chips of the wood give a purple dye in water. In the Sundarbans it is used for posts for native huts and for fuel."

The uses to which this wood have been put again illustrate the uneconomical manner in which Indian timbers are used, and the failure, up to now, to fully develop these resources.

The pores are very small, exceedingly numerous, and plugged. The medullary rays are fine, strongly marked, and crossed at right angles by extremely fine similar white lines. The transverse grain under the lens closely resembles that of African oak (*Oldfieldia*).

CYPRESS. *Cupressus sempervirens* Linn.
Weight 20 lbs (Baterden). Cyprus, Asia Minor, Great Britain.

This wood is not known commercially in the United Kingdom. Elwes says: "It is uncertain when the cypress was first introduced into England. The first mention that we know of it is by Turner, who was physician at Syon in 1548." He says of the wood: "The timber is light brown in colour, hard, and close-grained. . . . The wood is easy to work, and gives off a penetrating, agreeable odour. It is very durable, lasts indefinitely under water, and longer than oak when used for vine-props. In France and Italy it is considered excellent for furniture; and the doors of St. Peter's at Rome, which lasted from the time of Constantine to that of Pope Eugene IV., nearly 1000 years, were said to be made of cypress." He concludes by quoting Shakespeare, in *The Taming of the Shrew*, II. i. 353:

> In ivory coffers I have stuffed my crowns,
> In cypress chests my arras counterpoints,
> Costly apparel, tents, and canopies

CYPRESS. *Podocarpus Coriaseus* Rich.
British Honduras.

An uninteresting grey wood capable of producing a very fine, close surface.

The concentric layers are very narrow, and marked by light lines; the medullary rays are so fine and insignificant as to be hardly discernible with the lens. Shows an exceedingly fine ripple ray on the tangential surface.

CYPRESS, BALD. *Taxodium distichum* Rich.
Weight 33 lbs. 8 oz. Southern United States.

VERN—*Bald cypress*, Eng.—*Ahuehuete, ahuehuetl, ciprés, ciprés de Montezuma, cipreso, pentamón, sabino, pentamu, tnuyucu, yaga-chichicino, yaga-guichi xiña, yucu-ndatura*, Mex.

This is the deciduous cypress. It is imported in the form of planks and boards of various qualities, but only of late years in any considerable quantity. It is yellowish-red, often nearly salmon-coloured. In the United States it is used so extensively that Gibson writes: "The uses are so nearly universal that a list is impossible." Another American authority, Hough, says: "Its great durability, immunity from the attack of parasites, and non-liability to great shrinking or warping make it one of our most valuable woods for all woodwork exposed to weather, for tank construction, cooperage, etc." These qualities, combined with a sharp segregation of the hard and soft grain, and with a scantiness of resin, should bring this wood into more general use. It is especially satis-

factory for out-houses and green-houses, and where so used will probably outlast any other kind of softwood, even when unpainted. One such unpainted building in this country has survived for six years, and the wood, though subject to continual heat and moisture, is quite sound throughout. The English-grown wood appears to possess equally good qualities, and where available should be used for exposed woodwork. It differs from the American-grown timber that reaches this country [1] in colour, which is light yellow, and in appearance it recalls Lebanon cedar. There is a liability for the hard grain to rise and the soft to sink, so that the wood is apt to show a ridgy surface.

Gibson has made a statement which suggests that the remarkable durability of this wood is somewhat doubtful, but there is reason to question his opinion. Professor E. S. Sargent, in a private letter (March 3, 1915) on this subject, says: "The wood *Taxodium distichum* is considered to be exceedingly durable, and I do not know on what authority Gibson has made his statement. It is not impossible, of course, that the wood of a diseased tree, or one that had grown under abnormal conditions, might be of poor quality."

A very large quantity was purchased by the British Government during the war for aeronautical construction, but it was found to be unsuitable, and led to deplorable results.

The annual rings are marked by the alternation of the soft, open-meshed spring-wood and the hard, closer-grained summer-wood. The latter has one uncommon feature, it is apt to be divided into several concentric zones in each annual ring, by the intervention of narrow lines of wood like the spring-wood. The medullary rays are invisible. Resin-ducts are lacking (though resin does occur in the wood).

CYPRESS, FUNERAL. *Cupressus funebris* Endl.

Weight 34 lbs. (Gamble). China, Eastern Himalaya.

VERN—*Chandang, tchenden*, Bhutia—*Tsandan*, Lepcha.

The wood of this species is a bright yellow, with reddish streaks, and is very similar to the foregoing. In the timber museum at Kew there is a chair and a table made of funeral cypress wood. These are decorated with Chinese characters, and come from Ningpo in China.

Dalbergia cultrata Grah.

Weight 70 lbs. Burma.

VERN—*Yindaik*, Burm.

Yindaik is also called Burmese ebony. The trees yield only a small proportion of the dark-coloured wood, and in this and other characteristics

[1] In the United States the timber varies, so that a distinction is drawn between the heavy "black" and the light "white" cypress.

yindaik resembles the ebonies. The colour is a purplish-chocolate with black streaks. The grain is hard, firm, and very close, yielding a smooth and lustrous surface from the tool. Excellent for turnery and fancy woodwork, and deserving wider reputation and use.

Pearson and Brown, in *Commercial Timbers of India*, mention another species, *D. fusca*, stating that "the timber is often mixed up with that of *D. cultrata*, and is used for the same purposes."

The pores vary in size, and are irregularly and sparsely distributed. They are joined by light wavy concentric lines of loose tissue, which make a pretty grain on the tangential surface. The numerous medullary rays are so fine as to be scarcely discernible except under the lens.

Dalbergia lanceolaria Linn.

Weight 33–50 lbs. (Gamble). Ceylon, Central India, The Himalayas.

VERN—*Takoli, bithúa,* Hind.—*Bander sirıs,* Nep.—*Barbat, parbati,* Banswarra—*Gengri,* Panch Mehals—*Harráni,* Dharwar—*Nal valanga,* Tam.—*Pedda sopara, yerra patsaru, pasarganni,* Tel.—*Dandous, dandoshi, kaurchi,* Mar.—*Piri,* Kól—*Passi,* Merwara—*Sirsi, passi,* Jeypore—*Thitpagan,* Burm.

The colour is a yellowish-white, with a smooth, close grain, quite unlike other produce of *Dalbergia* spp., both in colour and grain. Gamble, quoting Skinner, says: "But it is probable that he has not described the right wood, for, although he gives the correct Telugu name, yet he calls his specimens *Moukshow* Burm. and 'Moulmein lancewood'; while Kurz . . . does not give *D. lanceolaria* as occurring in Burma." Gamble also says that J. W. Oliver "suggests that '*Moukshow*' is perhaps a corruption of 'sauk yo,' the Lower Burma name of a species of *Dalbergia*, possibly *D. Oliveri*." But my authentic specimen of *D. lanceolaria* bears no resemblance to the wood of *D. Oliveri*, nor is it in any respect like *Homalium tomentosum* (myaukchaw), the wood known as "Moulmein lancewood." It would appear, therefore, that there is some confusion in these reports.

Very scarce, small pores, varying from very small to small, sometimes plugged, with very numerous exceedingly fine medullary rays, crossed at irregular intervals by fine lines of light-coloured tissue, which follow the growth of the concentric layers.

Dalbergia Oliveri Gamble.

Weight 66 lbs. India.

VERN—*Tamalan,* Burm.

This beautiful wood was unknown commercially in England until 1920, since when it has been increasingly used for all kinds of decorative art

woodwork. It has a hard and close grain, and is of a salmon to rose-red colour, sometimes darker and even as dark as rosewood, often with golden streaks and always a lustrous surface, especially suitable for the Empire or Sheraton styles. The wood possesses a curious quality, surpassing all other woods, in that when struck with a hammer it produces a strong metallic note, so that it has been approved for use in the making of xylophones, for which purpose it has given great satisfaction.

The transverse section shows a pretty grain with light and dark wavy ripple marks. The much scattered pores are scarce and rather large. The medullary rays are prominent, parallel but uneven, and crossed at right angles by similar white lines, which, with the rays, give the appearance of a spider's web.

DAMSON. *Prunus domestica* Linn.
Weight 32 lbs. 9 oz. Europe.

This little-known but beautiful English wood can be used for decorative work with very effective results, and compares quite favourably with tulip or kingwood for banding, marquetry, or general cabinet work. It is capable of a very smooth surface from the tool. The colouring is of a bright yellowish-red, streaked with bands of lighter and darker red, the general appearance being very similar to that of bleached or faded Brazilian tulip-wood.

The pores, though numerous, are exceedingly small, with one or two layers of slightly larger pores in the spring growth. The medullary rays, which are parallel, are very strongly marked and of a greater thickness than in most woods; they show very clearly on the radial section, as in beech.

DANTA. *Cistanthera papaverifera* A. Chev.
Weight 46 lbs. (Imp. Inst.). The Gold Coast.

The *Imperial Institute Bulletin 29*, No. 2, reports the above wood as a valuable substitute for hickory and ash in tool and implement handles. The report names it as slightly inferior to hickory, Burmese yon, and English ash in shock resistance, but more flexible, and equally hard and tough; not so hard, but stronger than axle-wood, and less liable to breakage than yon. It works fairly well.

The wood has not yet been seen in commerce.

DEDALI. *Strombosia javanica* Bl.
Malay Peninsula, Burma.

VERN—*Dali dali, bayan badak.*

The tree is widely distributed but not abundant. The wood is pale brownish yellow, with only slight difference between sap-wood and heartwood.

Foxworthy, in *Malayan Forest Records*, No. 3, describes it as being " light, soft, very fine-grained . . . remarkably durable for a soft wood. . . . Used for planks, posts, beams, and cabinet work, liable to split if the freshly cut logs are left lying exposed to the sun."

DEGAME WOOD. *Calycophyllum candidissimum* Vahl.

Weight 50 lbs. (Record). West Indies.

VERN—*Degame, degame lancewood, degame spars,* Trade—*Dágame,* Cuba—*Sálamo, madrono,* C.A., gen.—*Espino madroño,* Nic.—*Alazano, guayabo alazano,* Pan.—*Camaron, palo camaron,* Mex.—*Lemon-wood.*

This wood is imported in straight, clean logs, with the bark on, ranging from 10 to 20 feet in length, and 4 to 8 inches in diameter. The colour is yellowish-red, rather like lancewood, though not so bright, or like a dull West India boxwood. It is elastic, bends well without breaking, and bears considerable transverse strain. It is used for a great variety of purposes, and as a substitute for lancewood.

Dephelium Longana.

Ceylon.

A dull plum-coloured wood with an exceedingly tight, close grain, giving a very smooth surface from the tool, comparable with that of beefwood. The wood is not seen in commerce.

Exceedingly small pores, hardly discernible under the lens, arranged generally in belts. The medullary rays are so fine that they are hardly visible.

DESBOTA. Source unknown.

Weight 69 lbs. Brazil.

This dull yellowish-brown wood takes a smooth surface.

The pores are small, moderately numerous, and unevenly distributed. The numerous medullary rays are crossed at right angles by thin wavy lines, which give the effect of a spider's web.

DHUP. *Canarium euphyllum* Kurz.

Weight 32 lbs. India, The Andaman Islands.

VERN—*Dhup,* Hind —*Indian white mahogany.*

The vernacular name of " dhup " has apparently been given to the wood of *Pinus longifolia, Ailanthus malabarica,* and *Canarium strictum,* as well as to *Canarium euphyllum.*

The wood known as dhup, the produce of *C. euphyllum,* is the only one of these which has been seen in commerce in Europe ; probably *C. strictum* and *C. euphyllum* equalise, for the only timber which has been largely introduced into European markets has come from the Andaman Islands, and is named *C. euphyllum* by Parkinson. He reports the wood as " light

coloured and perishable, with a smell like that of vinegar . . . sometimes used as floats for rafting timber . . . yields resin which is used by the Andamanese for burning and for making a composition for covering the binding of their arrows."

A very large quantity, which has been called " Indian white mahogany," has gone into consumption in the course of the last few years.

The wood is of a light straw colour, and assumes a glossy and smooth surface with the lightest touch of the tool. This is the more surprising, as, from the appearance, it would be thought to be rather fibrous or woolly. It does not warp, twist, or shrink unduly, but is liable to become stainy if exposed to wet, or left to lie without air current space. It has been used extensively for all kinds of decorative woodwork, where a good quality plain wood is required, including all kinds of cabinet work, linings, and interiors, billiard-table work (including legs, sides, and bearers), for ships' fittings and store linings, and as a substitute for American whitewood. It can be readily stained and polished, taking an excellent red mahogany colour, with a transparent grain, so that, if well handled, only an expert could recognise it as not being a regular red mahogany.

The pores are not very sparse, rather large, sometimes plugged. The medullary rays are close and regular in size and position.

Dialium divaricatum Vahl.

Weight about 56 lbs. (Record). British Honduras, Brazil, Central America.

VERN—*Jutahy peba, jetahy preta, itú*, Braz.—*Granadillo*, Col.—*Tamarindo, tamarindo del monte, tamarindo prieto*, C A.

This is one of the innumerable woods to which the name of ironwood has been given. Record says : " It is a large tree occurring in the forests of eastern Brazil." The colour is a dull reddish-brown, with a very close grain, and a whitish straw-coloured sap-wood. It is hard, close, and reported strong and durable, but not so hard or dense as most of those woods to which the name ironwood has been given. There are concentric rings of growth, clearly marked by dark lines, which may or may not denote annual growth. The transverse section shows a pretty pattern.

In the handbook *Brazilian Woods*, jatahy, with its alternative name of jatoba, is reported as the produce of *Hymenoea Courbaril*, and a note is added that the tree exudes a resin known as copal gum. Although both Stone and Charpentier also give jetahy as of this species, yet Colonel Gamble's sample marked " jatahy " does not agree with a specimen shipped from St. Vincent under the name of locust (the common name for *Hymenoea Courbaril*). It is also different from the specimen of the Dutch Guiana locust, the so-called Surinam teak, which is said to be the product of *Hymenoea Courbaril*. Colonel Gamble's specimen is of a bright yellow

colour, resembling in appearance East India satinwood. It has a fine texture and a very smooth grain. In *Dialium divaricatum*, very sparse and small pores, mostly plugged, form a constellation among a very fine network of medullary rays, with belts of similar white lines crossing them, making a fine pattern, like lace-work. Medullary rays fine and numerous, and only discernible under the lens.

Dialium ovoideum Thw.

Weight 82 lbs. (Gamble). Ceylon.

VERN—*Kaddupuli*, Tan.—*Gal-siyambala*, Cingh.

The colour is a deep purple-brown, interspersed with yellow patches. The grain is very close, hard, and firm, comparable with the grain of boxwood.

It is reported upon by authorities from Ceylon as being very rare, and difficult to obtain, even in small quantities.

The minute pores are arranged in wavy belts, very fine, making a pretty lace-like pattern. The concentric layers are marked by irregularly placed light lines, with exceedingly numerous and very fine medullary rays, which, crossed at right angles by the wavy belts, make an exceedingly fine network pattern, something of which is shown on both the radial and transverse sections.

Dichopsis polyantha Benth.

Weight 53 lbs. (Gamble). India and Burma.

VERN—*Tali*, Beng.—*Sill-kurta*, Cachar—*Thainban*, Magh.

A dull red-brick coloured wood, with a very fine, close, compact grain, capable of a very smooth surface under the tool. Has not been seen in commerce, but a few logs were sent over for the Wembley Exhibition. A good wood, of value in India, but not containing sufficient qualities to recommend it for the export trade.

The wood is reported as yielding a fair quantity of gutta-percha.

The somewhat scarce pores are placed in belts irregularly ; they are mostly plugged and are very small. The extremely fine medullary rays are crossed at right angles by strongly marked light lines, forming a pattern of a square.

DILLENIA SPP.

Himalaya, Assam, Burma, Ceylon.

Gamble reports nine varieties, which he divides into two sub-genera. Pearson and Brown, in *Commercial Timbers of India*, name the following three species, *Dillenia indica*, *D. parviflora*, and *D. pentagyna*, stating that they are used for various purposes in India and Burma.

As far as it has been possible to examine the wood of the different varieties, the similarity suggests that for description they may all be

treated as one. The colour is a light grey-red, fairly hard, close-grained, but except by considerable effort not giving a very smooth surface from the tool. On the radial section the medullary ray is very pronounced, somewhat like that shown by K'runtum ; while on the transverse section the grain is like a rather spongy greenheart (*Nectandra*). In a cargo of long squares collected in Burma during the war, for use in Salonika but eventually diverted to London, a large number of pieces were found to be of Dillenia spp. The wood proved serviceable, good for constructional work, and apparently durable. As a decorative wood, it does not possess sufficiently attractive qualities to make it worth further remark.

The identification of all the varieties may be included under the following : pores very scanty, very small to small ; medullary rays coarse, irregular, and of two kinds, one being much finer than the other ; generally occurring close to another of a similar character, and showing in a pronounced manner on the radial section.

DIPTEROCARPUS SPP.

Among the produce of this genus, that of the Siamese yang has been held in more esteem in India and Burma than the eng, kanyin, or gurjun of their own countries ; while in the United Kingdom gurjun and kanyin have found more favour than the Siamese yang, and perhaps even the Burmese eng has given better results. It is probable that the more favourable impression created in India and Burma is to be attributed to the fact that the Siamese wood was better produced and manufactured.

We have no record of the standing or durable qualities of these timbers prior to 1890, but after about thirty years' experience (1931) the woods of *Dipterocarpaceae* have all proved to be good and durable in the moderate climate of Europe. When used for outdoor work they have stood well ; posts have outlasted English oak posts put in at the same time under the same condition, and for interior first-class joiners' work the wood has stood as well as any hardwood. The best results have been obtained with supplies of gurjun from the Andamans, and kanyin from Burma. Two kinds are reported from Burma, viz. kanyin, which the botanists attributed to *Dipterocarpus turbinatus*, and kanyin-byu, *D. alatus*. There is no evidence as to whether the shipments have consisted of either, or both mixed, but there seems to be no difference.

The qualities of the remainder may be classed in the following order of merit : Southern India—Siamese yang—Borneo camphor-wood—the Philippines.

All these timbers are not highly valued or in much demand. While the general supplies from Borneo, Malay, and the Philippines bear a close resemblance to those from India and Burma, there exists a much greater variation in the softness and hardness of the grain, and care must be

taken if iron is used in contact with the wood, as staining and corrosion may result, especially with the Borneo camphor-wood. In the Malay Peninsula there are many species of *Dipterocarpaceae* which produce timber known as keruing. The supplies from the Andamans were originally supposed to be provided by *D. incanus* Roxb., but of late it has been said that it is *D. turbinatus*. Pearson and Brown, in *Commercial Timbers of India*, also mention *D. obtusifolius* and *D. costatus*, both of which would appear to be as useful as the other kinds reported upon. A description of other varieties is given under the heading of each.

Dipterocarpus glandulosus Thw.

Weight 51 lbs. Ceylon.

VERN—*Dorana*, Cingh.

The colour of this wood is a dull plum red, with a very hard, close texture, harder and closer grain, and showing a better character of heart-wood, than is general in the *Dipterocarpaceae*.

The pores are numerous, arranged in small bands, plugged, mostly surrounded by pale tissue. The medullary rays are thick and pronounced, with finer rays in between, and showing on the radial section in tiny flecks.

Dipterocarpus indicus Bedd.

Weight 44 lbs. (Gamble). India.

VERN—*Guga, challane*, Kan.—*Ennei*, Tam.—*Kalpayin*, Mal.—*Varangu, velayani*, Trav. Hills.

According to a specimen provided by the Research Department at Dehra Dún, this timber is a better quality than any of the numerous *Dipterocarpaceae*, from whatever part of the East they may come.

The colour is a good mahogany red, yielding a fine surface from the tool, with little gum or resin, and producing a cabinet wood equal to many specimens of the commoner sorts of mahogany.

A few specimen logs have been shipped from Southern India, but the timber has never been imported on a commercial scale. Its qualities would undoubtedly bring it into favourable notice, if it were better known.

The very scarce pores are uneven in line and position, open and plugged, with very numerous pronounced, rough-edged medullary rays following uneven lines, and crossed at right angles by light veins following the direction of the concentric growth.

Dipterocarpus pilosus Roxb.

Weight 43 lbs. (Gamble). India, Burma, Assam.

VERN—*Hollong*, Ass.

The wood is slightly browner in colour, generally lighter in weight,

and more open-grained than gurjun (*q.v.*), and perhaps will not stand so well.

Pearson and Brown, in *Commercial Timbers of India*, say that this timber is " as strong and elastic as teak." Without any authority on comparative experiments, it is probable that all the varieties of Dipterocarps in India and Burma would prove to have a greater tangential strength than teak, and probably *D. pilosus* would prove to be one of the weakest. It would be interesting to see some experiments carried out.

The pores in single and duplicate, sometimes plugged, are in between strong medullary rays, which show slightly on the radial section, though not so pronounced as in gurjun.

Dipterocarpus zeylanicus Thw.

Weight 45 lbs. (Gamble). Ceylon.

VERN—*Horá*, Cingh.

For description see GURJUN, *D. turbinatus*. No separate identification is necessary.

DOGWOOD. *Cornus florida* L.
C. Nuttallii, and possibly others.
Weight 46–50 lbs. British Columbia, Vancouver Island, North and Central America.

The wood is also known commercially by the names of " cornel," " cornelian " wood, and " flowering dogwood." The colour is yellowish-brown, generally with a darker-coloured heart, and a bright, rather lustrous surface, having a very close, fine, hard, compact grain capable of a very smooth surface when worked. There are innumerable uses to which the wood is put, including shuttle blocks, wood-engraving, and for making charcoal for gunpowder.

The very numerous pores are open, arranged between closely packed, clearly defined, prominent medullary rays which show in tiny flecks on the radial section.

Dolichandrone stipulata Benth.

Weight 36 lbs. (Pearson & Brown). Burma.

VERN—*Mahlwa, paukkyan*, Burm.

Pearson and Brown, in *Commercial Timbers of India*, report this wood to be " orange-red when first exposed, beautifully mottled with lighter and darker streaks, at length fading to pale grey-brown ; the quarter section has an attractive fine silvery fleck ; heart-wood not distinct ; quite lustrous . . . straight-grained or nearly so, medium and even-

textured. . . . A handsome timber, which is used for house posts, bows, spear shafts, oars, paddles, and furniture. Its use for furniture should be extended, for, though heavy [36 lbs.! A. L. H.], its pleasing appearance justifies further attention."

Doona congestiflora Thw.

Ceylon.

This wood is of a bright, light-reddish colour, with a bluish tint and a glossy sheen. The grain is close and firm, and much resembles that of poon (*Calophyllum Inophyllum*), for which wood it could be mistaken.

The pores are small, regular, and generally plugged. The medullary rays are very fine and numerous, with light-coloured bands crossing, following the lines of concentric growth.

Doona Gardneri Thw.

Ceylon.

A brown-coloured wood very much resembling teak both in colour and grain, but with a finer and closer grain, yielding a very smooth surface from the tool. A very strong, valuable, useful wood, which displays good standing qualities. It is reported that this wood is rather rare, and is called red Doon by the sawyers in the hill country, being the only hill species of Doona. It is durable, and was used for sleepers on the Haputale railway. It has not been seen in commerce in Europe.

The pores are scarce, very small, and plugged. The medullary rays are very numerous, exceedingly fine, crossed at right angles by light lines, and showing in strong flecks on the radial section.

Doona trapezifolia Thw.

Ceylon.

VERN—*Yakahalu*, Cingh.

The wood is of a light reddish colour, with a golden tint, and a very close, hard, and firm grain. Somewhat similar to *D. congestiflora*, but a little harder.

On the quartered section the medullary ray shows very strongly, as in beech. It is a handsome wood which could be advantageously used in fancy cabinet work.

The pores are scarce and small, generally plugged. The medullary rays very strongly marked, even, and parallel.

Doona zeylanica Thw.

Weight 29 lbs. (Gamble). Ceylon.

VERN—*Dún*, Cingh.

The colour is a light yellow nut-brown, with a smooth, close grain. This wood has not been met with in commerce in this country. Gamble

reports it as durable, and greatly in request for shingles, saying that the tree is often called the " shingle tree."

The small pores are very numerous and plugged. Medullary rays exceedingly fine, very numerous, crossed at right angles by faint-coloured lines of light tissue, which appear to mark the concentric layers of growth.

Duabanga sonneratioides Ham.

Weight 32 lbs. (Troup). India, Burma.

VERN—*Bandorhulla*, Beng.—*Lampatia*, Nep.—*Dúr*, Lepcha—*Kochan, kokan*, Ass.—*Jarúl-jhalna*, Cachar—*Bondorkella, bolchim, achung*, Garo—*Baichua*, Magh.—*Myaukngo, ma-u, thitazaw, linzin, kamaung-yegyi*, Burm.

The wood is a light nut-brown colour resembling a pale variety of teak. The grain is straight, but rough and soft, and does not take a nice finish. It is not suitable for requirements in the United Kingdom, and would not repay the expense of shipment.

The pores are rather large, and are generally in groups of two or three, with a slight halo of light-coloured tissue surrounding them. The medullary rays are irregular, and rather scarce and coarse.

DYSOXYLUM SPP.

Northern and Eastern Bengal, The Andamans, Burma, Southern India.

Gamble mentions fourteen species, and others have been added since. In Alexander Rodger's list of Burma trees he gives as vernacular for *Dysoxylum binectariferum*, " aukchinsa," and for *D. grande*, " tagat-ni " ; he also gives the vernacular name of " aukchinsa " to *Chisocheton paniculatus*, and he mentions *D. Oliveri* and *D. procerum* without giving any vernacular, but omits *D. malabaricum*. Definite references, therefore, become difficult.

Three of the timbers of Dysoxylum species have been met with in commerce, all originally sent for exhibition, namely, *D. glandulosum*, *D. binectariferum* called " aukchinza," from the Andamans, and Losonia from Bengal.

A description is given under the different names.

Dysoxylum binectariferum Hook. f.

Weight 53–54 lbs. North-East India, Western Ghats, Ceylon.

VERN—*Katongzu*, Lepcha—*Rangirata*, Cachar—*Borogotodhara, bandordema*, Ass.—*Agil, kadgandha*, Coorg—*Yerindi*, Bombay.

This wood was exported experimentally from Burma for the Wembley Exhibition, under the name of Aukchinza. According to Rodger, this vernacular name is used in Burma for four different varieties, namely,

Diospyros ehretioides, Dysoxylum binectariferum, Erioglossum rubiginosum, Chisocheton paniculatus. It is probable that the experimental export was of *D. binectariferum.*

The wood is a rich, deep red-brick colour, with a hard, close grain, capable of a smooth surface under the tool. It possesses a somewhat strong contrary growth of hard and soft layers. It is a useful, attractive wood, and the timber sent had a fairly good reception. It was reported that it had been used in Burma for making pencils, but a similar attempt here was a complete failure, the wood being wholly unsuitable for such a purpose.

The open pores, which are uniform in size and not very numerous, seem to be fine, in singles, pairs, and triplicates. The medullary rays, while being fairly numerous, are very faint and ill-defined.

Dysoxylum glandulosum Talbot.

Weight 37–52 lbs. (Gamble). North Kanara, The Andamans.

VERN—*Bili devdari, bili budlige,* Kan.

The colour is a light straw yellow, with a close grain, and contrary layers of hard and soft growth, so that a sharp tool is needed to make a smooth surface, which then presents a stripy pattern. An attractive wood, early discovered by the French to be suitable for first-class cabinet work ; many pieces can still be seen of French furniture made prior and subsequent to the Empire period, in which this wood was used to advantage ; as in other cases which could be named, they discovered the value of this wood and probably obtained supplies from Indo-Chin, thus again illustrating the more progressive French exploitation of timbers as compared with ours. The backwardness in the development of forestry resources in India, to which attention has been called by American writers, is illustrated by the use of this timber, which I have seen, in wasteful use, in tea-chests.

The concentric layers of growth are clearly marked by dark lines. The numerous small pores are partially plugged, with numerous fine medullary rays, crossed at irregular intervals by fine white lines, showing faintly on the radial section.

Dysoxylum malabaricum Bedd.

Weight 42 lbs. India.

VERN—*Velley agil,* Tam., Mal.—*Porapá,* Kader.

This timber is reported by Gamble as weighing 51 lbs. The colour is a dull, dirty brown-yellow, and the wood has no quality which would make it of any use for export trade. There is a fragrant scent similar to that of cedar, *Cedrela odorata.*

The numerous pores, small to medium in size, are generally grouped

and plugged; the medullary rays are exceedingly fine, and hardly discernible under the lens.

Pearson and Brown, in *Commercial Timbers of India*, would seem to regard *D. malabaricum* and *D. glandulosum* as one and the same, but those scanty shipments of wood which have been received, and reported to be under the two separate names, do not agree either in quality or appearance; also shipments which purported to be *D. malabaricum* bore a fragrant scent as named above, and no scent was to be found in that of *D. glandulosum*.

EBONY. Mainly species of *Diospyros*.

The term ebony is usually applied to a black wood of great hardness, heaviness, and closeness of texture. The definition of ebony, however, is rendered difficult by several facts. True ebonies all belong to one botanical family, *Ebenaceae*, but there are black woods that belong to other families and yet vie with ebony in blackness, though differing from it in other characteristics, such as hardness or structure. Among such are African blackwood (*q.v.*) or Congo-wood, which in Germany is often termed Senegal ebony, though such a custom is unjustifiable, as the wood in question is derived from the laburnum family. Incidentally it may be mentioned that certain woods, especially pear, are stained black and used as substitutes for ebony. Again, the name ebony is also applied to woods that are not black. Among such the most familiar perhaps is green ebony (*q.v.*), which is derived from various woods belonging to diverse species. Moreover, woods which are true ebonies, even those from the genus *Diospyros*, are not necessarily black. A considerable amount of commercial ebony shows some natural brownness of shade, and in order to conceal this, manufacturers of various articles blacken the wood with a stain. In fact, it may be said that ebony is not always as black as it is painted. In all species of *Diospyros* the external or sap-wood is light-coloured. In a number of the species the central portions of the wood are more or less black. In some cases, such as *D. Ebenum* and *D. Melanoxylon* from India and Ceylon, this black wood forms a solid central core extending for a considerable distance along the trunk, but even in these species the black wood is liable to be arranged in the form of thick strands interrupted by light-coloured wood. In other ebonies the black wood is always interspersed with patches or bands of lighter-coloured—light yellow to brown—wood: thus the marble-wood (*D. Kurzii*), from the Andamans, which is black and light yellow in patches, deserves this name, and the Calamander wood (*D. quaesita*) of Ceylon shows bands or streaks of black and brown. Still farther removed from blackness is the wood of *D. Chloroxylon* (British India), which is termed "green ebony," and is yellowish-grey in colour. It will be noted, too, that in several

cases, woods derived from the true ebony genus, *Diospyros*, are not termed ebonies ; two additional instances may be cited : the persimmon woods of North America (*D. virginiana*) and of Japan (*D. Kaki*). Trees belonging to the ebony family but not to the genus *Diospyros* also furnish ebony : such is alleged to be the case with *Maba Ebenus* of the Moluccas, and *Euclea Pseudebenus* from South Africa.

Its hardness, freedom from shrinkage and warping, powers of resisting decay and attacks by insects, as well as the smoothness of surface and finely polished appearance obtainable, cause ebony to be highly esteemed for particular purposes, including the making of piano keys, violin-bridges, flutes, handles of knives, handles and backs of brushes, rulers, mathematical instruments, walking-sticks, picture-frames, furniture, and ornamental cabinet work generally. Piano-cases are made of wood which is stained to resemble ebony.

The conditions of formation of the black wood in ebony are not identical with those obtaining in regard to the heart-wood of ordinary European trees. This fact is well brought out in Mr. Herbert Wright's most valuable paper on the ebonies of Ceylon.[1] The following information is taken from this source. " The occurrence of ebony (black wood) within the plant cannot be stated in terms of the age of the tree. . . . The black heart-wood occurs usually in the stem (trunk), but is often present in young twigs and roots. . . . The occurrence of the central black wood is often erratic, though most usually it decreases in volume from below upwards. . . . In some instances . . . the black heart-wood repeatedly dies away and reappears at different points along a given length (of trunk or branch)." The consequence of these facts is that the search for profitable ebony in ebony trees is by no means a simple one. " The ebony is obtained by felling the tree and stripping off the peripheral sap-wood. It is usual to fell all those trees which have attained, or exceeded, a breast-height circumference of 2 metres (6½ feet), providing the preliminary examination indicates the existence of a good proportion of solid black heart-wood. The preliminary examination usually consists of making an incision and determining the extent to which the discoloration (blackening of the wood) has proceeded. . . ."

The precise chemical nature of the black or deep brown colouring matters, largely contained in the cavities of ebony, is not finally established.

Apart from so-called " green ebony " (*q.v.*) the following have been or are the geographical and reputed botanical sources of commercial ebonies :

(*a*) *Black wood* (occasionally interspersed with wood of lighter colour). Ceylon and India (" Bombay " : *D. Ebenum* Koenig and *D. Melan-*

[1] Herbert Wright, " The Genus Diospyros in Ceylon : its Morphology, Anatomy, and Taxonomy," *Annals of the Royal Botanic Gardens, Peradeniya*, vol. ii. pp. 22-55, 1904.

oxylon Roxb.) ; in Ceylon the wood of these and other species when interrupted by light bands is sold as " bastard ebony."

Mauritius : *D. Tesselaria* Poir.

West Africa (Gaboon, Lagos, Old Calabar, etc.) : *D. Dendo* Welw. and *D. mespiliformis* Hochst.

Zanzibar : *D. mespiliformis* Hochst.

Madagascar : *D. Perrieri* Jumelle mainly, also *D. haplostylis* Boiv. and *D. microrhombus* Hiern.

Philippines (also Indo-Malaya) : *Maba buxifolia* Pers. The Indo-Malayan *D. Ebenaster* Retz. may supply some of the black commercial ebony.

(*b*) *Streaked or patchy wood.*

Ceylon and India : Calamander or Coromandel wood : *D. quaesita* Thw., streaked brown and black. (It is highly improbable that either *D. hirsuta* Linn. or *D. oppositifolia* supplies any " Calamander " wood ; see Wright, *op. cit.*)

Philippines : " bolongata " and " camagoon," respectively *D. pilosanthera* Blanco and *D. discolor* Willd., often very similar to Calamander wood.

Andaman Islands : " Marble wood," *D. Kurzii* Hiern., black with very light, often creamy white, stripes or patches.

Celebes : Macassar ebony ; a wood of unknown botanical origin, varying in appearance, often reddish-brown with black bands, but sometimes variegated with other tints.

Japan : Kaki or Japanese persimmon, *D. Kaki* Linn. f. ; black with varying amounts of light or grey bands or patches.

North America : American persimmon wood, *D. virginiana* Linn., light in colour with little or no black heart.

EBONY, AFRICAN. *Diospyros Dendo* Welw.

Weight 78 lbs. West Coast of Africa.

The imports are from Old Calabar, Cameroon, Gaboon, Cape Lopez, Ogowe, Burutu, and Niger. It is somewhat difficult to determine between the respective merits of the various districts. The shipments vary in quality, conditions, and colour. The wood is sent over in billets, and also in short logs with the centres left in ; the billets are from about 5 to 10 inches wide, and from about 2 to 7 inches thick, the logs from 2 to 13 inches in diameter. Billets and logs are from 2 feet to perhaps as much as 8 feet. The billets are pieces split and chopped out from the main trunk of the tree with the sap and faulty places cut away. The following information was supplied by Mr. T. S. Leadam.

OLD CALABAR.—This was a good black ebony of fine grain, and was

much in demand when obtainable, although almost always small in diameter and very short, being about 3 to 4 inches in diameter and about $2\frac{1}{4}$ feet long. It was well prepared, and trimmed always in billets. The average weight of each piece was about 15 kilos, a piece weighing 20 kilos being rare. It was used for pianoforte keys, and there was a considerable demand for it in Sheffield for knife-handles. For some reason, at present unknown, the import has entirely ceased, but it has been said to be due to some local cause. Before the Old Calabar exports entirely ceased the wood came in larger sizes, and this suggests that it was coming from distant districts through the same port.

CAMEROON.—In the absence of Old Calabar this wood seems to take the lead. It is generally of much larger sizes, often averaging from 25 to 30 pieces to the ton. The quality is good and the colour deep black.

GABOON.—This wood is a very deep black and is usually reliable, but the trimming and sorting has been conducted carelessly. At one time it was customary in Liverpool for the selling brokers to sort the parcels into three classes, which were called " flats," " billets," and " heavy." The " flat " grade consisted of all the faulty wood, and was selected on account of its deep degree of blackness for use in cutlery manufacture at Sheffield. The " billets " were the best wood of good sizes without centres. The " heavy " consisted of the large solid pieces, with or without centres, more solid than the " flat " but of any kind of shape. There was at that time a good demand for each class.

OGOWE.—This quality is the nearest approach to the Gaboon.

CAPE LOPEZ. Weight 78 lbs. 4 oz.—The quality of this variety is very much like that of Ogowe but has the reputation of containing a greater supply of greyish colour. The pores are very variable in size, and are generally filled with a white gum. The medullary rays are very obscure and hardly discernible with a lens. There is a very faint, rather agreeable aromatic scent.

BURUTU.—This is a coarse ebony, like an inferior quality of Macassar, somewhat long and irregular in shape, and it is very little in demand.

NIGER.—A term generally used in America to cover all of the above imports except Burutu. There is, however, one quality known as " Niger," which, though usually good in colour, has a tendency to be streaked with grey.

EBONY, BURMESE. *Diospyros burmanica* Kurz.

Weight 55 lbs. India, Burma.

VERN—*Té*, Burm.

This is an inferior kind of ebony, which possesses such a small black heart and so wide a band of light (sap) wood that for European purposes

it could only be used for decorative inlay work or for golf-club heads. The wood is hard, heavy, and close-grained, but is generally defective in the heart.

The pores and medullary rays are exceedingly fine, and scarcely discernible with the lens (+ 12).

EBONY, INDIAN and **CEYLON.** *Diospyros* sp.

Ceylon, Southern India.

The word ebony half a century ago instantly suggested to anyone engaged in the timber trade, either India or Ceylon. While small and irregular parcels found their way into London from other sources, the main ebony supplies were provided by Ceylon and the south of India. Ceylon especially produced a regular supply, and in a minor degree also Coromandel or Calamander wood (*q.v.*). Between thirty and forty years ago it was found possible to get in one shipment 100 logs up to 30 feet in length and more than 30 inches in diameter at the butt , to-day it is rare to see anything as much as 20 feet by 15 inches, besides which it is quite impossible to-day to find a sound, clean log which will cut any such length or size, whereas before these were comparatively easy to secure. Shipments from India have now entirely ceased, presumably because the trees are practically all used up, and from Ceylon shipments have become negligible. With the falling-off of supplies there has been a corresponding falling-off in demand, many of the previous uses having disappeared

The botanist divides the timber into three varieties, viz. *Diospyros Ebenum* Koen., *D. Embryopteris* Pers., and *D. oocarpa* Thw. It is probable that the three have been generally mixed. Gamble reports *D. Ebenum* as " the chief Ebony-yielding tree, and the only black one, without either streaks or markings," but I have never seen any Ceylon or Southern India wood absolutely black, with no variation in colour. The India wood, including Ceylon, is of a very close, dense, hard grain, rather brittle, with a consistency somewhat resembling African blackwood, with almost a marble-like smoothness. It is rare to find a piece not streaked with a darker or lighter brown, and sometimes even a golden colour, but never of the same intense blackness as some ebony which can be found on the west coast of Africa. Occasionally a log is found finely marked with light brown or golden streaks, and this has been termed Coromandel.

The pores are exceedingly small and hardly discernible under the lens. Medullary rays so fine that a powerful glass is required to locate them.

Diospyros Embryopteris Pers.

Weight 48–49 lbs. India, Burma, Ceylon, Western Himalaya.

VERN—*Gáb, makur-kendi, kala tendu,* Beng , Hind.—*Kúsi,* Banda—*Kendu,* Ass.—*Gusvakendhu,* Uriya—*Gara tiril,* Kól, Sonthal—

Titia, Khond—*Nititunika*, Palkonda—*Muttia tumiki*, Reddi—*Timburi*, Mar.—*Panichi*, Mal —*Tumbika, pani-chika, panichchai*, Tam.—*Tumil, tumika*, Tel.—*Holle-tupra*, Coorg—*Kusharta*, Kan. —*Timbiri*, Cingh.—*Ye-ngan-bok*, Lower Burma.

The tree which produces this timber is more valuable for other purposes than its wood production. A specimen plank submitted to the Wembley Exhibition, however, showed a fine quality close-grained, nut-brown coloured wood, with a close texture similar to other products of *Diospyros*, but without any of their attractive black colouring, and it is probable that as a timber-producing tree its possibilities are negligible.

The very fine pores are somewhat scanty ; the concentric layers of

Photograph by G R Keen

LOGS OF EBONY. SOUTH-WEST INDIA

growth are marked by fine, light-coloured bands crossed by the extremely numerous and very fine medullary rays, which glisten brightly on the radial section.

Diospyros tomentosa Roxb.

Weight 48–77 lbs. (Gamble). Northern India, Himalaya.

VERN—*Tendu, kendu, temru, abnús*, Hind.—*Kend, kyon*, Beng.—*Kendhu*, Uriya—*Tumri, tummer, tumki*, Gondi—*Tendú*, Baigas—*Tiril*, Kól—*Tumiki*, Koya—*Tumma*, Reddi—*Timru, tibru*, Merwara.

This tree produces a fine ebony, similar to the commercial ebony from Ceylon, *D. Ebenum*, which is better known. Gamble reports that " Brandis unites this with *D. Melanoxylon* and, indeed, it is very difficult to distinguish them either in the field or in the Herbarium." For the pur-

poses of the report on the wood, there is no distinguishable difference. While the trees are still obtainable in fairly large quantities from Ceylon, the supplies from India of *D. tomentosa* seem to be practically exhausted. A further variety is reported by Gamble, of which a specimen was sent over prior to the Wembley Exhibition, named *D. assimilis*, producing a wood similar to that of *D. tomentosa*, the specimen itself having a most attractive narrow golden-yellow streak of an unusual character. In texture and quality of grain there is no difference between the two varieties.

The exceedingly minute pores are somewhat scarce; the medullary rays are very fine indeed, joined at right angles by similar fine light-coloured bars, forming a minute pattern.

EBONY, GREEN. Source dubious. (Possibly *Tecoma Leucoxylon*, Mart.[1])
Weight 72 lbs. 2 oz. West Indies.

This hard, heavy wood is obtainable only in small pieces of round section, varying in diameter from $2\frac{1}{2}$ to 6 inches. The sap-wood is yellowish-white, while the heart-wood is brownish-yellow, tinged more or less with bright bronze-green, and traversed with deep brown and yellow stripes. This dense wood, of nearly uniform texture, yields a very smooth bright surface which is cold to the touch. My specimen has no scent whatever. Another specimen, which was sent to me by Dr. Girdwood, is of a much darker and duller green, and possesses a most fragrant scent. It is evidently of a different species. It is used for linings and bandings in cabinet work and inlay, and is well suited for turnery. In another instance the wood of blue mahoe (*Hibiscus elatus*) (*q.v.*) was sawn up and passed as green ebony. The scent of this wood, which is very fragrant, much resembles that of the true green ebony.

While Record alludes to the wood of *Tecoma*, he does not describe it nor refer to it as true green ebony, about which, however, there can be little doubt. There does not seem to be any evidence that the wood of *Brya Ebenus* has ever been regularly accepted on the market as green ebony. Holtzapffel says that it was produced from Jamaica and the West Indies generally; has a bark much like cocus, but thinner and smoother; the heart-wood is of a brownish-green, like the green fig.

[1] Professor Groom says that "The name 'green ebony' is given to several woods. One of these is *Brya Ebenus* DC., from the West Indies. Another is *Tecoma Leucoxylon*, with which the name is specially associated. The sample agrees in many respects, but not perfectly, with the published descriptions of this It also resembles the Nicaraguan wood known as 'bois d'or,' but from this and from *Brya* it differs in that its medullary rays are not arranged in horizontal series to form tiers. As opposed to greenheart, the vessels are so fine that as delicate scratches along the grain they are invisible to the naked eye."

The ebony of Jamaica is *Amerimnum Ebenus*. *Brya Leucoxylon* of South America yields green ebony.

Writing of the wood imported from the West Indies and Jamaica, Holtzapffel says : " It cleans remarkably well. The dust is very pungent and changes to red when the hands are washed with soap and water. The wood is very much used for dyeing, and it contains so much resinous matter that the negroes in the West Indies employ it in fishing like a torch."

In transverse section the concentric layers are marked by the alternation of light and dark concentric zones. The pores and medullary rays are invisible to the naked eye ; with the lens the former, largely plugged, stand out as yellowish-white spots and the latter as thin, light lines. The pores contain a yellowish to dark red substance.

EBONY, MACASSAR.

Weight 69–74 lbs.

This wood is imported in large billets and round logs, which generally vary in size, ranging from 10 to 30 inches, with an average of 16 inches in diameter, while good lengths of 6 to 16 feet are procurable, fairly sound and good, free from other defect. It is of a rather dense, close grain, but is not so good in this respect as the ebonies of the West Coast of Africa. The colour ranges from dark brown to black, and a large proportion of the logs are streaked with yellow or yellowish-brown, some very handsomely figured pieces being occasionally found. These are generally selected for special ornamental work, such as brush backs, mirror handles, and veneers.

On the tangential section the gum shines brightly in the slightly open pores. These are fairly evenly distributed, but are rather obscure and mostly plugged The medullary rays are fine and very indistinct.

Echinocarpus dasycarpus Bth.

Weight 32 lbs. (Gamble). Eastern Himalaya.

VERN—*Gobria*, Nep.—*Taksol*, Lepcha.

A specimen of this wood was sent over to the Exhibition for experimental purposes, but it possesses no quality to make it of any interest for export trade. It is apparently in good demand in India, for local purposes of various sorts.

The colour is a dirty greyish-blue ; the grain is soft, showing signs of lines of incipient decay.

The pores are very small ; the strong, well-marked medullary ray showing on the radial section as in sycamore.

EKHIMI. *Piptadenia africana* Hook.

Nigeria.

The Imperial Institute reports this wood as resembling plain oak in appearance, but having no specially attractive feature. It is suitable for rough construction work, doors, sills, or as cheap furniture wood, but too heavy for many purposes.

Elaeocarpus serratus Linn.

Weight 30 lbs. (Gamble). Ceylon, India, Malaya, Java.

VERN—*Jalpai*, Beng—*Ulang kárai, uttraccham*, Tam—*Valiya kara*, Mal.—*Weralu*, Cingh.

The colour is a rather dirty grey, with dark- and light-coloured streaks, which give indication of being the first stages of incipient rot. A close, firm grain, yielding a smooth surface from the tool, showing on the radial section the small flecks of medullary rays. The wood is reported by Gamble as not being of much use, which report is probably correct.

The exceedingly numerous pores are very small, and plugged. The medullary rays are numerous, irregular, and ill-defined, showing on the radial section as above stated.

Elaeodendron glaucum Pers.

Weight 48–58 lbs. (Gamble). India, Burma, Ceylon.

VERN—*Mirandu, padriún, bakra, janwa*, Pb—*Bhutta*, Kashmir—*Bakra, shauria, chauli, daberi, mámri*, N.-W P.—*Dhebri*, Dehra Dún—*Chauri, metkúr*, Oudh—*Chikyeng*, Lepcha—*Jamrási, kala mukha, rohi*, C P.—*Bhutikassi, jamrási*, Berar—*Dhakka, nisur*, Gondi—*Niru*, Kurku—*Ratangeru*, Koderma—*Miri*, Kól—*Aran, tamruj, bilúr, buta pala, burkas*, Mar—*Bata karas*, Bhil—*Karkava, irkuli, sclupa, siri, karuvali, piyari*, Tam—*Nirija, neradi, botanskam, kanemis, bootigi*, Tel—*Bhutrakshi*, Hyderabad—*Neralu*, Cingh.

The colour is a dirty brick-red, with an exceedingly close, firm grain, yielding a very smooth surface from the tool. Gamble reports it as seasoning well, and used for cabinet work and picture frames. It has not been seen in commerce.

Numerous pores, largely plugged, very small. Medullary rays very fine, showing faintly on the radial section.

ELDER. *Sambucus nigra* Linn. Europe.

Those who have ever employed themselves in hewing down the common elder stems when growing, and have found how readily a sharp axe cleaves through a thick stem, would be surprised at the exceeding hardness of this wood when dry, and how attractive it can be.

It is a brown straw-yellow colour, with fine small clash of medullary rays which show on the radial section.

It would make an attractive wood for inlay cabinet work, and in America it is utilised for making combs.

The not very numerous pores are very minute and plugged. Strong, well-defined medullary rays, not parallel, clearly showing on the radial section.

ELM, AMERICAN and CANADIAN. *Ulmus americana* Linn.
U. racemosa Thomas
U. pubescens Walt.
U. crassifolia Nuttall
U. alata Mich.
U. serotina.

Weight 44 lbs. 1 oz. Canada, United States.

As with all American and some Canadian timbers, the English timber merchant is always confronted with the difficulty of obtaining reliable supplies, on account of the fact that these consist of the produce of several botanical species mixed indiscriminately. These supplies may vary from the fine, hard, white rock elm (obtainable from Canada twenty-five years ago in large quantities of good size), through less white and less hard transitional types, to the soft swamp elm which is possibly derived from *U. alata* and is little wanted in England. Gibson quotes the respective weights of dry wood as " 40·54 lbs., 45·26 lbs., 43·35 lbs., 45·15 lbs., 46·69 lbs.," in order named above, omitting *U. serotina* ; but, according to him, *U. americana* is called rock elm if it grows on " stony uplands," and swamp elm if on low ground. It is, therefore, not difficult to account for the extraordinary differences found in both colour and density between the different supplies. Gibson states that it would be difficult, if not impossible, to identify the elms or any one of them by the colour of the wood alone. Until a few years ago American and Canadian elm was imported from Quebec in hewn square logs from 20 to 40 feet in length, and 11 to 16 inches square, sometimes even larger, after which for many years it was found exceedingly difficult to obtain supplies of high-class white rock elm, and for several years before and after the war the general quality deteriorated, most of that import being in smaller-sized logs, in the round with the bark on. Some change appears to have occurred, which has resulted in sufficient supplies having been available for the last seven or eight years (1931), much of which has been equal in quality and colour to that which was obtainable twenty years ago, the only notable difference being that the average size in length and diameter has lessened.

The wood is whitish-brown in colour, hard, tough, and flexible, with a fine, smooth, close, silky grain ; and as it has only a small quantity of sap-wood, it can be worked up closely and economically. It is necessary to remove the sap in the conversion of the log, as, unlike that of the Eng-

lish elm, it is of a perishable character. If exposed to a current of dry air it is very liable to split with fine, deep shakes from the surface. Having this serious liability to rend in seasoning, the logs should never be left a week exposed to the influence of drying winds, without some kind of protection. To preserve this timber, therefore, for future use, it should be treated in the same manner as the English common elm, namely, by immersing it in water. It has also been used in aircraft manufacture. During the war the specifications drawn up by the Engineering Standards Committee for the supply of rock elm for aircraft limited this to the produce of *Ulmus racemosa*, but in practice it is doubtful if it would ever be possible to obtain supplies solely of one botanical species.

The wood is valuable for shipbuilding, boatbuilding, and for many purposes where toughness and durability under water are required.

It is very slow-growing, and the annual rings, which are very close, are distinctly marked. The medullary rays are clearly defined and parallel. The pores in the autumn wood, which are exceedingly small, appear like a series of very small, white, wavy bands, making a pattern at right angles to the rays. There is a rather indistinct line of larger pores in the spring wood.

ELM, BRITISH. *Ulmus campestris* Sm., etc.

Weight 36 lbs. 6 oz. United Kingdom.

This wood, although so well known, is not treated with the consideration which its merits deserve. There is little doubt but that scientific research could bring to light many more purposes for which it could be employed than those for which it is at present utilised. It has been used for decorative work with very satisfactory results, as the colour and grain lend themselves to artistic effects. In Austria and Hungary, for instance, it is highly valued, being used particularly for open timbering work in halls and staircases. There is no evidence to show what botanical variety is used, but *Rugen Holtz* is often employed, and it is probable, though not certain, that this is the product of *Ulmus campestris*. The British Consul at Vienna in 1914 had his country house furnished with it, and told me that he considered it as good as oak, and perhaps more ornamental. This example of the utilisation of home products rather than those of more exotic growth might well be followed in this country, which generally adopts the bad economic policy of the reverse system.

It must be borne in mind, however, that this wood is very apt to warp and twist, though where special measures have been taken, this difficulty has been overcome. As the first cost is very low, it would not be extravagant to use a means of protecting the exterior without interfering with the appearance of the wood, thus making it immune from the attacks of boring insects. There is little doubt but that with the aid of preserva-

tives it could be made more useful for many kinds of constructional work, as it is very durable under water, and fairly so under ground.

During the war it was tested for aeroplane work, although considerable discussion arose as to its suitability, opinion being strongly divided on the subject.

The panelling of a room in a prominent bank in Leadenhall Street has been executed throughout in British elm, the stiles, rails, mouldings, etc., being in solid plain wood, with wide panels of beautifully figured elm burrs, the whole work displaying a handsome effect which has been greatly admired.

A room in Marsham Street, Westminster, recently completed, designed by Sir Herbert Baker for his own use, the panelling work executed by Holloway Bros., provides a beautiful example of the best class of work that can be accomplished in this wood, the result of which must be to bring it into prominence and use elsewhere.

A very determined effort has been made since the war to popularise the use of elm for road pavement. It is not clear whether any success has been achieved, but it is very doubtful, on many accounts, whether it can be generally used for that purpose.

The pores in the spring wood are large and open, and in the autumn wood form a pretty pattern of complete wavy bands, which are so conspicuous as to be visible without the aid of the lens. The medullary rays are so prominent that it is strange that they do not show on the radial section.

ELM, CHINESE. *Ulmus Chinensis.*

North and South China.

The Chinese elm produces such a beautiful timber that it is to be regretted that it has never been available in ordinary commercial circles. The colour is a rich, warm, golden yellow-red, with a beautiful and very smooth surface, and a hard, close grain, so that on account of its colour, grain, and lustre it would form one of the most beautiful decorative woods obtainable. There is no indication of any liability to warp and twist, as in the case of all British-grown elms. Mr. Wardle has sent me a specimen of a tree grown at Ballarat in Australia, in which the quality is so fine that it would seem almost worth while to cultivate it for decorative timber purposes.

The concentric layers are clearly marked by strong light-coloured lines. As in all elms, the radial section gives a very pretty pattern ; the light lines of concentric growth displaying small pores, heavily plugged, while the remaining growth displays belts of pores. The very numerous medullary rays are uneven, varying in size, and show an attractive pattern on the radial section.

ELM, CORNISH. *Ulmus nitens* var. *stricta* Ait.

Weight 33 lbs. United Kingdom.

This tree produces a wood which is superior in quality and texture to either the common English elm or the wych elm, and more nearly resembles the quality of the American rock elm, although not so hard, tough, or white. According to Elwes and Henry, " It produces a remarkably tough wood, which is used by wheelwrights for naves, felloes, and framework of waggons . . . and also formerly for making boxes in which gunpowder was compressed by an hydraulic press, as no other wood was found to bear great pressure so well." It also stands very well for the framework of lighter carriages and carts. Cornish elm was used for some old carved panelling which is carefully preserved in the church at Lantiglos near Fowey, but it displays here its liability to be attacked by a worm or beetle, which has perforated some of the panels with holes. It is harder and of a lighter colour than the other English elms, and is capable of a smoother surface from the tool. There is also some difference in the transverse grain, which is more compact and dense, the pores being smaller and rather less in number.

ELM, INDIAN. *Holoptelea integrifolia* Planch.

Weight 40 lbs. (Gamble). India, Burma.

VERN.—*Papri, khulen, arján, rajáin, kachám,* Pb.—*Banchilla,* Saharanpur —*Papar, kanju,* Kumaon—*Papri,* Bhartpur—*Dhamna, kúnj,* Oudh—*Karanji, chilbil, chilmil, kúmba, kúnja náli, kandru, begana,* C P.—*Chillar,* Jeypore—*Pulari,* Reddi—*Daurango,* Uriya —*Karinji,* Gondi—*Karanjel,* Kurku—*Aya, ayil, velayil, kauchia,* Tam —*Namli, navili, tapasi, nali, pedda-nowli-eragu,* Tel.—*Wawali, papara,* Mar —*Ras bija,* Kan —*Thapsi,* Mysore, Coorg—*Kaládri,* Hassan—*Aval,* Mal —*Goda-kirilla,* Cingh —*Mvaukseik, pvaukseik, thalè,* Burm.

This wood bears little, if any, resemblance to the elm of this country. The colour is a rather bright straw yellow, with dark streaks; with a hard, somewhat cross grain. In India it is used for brush manufacture, but it has not been included in commercial supplies to this country, although a specimen was shown at the Empire Timber Exhibition of 1920, which failed to claim any interest.

The pores are small and regular, not numerous, and are joined by faint lines of pale soft tissue. Medullary rays are exceedingly fine, well-defined, parallel, and equidistant.

ELM, WYCH. *Ulmus montana* Sm.

Weight 33 lbs. 1 oz. Europe.

This wood, which is similar to the common elm, is of a better character, milder, generally straighter in the grain, and less liable to twist, warp, and

shrink. Carefully selected, it can be used with advantage for panelling, staircase, or other joinery, but although used for chair-making, it is not really satisfactory, as it is always attacked by beetle. In Southern Europe it is largely employed for trim of houses, staircases, panelling, etc., but in the United Kingdom its chief uses are for van- and cart-building, some forms of bent wood, and especially for boat boards. If carefully selected and seasoned, more advantageous uses could be found, as it is an attractive wood in colour and grain.

The concentric layers are marked by light-coloured lines, with a double or triple row of open pores, minute and very scarce, between the layers. The very strongly defined medullary rays, which show on the radial section in pronounced flecks, are crossed at right angles by wavy belts of minute pores, making the usual pretty pattern, which elm shows on the transverse section.

EMPATA. *Vatica* sp. or *Cotylelobium* sp. ?
Weight 54 lbs. Borneo, The Philippines.

This wood is variously known as " rassak," " empadu," and " narig," and according to Foxworthy, is principally derived from species of *Vatica* or *Cotylelobium*, both of which belong to the tribe *Vaticeae* of the order *Dipterocarpaceae*.

The timber is hard and close-grained, and much resembles the grain and colour of false acacia (*Robinia Pseudacacia*), but is of a deeper tint. The wood is durable but somewhat liable to warp. If thoroughly seasoned it would be suitable for general constructional work.

The medullary rays are fine, clearly marked and parallel, but not equidistant. The pores, which are numerous, are irregularly distributed, and are sometimes partially filled with resin.

ENG. *Dipterocarpus tuberculatus* Roxb.
Weight 39 lbs. 3 oz. (my sample) ; 50–59 lbs. (Gamble) ; 55 lbs. (Brandis). Burma.
VERN—*In, eng*, Burm.—*Sooahn*, Taleing.

In the United Kingdom the name " eng " is most commonly used, while in its native country the term " in " is usually employed to designate this wood. It is a straight tree attaining, according to Troup (*Forest Pamphlet*, No. 13), " the height of 80 to 90 feet with a girth of 8 to 10 feet, but it may attain a height of over 120 feet and a girth of 15 feet." The timber is of a dull reddish-brown colour and has gummy pores. It has a pleasant and aromatic scent, which can pervade a room, and is fairly persistent. The wood greatly resembles Borneo camphor-wood, Siamese yang, and Andaman gurjun. Concerning this last, Sir D. Prain, in a

private note, points out that " the Gurjun of Chittagong, or Kanyin of Burma, are in botanical characters difficult to separate from *D. laevis*,

Photograph by R S Troup

ENG (*DIPTEROCARPUS TUBERCULATUS*), THEYAUNG FOREST, KATHA, UPPER BURMA

and indeed they are generally considered identical. Yet within what is thus treated as one species, the natives had two distinct things which they recognised readily as Telia (from tel or teli-oil), the tree that yielded

the wood oil, and Denlia, a tree with a good, strong yet light, wood, used among other things, in the poles of palanquins (known as Denlis). The wood of this Gurjun or Kanyin tree is very like that of the Eng (*D. tuberculatus*), which also yields a wood oil, or oleo-resin. The timber of the Eng is very similar in colour and grain to that of the Kapor or Camphor tree of Sumatra and Borneo (*Dryobalanops aromatica*)." Sir D. Prain also says that he thinks this tree " does not contain pockets of camphor, but that it may at times. If there be a timber which habitually shows pockets of camphor I do not know it, and should expect it to be some distinct species, and not *Dryobalanops aromatica*."

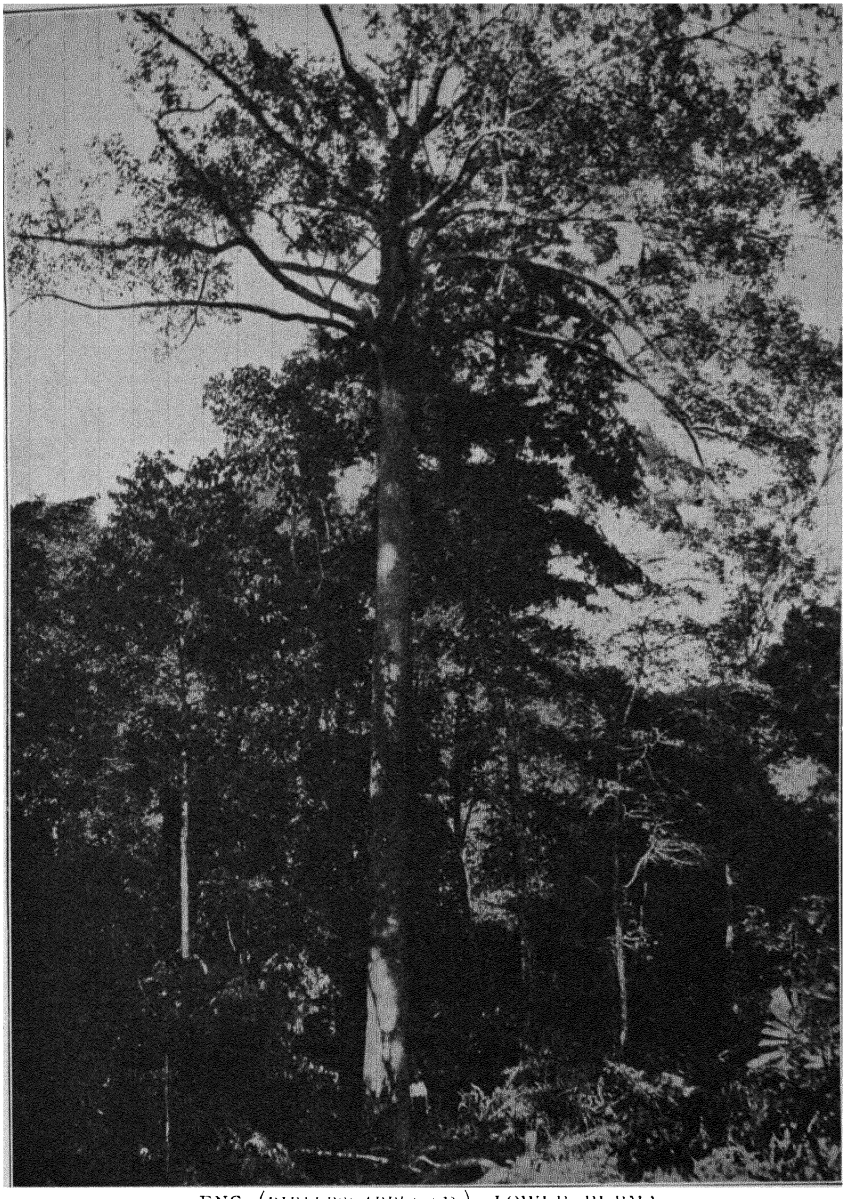
Eng is of hard texture, is straight-grained and works easily. When planed the resinous pores shine brightly. The timber is imported in sawn planks, clean and sound, from 10 feet to about 35 feet long, 7 inches to about 18 inches wide, and from 2 to 9 inches in thickness. As the trees are large and of great height, with clean, straight boles, even larger sizes could be obtained if required. " Were it not that Burmah has so many valuable timbers, and especially Teak, Eng would probably be in even greater demand " (Gamble). In India the wood is largely used for building construction and for boats. It is not considered there to be a very durable timber for work exposed to the weather, nor according to Troup was it found satisfactory for paving-blocks in Rangoon, where it was used for this purpose, as it absorbed too much liquid and soon gave off an offensive odour. Where exposed to the weather, as in sleepers, etc., it has been destroyed by the white ant.

In a later private note R. S. Troup says: " The importance of this timber lies a good deal in its great abundance. There is an enormous demand for the timber in Burma, and in many places the forests have been overworked, as well as wastefully worked. The value of In forests is, however, coming to be appreciated, and adequate steps will, no doubt, be taken to prevent wasteful exploitation and secure regular supplies for the future."

This demand, particularly in view of the continually increasing cost of teak, is certain to increase, both for home use in Burma and India, and for the United Kingdom and all other parts of the world, as the supplies of timber grow yearly more restricted. It appears to be useful for both external and internal construction work in the United Kingdom, although perhaps it is yet too early to speak with confidence as to its durability under exposed conditions. If its characteristics were more carefully studied, it might be used to advantage more regularly.

The products of *Dipterocarpaceae* from Siam and Borneo have been improperly described as " eng-teak " and " yang-teak," which has given the impression that they are a variety of this wood (*Tectona grandis*), and being handled accordingly it has often given unfortunate results. Un-

like teak, it is exceedingly difficult to season, and indeed, without kiln-seasoning it has perhaps never become properly seasoned. A sample 18



ENG (*DIPTEROCARPUS* SP.), LOWER BURMA

inches long, 10 inches wide by 2 inches thick, cut over three years, was found to shrink nearly $\frac{1}{8}$ inch in thickness, and just over $\frac{3}{8}$ inch in width, when subjected to kiln-seasoning. If properly dried, eng is very suitable

for floorings, as the grain is not too fibrous, nor is it hard enough to cause a slippery surface. The floor at Wigmore Hall, which was laid in 1905, is of this wood. An ugly black stain is caused, as with gurjun and Borneo camphor-wood, if iron or steel nails or screws are used wherever it is subject to damp.

Mr. Nesbitt, in a recent letter to the *Timber Trades Journal*, says that the timbers of the Dipterocarps contain " an essential oil " which is destructive to the timber. He points out that this constitutes the great distinction between teak and eng (which in England are sometimes confounded by the uninformed), as teak contains an essential oil that is a preservative not only to the timber, but to everything with which it comes into contact.

Eng appears to be fairly durable when exposed in this country. This may perhaps be explained by the fact that " the destructive essential oil," referred to by Mr. Nesbitt, may have exuded. The durability of the timber is not so marked when under or close to the ground, in which situations it soon begins to show deterioration. There is little doubt that a scientific means of preserving such a valuable wood could soon be found. Even when it is exposed to wet and dry conditions above ground, it is quite durable ; for under these circumstances work under observation during twelve years gives quite satisfactory results.

The pores are irregular in size and position, and are partially plugged with resin. The medullary rays are irregular and somewhat coarse, showing in flecks on the radial section.

Engelhardtia spicata Bl.

Weight 30–36 lbs. (Gamble). India, Burma.

VERN—*Silapoma*, Hind.—*Mowa, mahua*, Nep.—*Savyak*, Lepcha—*Bolas*, Beng.—*Rumgach*, Ass.—*Bor-patta-jam*, Cachar—*Dinglaba*, Khasia —*Vakru*, Garo—*Taungtamasôk, petsut, thitsawbwa, thitswèbwè, pyinsit*, Burm.

An experimental export was made for the purpose of the Exhibition, but the wood, although very useful and having merits, possesses no outstanding quality to bring it into prominence for the export trade. Gamble reports it as good for carving, and as being used in the Khasia Hills for making spoons ; for both of which uses its qualities admirably recommend it. It is of an agreeable grey-brown colour, with a suggestion of green about it, and gives a lustrous surface from the tool.

The pores are very scarce ; in singles, pairs, and triplicates. They are of an unusual oblong, or carrot shape. The exceedingly fine and very numerous medullary rays are difficult to identify under the magnifying glass, and are crossed at right angles by finely marked belts of smaller light lines, forming a faint pattern.

ENTEROLOBIUM. *Enterolobium Saman* Prain. (" Rain tree.")
Central and parts of northern South America.

Record says it is a native of Central America and parts of northern South America, and has been introduced from India, Ceylon, and Burma, also that it resembles very closely the wood of the siris tree of India (*Albizzia Lebbek* Benth.). He reports it as being of little or no commercial importance, but says that the timber enters the U.S.A. markets as roughly hewn logs averaging about 24 inches in diameter and from 10 to 14 feet in length, usually free of defects.

There is very considerable variation in the density of the wood, ranging from the consistency of white pine to that of walnut, the heavier variety resembling walnut in general appearance, and making a fairly satisfactory substitute for that wood.

Eperua falcata Aubl.

Weight 59 lbs. British Guiana.

VERN—*Wallaba, soft wallaba,* B.G.—*Bylhout, bijlhout, woapa, wouapa, walaba,* Sur —*Wapa, wapa huileux, wapa gras, eperu,* Fr. G — *Apa, apazeiro, espadeira, wapa patouvé,* Braz.—*Palo machete,* Venez.—*Wallabaholz,* Germ.

This timber, known sometimes as wallaba or wapa, is of a red-brown colour, with dark streaks, resembling Rhodesian teak (so-called). A very attractive wood with a hard close grain, but freely exuding an oily gum which stains anything with which it comes in contact. Baterden refers to its use in Barbadoes and Trinidad for telegraph and electrical poles.

Medullary rays very fine, obscure, difficult to locate even with the lens. Pores scarce, small, sometimes plugged, concentric layers marked by dark lines.

Eriolaena Candollei Wall.

Weight 50 lbs. India, Burma.

VERN—*Dwani, swani, tayaw-ywetwaing,* Burm.—*Hadang,* Kan.

This wood, which in Burma is called " dwani," has only been imported on a commercial scale since 1920. It is one of the lesser known but valuable decorative hardwoods of Burma. The colour is a bright salmon-pink to brick-red and it is often marked with orange and brown streaks. The grain is hard and close, and it seasons and polishes well. In India it is used for such purposes as gun-stocks and cart-building, but its value in the European market lies in its use as a medium for cabinet-making, inlaying, turnery, and all kinds of decorative art woodwork, such, for instance, as the brushes and electric light fitments shown at the Empire Timber Exhibition.

The pores vary in size and are very irregularly distributed ; they are

often joined in wavy concentric bands of loose tissue. The very numerous, straight, white medullary rays are clearly marked.

ESCALLONIA. ?*Escallonia floribunda* H. B. K.
E. tortuosa H. B. K.

Northern South America.

VERN—*Jarillo, cochinito, puerquito, Quitasol*

Tropical Woods, No. 1, reports the tree as from 25 to 45 feet in height and 14 to 16 inches in diameter. The wood is mostly used for fuel, although also used locally for building purposes. The colour is light brown with a reddish tint, with a hard, rough grain, taking a smooth finish, resembling thuya although much harder. The specimen from a tree grown at Powerscourt in Ireland provides a good hard quality of wood, but without sufficient quality to recommend it for use.

ESPAVÉ. *Anacardium Rhinocarpus* DC.

Weight 38–39 lbs. South America.

VERN—*Espavé* (or *esparva*), *espavé mahogany, Pesége mahogany*, Trade—*Espavé, espavel, aspavé*, C A.—*Caracoli*, Col —*Caracolí, mija, mijagua*, Venez.—*Giant cashew tree.*

The colour is a light nut-brown, with a fairly smooth grain, showing alternate layers of hard and soft growth. This timber may possibly be described as one of the most deceptive of all woods. My specimen shows a useful firm timber, highly suitable for works of a secondary nature, linings and backs of cabinets, etc. Its use would be limited to those parts of the decorative woodwork which are not seen On the other hand, generally, it is not durable, and very severely attacked by worm (" beetle ").

There are two sorts of espavé—the light and the dark—the light being inferior, with small heart-wood and much sap-wood. Generally speaking the tree is a native of the lowlands, but occasionally it is seen even on the tops of the hills. The dark variety is more often found in a dry situation, although it can occasionally be seen at the water's edge. It is much superior in quality, containing a greater proportion of heart-wood and much less sap-wood. It resists beetle attack better, and the heart-wood is in fact practically insect-proof. It is used but little locally, but along the coast it is the chief timber for canoes and boats, an excellent recommendation in itself.

In an article in *Tropical Woods*, No. 22, p. 4, it says : " The tree has various local names. In Costa Rica it is best known as Espavel, although an alternative is Quina, perhaps in reference to the bitter bark. The Panama name is Espavé or Espava ; the Colombian, Caricoli ; the Venezuelan, Mija or Mijaguo. The West Indians call it Wild Cashew because of the resemblance to the cultivated Cashew, to which it is closely related.

The use of the name Mahogany for this tree or its timber, as is occasionally the practice of dealers and promoters, is wholly without justification." Also, " Attempts to introduce the lumber into the markets of the United States have been made in a desultory way, but with little success. . . . It is none the less potentially a very useful timber."

This last reference to the usefulness of the wood is more flattering than its reputation during the last twenty years would seem to warrant.

About the year 1910 a cargo of espavé, purporting to be mahogany, was sent to Astoria near New York, where it was attacked by a weevil or beetle, which did an enormous amount of damage, and spread to the mahogany stored near by. The resulting loss led to a lawsuit in the American Courts, and the judgment given by Judge Blackmore on that occasion is included in full at the end of this article, as it deals with an important point regarding the liability of sawmillers of timber in their relation as storage contractors, and the decision of the United States Court as to the separate obligations of the parties concerned provides a useful authority in the event of any future dispute that might occur. It is not known whether the cargo consisted of the light or dark varieties, but it is probable that it contained both. Upon arrival of the cargo of supposed mahogany at New York, and when it was discovered that there was no mahogany on board, inquiry was instituted, an explanation being received that before the mahogany trees on this concession could be got at it had been found necessary to clear a quantity of espavé trees, and that a second cargo was being despatched which would be found to consist of mahogany. In due course the second shipload arrived, but upon discharge it was discovered that the whole cargo again consisted of nothing but espavé. A surveyor was then despatched by the promoters of the Company to make inquiry on the spot, when he found there was not one single mahogany tree on the concession which had been sold to the Company, with the result that they sustained a very great loss.

Mr. Alexander Williams of Astoria Sawmills informed me at a later date that after the espavé had been sawn and stacked over a considerable area of ground, he was surprised one day to see a great number of swallows circling over the piles of timber. The incident created general interest and astonishment, as no swallows had ever been seen in the neighbourhood before. Attention thus being drawn to the piles, further inquiry was made, when innumerable small heaps of sawdust were found lying on the timber, which on further investigation revealed the terrible ravages which had been caused by the destructive beetle. The whole incident is of first importance, as the losses incurred amounted to many thousands of pounds. If measures could be taken to prevent the attack of this beetle, espavé might become a useful wood.

The rather sparse pores, somewhat open, and to a small extent plugged

vary in size from rather large to medium. The medullary rays are strong and clear, crossed at right angles by thin, light bands of parenchyma. The concentric layers are well defined.

New York Law Journal, February 26, 1913.

DECISION BY JUDGE BLACKMORE

ASTORIA VENEER MILLS AND DOCK CO. *v.* HORSEY & SON

The following propositions suffice for the disposition of this case :

1st. A contract for the storage of goods, wares, and merchandise which does not provide for any definite time of continuance may be terminated by either party on notice.

2nd. The contract in the present case provides no definite time of storage. The provision that if the logs are not withdrawn within a year the warehouseman may sell or store them elsewhere is not equivalent to an agreement on the part of the warehouseman to keep them in storage for the period of one year.

3rd. Even if the storage was for a definite period of time the development of the pest in the logs, which rendered their continued storage destructive of the property both of the warehouseman and the lumber of others in its care, justified it in terminating the contract of storage.

4th. Upon the refusal of the bailer to remove the logs, pursuant to notice and request, the warehouseman was justified in removing them and storing them in some other place for the account and at the risk of the owner.

5th. As it was the duty of the owner to remove the logs when notified by the warehouseman, he is liable for the charges and expenses incurred in effecting their removal, and also for such charges and expenses as had already accrued up to that time.

6th. Neither the plaintiff nor the defendant knew at the time when the logs were placed in storage that the insect pest was likely to develop, and neither of them were negligent so as to give a right of action to the other.

7th. The defendant neither created nor maintained a nuisance, and therefore is not liable upon that theory.

It follows that judgment should be rendered for the plaintiff to the effect that the storage contract was terminated and ceased to exist between the parties on August 16, 1912 ; that the plaintiff is released and discharged from all further responsibility to the defendant as warehouseman ; that the defendant should be enjoined from further negotiations of the warehouse receipts, and that the defendant should pay to the plaintiff the charges incurred up to the time of the removal of the logs and its expenses incurred in the removal, and that the counterclaim of the defendant be dismissed.

Eucalyptus capitellata Sm.

Weight 62 lbs. South-east Australia.

This wood is known as the " brown," " red," or " Coast " stringy-bark ; it is of a pale brown or red colour, hard, works well, and is suitable for use in places where hardwoods are required, also for fencing and house-building. It is reported as not so durable as the " white " stringy-bark (*E. eugenioides*), but superior to the " red " or " mountain " stringy-bark (*E. macrorrhyncha*).

Eucalyptus corymbosa Sm.

Weight 56 lbs. (Baker). Australia.

Known as " bloodwood." The colour is dark red, with a hard, very coarse texture. It is reported as one of the most durable timbers of Australia, durable in the ground and of value in damp situations, used for telegraph poles, keels of vessels, piles, posts, and sleepers, and as being the most important timber of the Australian bloodwoods, and in great demand.

It is probably to be introduced on our London markets for the first time this year.

Eucalyptus Delegatensis.

See STRINGY-BARK.

Eucalyptus fastigata.

Weight 56 lbs. (Baker). Coast of New South Wales, Eastern Victoria.

Known as cut-tail and stringy-bark.

" The timber is straight-grained, pale coloured and free working, fissile. . . . A good substitute for imported ash (*Fraxinus*)." Used locally. " An excellent medium hardwood . . . and valued in some parts for its durability in the ground " (Baker).

Eucalyptus fraxinoides J. H. M.

Weight 45 lbs. (Baker). New South Wales.

Known as white ash.

Baker remarks that " The timber has all the characters and qualities of the European and American ashes, being almost white, with a nice sheen, fissile, free working . . . suitable for casks, carriage work of all kinds . . . in fact, every purpose to which lightness, strength, and bending qualities are a desiderata."

Eucalyptus Oreades R. T. B.

Weight 46 lbs. (Baker). New South Wales.

Known as smooth-bark mountain ash.

Described by Baker as " one of the most conspicuous trees in the gullies of the Blue Mountains . . . it has all the bending and resilient qualities of European and American Ashes, but is heavier. . . . Suitable for house construction, carriage-building, and cabinet work. . . . It has little figure . . . is fairly hard, tough, and straight-grained, pale-coloured, almost white."

Eucalyptus Sieberiana F. v. M.

Weight 51 lbs. (Baker). New South Wales, South Australia, Victoria.

Known as N.S.W. mountain ash.

Baker reports this timber as being " harder, darker in colour (than *E. Delegatensis*), and almost invariably marked with black spots . . . a first-class timber for general building purposes, bridge-work, wharves, and heavy coach and carriage work."

Eucalyptus Smithii.

Weight 60 lbs. (Baker). New South Wales.

Known as gully ash and white top.

Baker describes this as a " hard, pale-coloured, close-grained timber." The grain is slightly interlocked, shrinks a good deal in seasoning, and the sap-wood liable to attack by borers. Suitable when dry for general rough building purposes, coach framing, and bridge superstructures.

Eucalyptus virgata Sieb.

Weight 54 lbs. (Baker). Tasmania, New South Wales, Victoria, South Australia.

Known as Tasmanian ironbark, Tasmanian mountain ash.

Baker remarks that " its commercial qualities fall below that of the Mainland ironbarks," and that the presence of gum veins somewhat detract from it to a certain degree, but otherwise it is a close, straight-grained, pale-coloured, hard, fairly heavy timber requiring careful seasoning, " and is suitable for constructional works, carriage and bridge work, and general economic purposes."

Eugenia bracteata Roxb.

Ceylon, Southern India.

VERN—*Hijuli mendi*, Beng.—*Sagarabatna*, Uriya—*Arivita, aramanda, goragmúdi*, Tel.—*Kaya, venkalikaya*, Tam —*Tembiliya*, Cingh.

This is reported as only a small tree or shrub, often cultivated for ornament (Gamble).

The colour of the wood is olive brown, with a very close grain, capable of a very smooth surface. The wood has not been seen in commerce.

The pores are very numerous, but exceedingly small, and joined by light bands forming a kind of check pattern. The medullary rays are of two sorts, one extremely fine, hardly discernible under the lens, while the other, though also fine, is prominent. The rays are crossed at right angles or obliquely by fine dark lines, which would seem to indicate the growth of the layers.

Eugenia Gardneri Duth.

Weight 63 lbs. Ceylon, Southern India.

VERN—*Dambu*, Cingh.—*Nir-naval*, Tamil.

The colour is yellow-brown with a greenish tinge, and a very close, firm grain, rather hard, but not yielding a very smooth surface from the tool. Pearson and Brown, in *Commercial Timbers of India*, say " there appears to be no reason why properly seasoned scantlings, rafters, and posts of *Eugenia Gardneri* could not also be profitably exported," and compare the wood with that of *Terminalia paniculata*, *Calophyllum tomentosum*, and *Lagerstroemia lanceolata*. While the expressed opinion may be justified as regards the export to Indian and Persian ports, I do not consider its qualities would warrant any export to European markets, and I am not in agreement that this wood is comparable with the three others named.

The very small pores are rather variable in size, and plugged, arranged irregularly with narrow wavy belts of light tissue. Very fine thread-like medullary rays, forming a very small, pretty pattern.

Eugenia Jambolana Lam.

Weight 48 lbs. (Gamble). India, Burma, Ceylon.

VERN—*Jáman, jam, phalında, jamnı, phalánı, pharenda, phaunda*, Hind. —*Jam*, Beng.—*Jamo, jambo, kudıjamu*, Uriya—*Phober, taglang*, Lepcha—*Chambu*, Gáro—*Kor-jam*, Mechı—*Jamu*, Ass.—*Naval, navvel, nawar, naga*, Tam.—*Nerale*, Mysore—*Narala, nairul, nerlu*, Kan.—*Nasedu, nairurı, nareyr, neredu*, Tel.—*Naındı*, Gondı—*Jambúl*, Mar.—*Jambu*, Merwara—*Kodo, kúd*, Sonthal—*Kuda*, Kól—*Jambún*, Oraon—*Lohudru*, Khond—*Neredu*, Reddi —*Nerel*, Badaga—*Mahadan, ma-dan*, Cingh.—*Zebrı, chaku, kau*, Magh.—*Thabye-byu, tamè*, Burm.

Sometimes known in India as the " black plum." The colour is a reddish-grey, with a straight grain, suitable only for general constructional work. Gamble says " it is largely used in India for native building purposes, posts, beams and rafters of houses, for agricultural implements and for well-work, as it resists the action of water." He also mentions that five sleepers laid on the Oudh and Rohilkhand railway in 1870, taken up in 1875, were found to be fairly sound and untouched by white ants.

Pearson and Brown, in *Commercial Timbers of India*, recommend a trial of this wood as a furniture timber, but I cannot agree with their opinion, considering that the timber has no special merits to warrant its export, and this view would seem to have been already confirmed by the small shipments which have come to hand during the last ten years, but created no interest although every effort was made to popularise the wood.

The pores, which are very small, are oval in shape and are often joined by wavy belts of loose tissue. The medullary rays are so fine as to be scarcely discernible even under the lens.

Eugenia sylvestris Wight.

Weight 49 lbs. (Gamble). Ceylon.

VERN—*Alubo*, Cingh.

The wood is of a brick-red colour with close, hard grain and a rough surface. It is liable to contain black streaks and lines, which make an irregular pattern on the surface of the wood. It has contrary layers of hard and soft grain, broken up, which increase the work required to secure a smooth surface.

The pores are very small and numerous, plugged. The medullary rays are very numerous, fine, and hardly discernible under the lens.

EUMUNG. *Acacia salicina* Lindl.

Weight 48 lbs. (Baker). Victoria, South and Western Australia.

The colour of the wood is a rich brown, with a rough grain showing that a smooth surface can only be obtained with difficulty, but it is reported as presenting a rich appearance when properly handled.

EXCOECARIA SPP. (Sandaleen.) *Excoecaria lucida* Sw.
Sebastiana lucida Muell. Arg.

Record notes this wood as the product of what is now called *Gymnanthes lucida* Sw., and reports it as occurring in Florida, the Bahamas, and the Antilles. Troup reports it as a common tree in the coastal belt of Natal and Zululand. The wood is also exported from Portugal and East Africa. In Africa it is known as "Um Tom Boti," and also "Sandaleen." Record says: "Occasional logs reach the New York market, and veneers in the form of thin cross-sections called Cuban oyster wood." My specimen, and also a walking-stick, have both come from South Africa.

The wood is of a dull, dark red colour resembling that of beefwood. It is very hard, heavy, and close-grained, possessing a sweet aromatic scent somewhat similar to that of sandalwood.

Mrs. Jamieson, the donor of the stick, informed me that she possessed a considerable tract of forest growth, some of which had been successfully employed in South Africa for furniture.

Its qualities would make it useful for inlay work, in banding, for turning or small cabinet work, and as used in New York, for fancy cabinet work.

The concentric layers of growth are clearly defined by dark lines. Pores exceedingly scarce and very small, largely plugged. The medullary rays are exceedingly fine, hardly discernible under the lens.

Excoecaria agallocha. ("The Eye-blinding Plant.")

Ceylon to The Philippines, and Australia.

Foxworthy gives this wood the name of buta-buta. He describes it as

a soft white wood, and says : " The ' eye-blinding plant ' of India is of evil repute. The wood contains an extremely acrid dark-coloured gum said to cause blindness if rubbed on the eyes."

FEJAO BRABO. Source unknown.

Weight 54 lbs. Brazil.

The small specimen of this wood in my collection is that of a very small tree ; it would probably be of little commercial use, and no further description is necessary.

The pores are exceedingly small and the medullary rays very fine.

Feronia elephantum Correa.

Weight 45 lbs. (Gamble). India, Ceylon, Java.

VERN.—*Bilin, kait, kat-bél,* Hind.—*Kath-bél,* Beng.—*Kabit,* Melghat—*Koito,* Uriya—*Cawtha,* Bombay—*Vallanga, vela, kavit,* Tel.—*Velagá, elaka, yellanga, vellam, vila, vilatti,* Tam.——*Bilwar,* Kan.—*Kawat,* Mar.—*Diwul,* Cingh.—*Thibin, thi,* Burm.

This timber, which is also found in India and Java, is of a yellowish straw colour, with a very close compact grain, yielding an exceedingly smooth surface from the tool, comparable with that of pencil cedar. The tree produces a useful gum.

The rather sparse pores are very small and plugged. The medullary rays are exceedingly fine and numerous, crossed at right angles by similar fine lines, with stronger and pronounced bands of similar lines, altogether not unlike the boxwood (*Buxus* sp.) sections.

Ficus callosa Willd.

Southern India, Ceylon, Andaman Islands, Burma, Java.

VERN—*Wal-gona,* Cingh.

Very light in weight. Of a yellow-grey colour, with numerous darker-coloured lines or streaks. Relatively strong, and a possible substitute for Indian balsa (*Sterculia*), but the wood has not yet been met with in commerce.

The pores are very scarce, ranging from very small to fairly large, very open, and almost entirely in narrow belts joined by tiny pores, or lines of a light colour. The very numerous medullary rays are fine and firm, with the right-angled belt of pores making an unusual pattern as of network.

Ficus Tsiela Roxb.

Weight 34 lbs. (Gamble). Southern India, Ceylon.

VERN—*Jadi,* Tel.—*Pipri,* Mar.—*Bili-basri,* Kan.—*Kalatti,* Tam.—*Ela nuga, ehetu,* Cingh.

A dark brownish-coloured wood with a tinge of green in it, a hard, straight grain like a Sapeli mahogany, but with a smoother surface. An

attractive wood for good quality decorative woodwork, the transverse grain marked by wide patches of dark-coloured concentric layers.

Pores not very numerous, very small, plugged. Medullary rays hardly discernible under the lens.

FIG. *Ficus* spp.

India, Burma, Africa.

This is probably the genus of woody plants of the Indian forests which contains the largest number of species, and it is also found extensively in other parts of the tropics. Many of them are unimportant shrubs, climbers or small trees. I have the following samples in my collection :

(*a*) ***Ficus bengalensis.***

VERN—*Bor, bar, ber, bargat,* Hind —*Badu,* Kumaon—*Bur, but,* Beng — *Boru,* Uriya—*Borhar,* Nep.—*Kangji,* Lepcha—*Ranket,* Gáro— *Bot,* Ass.—*Barelli,* Gondi—*Wora, wada,* Kurku—*Bai,* Kól—*Ala,* Tam.—*Mari, peddi-mari,* Tel —*Ahleda, aladamara, ala,* Kan — *Peralu,* Mal —*War, vada, vadi,* Mar.—*Cherla,* Mal.—*Maha-nuga,* Cingh —*Pyinyaung,* Burm.

This is the " banyan " tree, considered sacred by the Hindus, and rarely cut, so that it is negligible from the commercial point of view. According to Gamble, the name banyan was given to a tree growing near the Gambroon (*i.e.* Bandar Abbas in the Persian Gulf) under which some banians or Hindu traders had built a pagoda. The tree is very large and throws down numerous aerial roots from the branches, which root in the ground and grow into separate trunks, and by this means one tree covers an immense area. Gamble mentions a banyan in the Andhra Valley near Poona, which had a circumference round the spread of the branches of about 2000 feet. Commander Buxton and Major Darley saw a *Ficus* in Abyssinia which was 75 feet in circumference. They climbed to a height of 10 feet, and the tree was then large enough to build a house upon.

The timber of the banyan is light in weight, and rather resembles Oregon pine (*Pseudotsuga Douglasii*), though it is of a harder nature. On the radial section it has a characteristic grain not unlike *Bombax malabaricum.* It is not suitable for general use, but it might be employed for secondary cabinet work, such as the linings of drawers and cabinets.

The transverse section shows narrow, wavy concentric bands of soft tissue, alternating with harder and firmer wood. The pores are moderate to large sized and are irregularly and scantily distributed. The medullary rays are very distinct, and fairly numerous.

(*b*) ***F. glomerata.***

VERN—*Kathgúlar, krúambal, rumbal, kakammal, dadhúri,* Pb.—*Gúlar, paroa, lelka,* N.-W.P.—*Khaina,* Garhw.—*Kheunia, umra,* Kumaon —*Khutnia,* Dotiál—*Gúlar,* Oudh—*Umar, umrai, tue,* C.P.—

Dumri, Nep.—*Tchongtay*, Lepcha—*Jagya dumar*, Beng.—*Dhimeri*, Uriya—*Láwa*, Melghat—*Thoja*, Gondi—*Alawa*, Kurku—*Lowa*, Sonthal—*Dumer*, Mal Pahari—*Toga*, Khond—*Mori*, Koya—*Budi*, Reddi—*Umbur*, Mar.—*Atti*, *rumadi*, *kulla-kith*, Kan.—*Atti*, Tam.—*Moydi*, *atti*, *bodda*, *paidi*, *mari*, *medi*, Tel.—*Attika*, Cingh.—*Thapan*, *ye-thapan*, *nyaung-thabye*, Burm.

This timber, though by no means of so high a quality as the foregoing, is yet very similar. It is used in India for a variety of purposes, such as cheap furniture, but has not been seen in the European markets.

(*c*) ***F. altissima.***

VERN—*Yokdúng*, Lepcha—*Práb*, *phegran*, Gáro—*Bur*, Ass.—*Kathal*, *bat*, Sylhet—*Nyaung-peinnè*, Burm.—*Nuga*, *kosgona*, Cingh.

This is much lighter in weight than *a* and *b*, and the specimen shows distinct signs of incipient decay; the wood is probably very perishable. It is the produce of a very large tree of the eastern Lower Himalaya.

(*d*) ***F. religiosa.***

VERN—*Pipal*, Hind—*Aswat*, *asúd*, Beng—*Pipli*, Nep.—*Bor-bur*, Cachar—*Jari*, *usto*, Uriya—*Hesar*, Kól—*Pipali*, Khond—*Arasa*, Tam.—*Rai*, *raiga*, *ragi*, *ravi*, Tel.—*Ali*, Gondi—*Pipri*, Kurku—*Ashvatha*, Mar.—*Pipro*, Panch Mehals—*Rangi*, *arali*, *basri*, Kan.—*Nyaung-bawdi*, Burm

This is the "peepul," one of the best known of Indian trees, held sacred both by Hindus and Buddhists. Gamble says that by Hindus the killing of a peepul tree is looked upon as a great sin, so that it is rarely felled, and although it is very destructive to forest trees it is difficult to get it cut. He also mentions a peepul tree at Anuradhapura in Ceylon, which was brought from Northern India and planted in 288 B.C., which is probably the oldest, or nearly the oldest, historical tree in the world. The timber, however, is of little value, even if it were procurable. It is very soft and light and my specimen shows signs of incipient decay. The transverse sections of these four specimens are all very similar. (See *F. bengalensis*.)

Filicium decipiens Thw.

Weight 65–68 lbs. India.

VERN—*Katu puveras*, *athalanghi*, Tam.—*Val murichha*, *nirvali*, *niroli*, Trav Hills—*Pehimbiya*, Cingh.

This is a very hard wood of a red colour; it is reported by Gamble as being strong and useful. It is unlikely, however, that it will ever be of much commercial importance in the European markets.

"Pores small, in groups of short radial lines. Medullary rays fine, numerous, at unequal distances" (Gamble).

FIR, SILVER. *Abies pectinata* DC.

Europe.

The tree was introduced into England at the beginning of the seventeenth century, one tree being mentioned by Evelyn as having been planted in 1603. The wood is similar in appearance to the silver spruce of British Columbia ; in colour and texture midway between spruce (*Picea excelsa*) and yellow pine (*Pinus Strobus*). The grain is very smooth and silky. The principal use of silver fir in this country before the war was for the sound-boards (belly boards) of pianos and violins. Elwes and Henry say that " staves of this wood were found in 1900 lining the ancient wells in the Roman Cilchester (Hants), the wood being identified by Marshall Ward. The casks from which the staves were taken were probably imported from the region of the Pyrenees, and either contained wine, or Samian ware."

FIRE BUSH (The). *Embothrium coccineum.*

Chili, India.

The specimen of this species is marked " fire bush," and Zon and Sparhawk give to it the vernacular name of *ciruelillo*, but that name, according to Record, is given to the product of *Ximenia americana* L. of Cuba.

The wood has a pretty greyish-white colour, with a very lustrous surface ; it is hard, bony, heavy, and strong, considered a good furniture and cabinet wood, and suitable for flooring.

The medullary rays are pronounced, as in the plane.

Flacourtia Cataphracta Roxb.

Weight 52–54 lbs. (Gamble). India, Burma.

VERN—*Paniála, panizali*, Beng.—*Pachnala, jamuna*, Dehra Dún—*Talispatri, paniála*, Hind.—*Vayangkarei*, Tam.—*Thallira*, Mal.—*Jugguru*, Bomb.—*Abblu*, Kan.—*Naywè, kyetyo-po*, Burm.

A dull, somewhat plum-coloured wood, very strong and hard, with a fine close grain.

The fairly numerous pores are small and uniform in position. The close, fine numerous medullary rays show on the radial section—as in sycamore.

Flindersia Australis R. Br.

Weight 54 lbs. (Baker). New South Wales.

The colour of this wood is yellow to yellowish-red, with a close, hard grain, and an oily surface. Baker calls it " teak," and Mr. Wardle

" native teak," a most unsuitable name as it has neither the resemblance nor characteristics of teak ; a more correct comparison would be to birch.

A very valuable timber for uses in its own country, specially having regard to the oily nature which preserves the iron or nails with which it comes in contact. In spite of its being liable to split, and difficult to work, on account of its great strength and durability it is in great request for numerous works in ships and dockyards.

The rather scarce pores, partially plugged, are between irregular, variable medullary rays which are rather coarse, and crossed at irregular intervals by numerous white layers, which mark the line of concentric growth.

FOOCADIE. *Terminalia Buceras* Bail.

Weight 57 lbs. British Guiana.

The name of this timber is variously spelt as fukadi, fucadie, and phokadie. A specimen was shown at the Empire Timber Exhibition in 1920. It is a hard, heavy, durable wood not unlike greenheart, though it is of a coarser and more open grain. It is suitable for general constructional work, though in common with many of the valuable timbers of British Guiana, the difficulties of exploitation will probably prevent any general use for some time to come.

FRAMERE or **FRAMIRE.** *Terminalia ivorensis* A. Chev.

Weight 42–43 lbs. French Equatorial Africa.

This wood, in colour a rich light golden yellow, was referred to in *Tropical Woods* (1925) as being a highly useful African wood, but that its importation into France had been practically suspended because of insect attack. The latest information received describes it as mild, with resistance equal to red deal, and that it tenons and mortises well, holding nails and screws securely.

It works well and is an excellent wood for cabinet and joinery work, mouldings, floor blocks, aeroplane propellers, and piano work, but is not exported in large quantities.

The rather large pores, plugged and open, are situated between fine, irregular, uneven medullary rays.

FREIJO or **FREI-JORGE.** *Cordia Goeldiana* Huber.

Weight : Freijo 46 lbs., Frei-Jorge 39 lbs. Brazil.

In Colonel Gamble's collection there are two very distinct specimens. That marked Freijo, which has been called " South American mahogany," is somewhat like *Swietenia* sp. only slightly darker and heavier, being of a dull brick-red colour.

The other specimen is marked Frei-Jorge and is a very pretty, light

greyish-brown wood with slightly darker streaks, the medullary rays showing in fine flecks on the radial section.

Commerce Reports, U.S.A., 20th April 1925, from the Consul at Oporto, says that Freijo has proved unsuitable for staves, owing to the poor quality of the wood received, and the fact that it imparts a flavour to the wine.

Record gives the probable source of Freijo as *Cordia Goeldiana* Huber, and Frei-Jorge as *C. frondosa* Schott.

In the light-grey wood the pores are very numerous and are so linked together in undulating lines as to form a very pretty pattern. Strongly marked medullary rays intersect the pores. The concentric layers are marked by a thin white line at varying intervals.

In the heavier, darker-coloured wood the pores are irregularly distributed and are not very large. The medullary rays are very clearly defined, and can be seen with the naked eye, very close and parallel, showing on the quarter in strong, large, and regular oblong patches, unlike any other wood.

Fu-ch'ai. Source unknown.

China.

This attractive wood has a fairly hard, close grain, somewhat like concha satinwood. The colour is a yellow-grey, with a rather bright sheen. The specimen shows strong broken roe, with mottle, and presents a high-class decorative cabinet wood which has a special character of its own, rather like the light-coloured grey harewood of the very best kind, or a rather pale-coloured concha satinwood.

The concentric layers of growth are marked with faint lighter-coloured lines. The pores are very small, partly plugged, in bands or belts, making a pretty pattern. The medullary rays are extremely fine, close, and show on radial section as in sycamore.

FURNITURE WOOD. Species unknown.

Weight 48 lbs. 1 oz. West Coast of Africa.

Many very different varieties of hardwoods have from time to time been brought to England, and for want of more accurate information have been called by the term " furniture wood." There has been such a great divergence of quality and appearance that it is difficult to know exactly the best manner of describing the timbers. Among these supplies, however, has been found one handsome and valuable variety that so nearly resembles in all respects Australian blackwood (*Acacia Melanoxylon*) that it suggests its being the same tree. The weight of my sample is exactly the same as one of the specimens of blackwood, while the colour and general appearance are also similar. There are the same dark gummy streaks and the same bright metallic lustre. It is only when the section

end is examined with a magnifying glass that any apparent difference is manifested.

The annual layers of growth are clearly defined by thin light-coloured streaks, and the open pores are so evenly distributed that they would almost give the impression that they were artificial. The medullary rays are fine, parallel, very close and regular.

FUSTIC. *Chlorophora tinctoria* Gaudich.

Weight 50 lbs. Central America, West Indies.

VERN—*Fustic, fustick, old fustic, fustic wood, mulberry, dyer's mulberry, fustic mulberry, Cuba wood, yellow wood, mora, mora yellow wood,* Eng.—*Bois jaune, bois jaune de Bresil, bois jaune de Cuba, bois jaune de Tampico, fasteque, fusteque, bois à pian, maclura tinctorial, murier à rameaux epineaux, murier des teinturies,* Fr.—*Fustik, fustikholz, alter fustik, gelbholz, brasilienische gelbholz, Brasilienholz, fiselholz, fisetholz, fustteholz, Jamaikaholz, farber-maclura, farber-maulbeer, farbende maulbeer,* Germ.—*Bastaord yzerhart, stokvischo-hout, citroenhout, geelhout, verwer-morebessen,* Dutch—*Fustete, mora, mora de piedra, mora del pais, mora blanca, fresno de America,* Cuba—*Mora, palo de mora,* P.R.—*Fustic, bois d'orange, palo naranjo,* Trin.—*Tata-jiba, tatajuba de tincta, tayuva, amoreira de espinho, espinheiro branco, limao, runa, páo amarello,* Braz.—*Dinde, palo mora,* Col.—*Mora, mora amarilla, mora colorada, brazo del fuego, tatayibá, tatayibá-pyitá, tatayibá-saiyú,* Arg —*Amarillo,* Boliv.—*Moral amarillo, moral de clavo, moral liso, moradilla, palo moral, yaga-huil,* Mex —*Morera, palo de mora, brasil?* C.R —*Palo amarillo, mora,* Salv.

This wood is a bright golden or greenish-yellow colour, and is chiefly valued for the yellow dye which it produces, but occasionally it is used for cabinet work, and also for mill-rollers and naves of wheels. It saws and planes well, is durable and does not warp.

The wood is hard and heavy. Pores rather small, but distinct, fairly numerous. The rays are barely visible on cross and tangential sections, distinct on radial surfaces producing a fine silver grain in proper light (Record).

GANGAW.

See *Mesua ferrea.*

GARAPA. *Apuleia polygama.*

Weight 59 lbs. Brazil.

This is a close-grained, fine-textured wood of a golden-brown mahogany colour. It so closely resembles the coral-wood of the Andamans (*Adenanthera pavonina*) (*q.v.*) that further description is unnecessary. It has the same golden-reddish lustrous grain, and is a beautiful furniture wood. Record, in *Timbers of Tropical America*, makes no reference to *A. polygama.*

Before his work was published I was doubtful whether it was the same as *grapia-punha* or *Garapa amarella*, the produce of *A. praecox* (*q.v.*), and concluded they were distinct.

The pores are very small and are generally plugged with a white substance. The medullary rays are very fine and numerous; they vary in distance, some being wide apart, and others very close together.

GARDENIA SPP. *G. latifolia* Aiton.
G. turgida Roxb.

Central and Southern India, The Himalayas, Burma, Ceylon.

Gamble names about eleven species, small trees or shrubs. The colour of the wood is a bright yellowish-white, with a close, very firm, compact grain, being of a similar colour and grain to the ordinary known boxwoods, sometimes before use, and always in the finished state, almost indistinguishable from boxwood. Gamble reports it as " easy to work, durable, and recommended . . . as a substitute for boxwood . . . likely to be very good for engraving and turning " ; and states that combs were made of it. There is no evidence to show that it was imported into London until after the war, when the usual stocks of Caucasian, Turkish, African, and Venezuelan boxwoods were much exhausted, and an opportunity was presented to try shipments of gardenia from India. After the first of such shipments had arrived, some of the logs were found to split in the log, and while being worked, and also in the finished manufactured article. It was noticed that in some cases no such splitting occurred, either in the log or after working, and on inquiry it was found that the produce of *G. latifolia* did not split, either in the log or after manufacture, but that the produce of *G. turgida* split badly, and export of this species was accordingly stopped.

The produce of *G. latifolia* was found admirable for turning, for containers for glass-stoppered bottles suitable for chemists, and for other requirements. Experimental containers turned with a screw top up to 3 inches in diameter, after careful observation and daily use, have retained their shape for upwards of twelve years, the cases being perfectly sound, and with the screw cuttings as good as when first cut ; moreover, in a case measuring as much as 15 inches by 4 inches diameter no measurable expansion or contraction has taken place.

There is evidence to show that the trees should be felled only at a particular time of the year, although no information is available to show which is the best time.

Continual importations occurred up to 1924, when the other boxwoods reverted to a pre-war basis, and the Indian supplies became too costly.

Superficially the wood of Gardenia sp. resembles that of Buxus sp., but upon a close examination a good deal of difference is revealed.

Pearson and Brown, in *Commercial Timbers of India*, mention two other varieties, namely *G. lucida* and *G. gummifera*, which have not been seen in commerce and consequently cannot be reported upon.

The minute pores of *G. latifolia* are open, and the medullary rays more pronounced than in the case of *Buxus*. In *G. turgida* the pores are more numerous, also open and slightly larger.

Garuga pinnata Roxb.

Weight 40 lbs. India, Burma.

VERN—*Kharpat, katúla, kilmira, sarota*, Pb.—*Ghogar, kaikar*, Hind.—*Til-madi, kanman*, Kumaon—*Gurja*, Banda—*Kaikar, kaikra, ghunja, mahárut*, C.P.—*Júm, kharpat, nil bhadi*, Beng.—*Mohi, sompotri*, Uriya—*Gia*, Mechi—*Dabdabbi*, Nep.—*Maldit, róm*, Lepcha—*Gendeli poma*, Ass—*Chitompa*, Garo—*Mroung-shisha*, Magh—*Garuga, gárgá*, Tel.—*Gúpni, gharri, kekra*, Gondi—*Karúr*, Sonthal, Bhumij—*Kékur*, Kharwar—*Nia jowa*, Kól—*Kosomara*, Ghatwal—*Kosromba*, Mal Pahari—*Sompotri do dopé*, Khond—*Kahúd, kekda*, Berar—*Kekkeda*, Kurku—*Karre vembu*, Tam.—*Kuruk, kudak, kangkur, kakad*, Mar.—*Halabalagi*, Kan.—*Chinyôk, chiôk, sinyôk*, Burm.

The wood is reddish-brown with a handsome silver grain. It is even-grained and fairly hard, and is a useful wood for secondary work such as planking, and for canoes, etc., for which purposes it is employed in India. Little notice was taken of the small shipments received since 1920.

The pores are very numerous and are evenly distributed. The medullary rays are very fine and numerous, and undulate slightly.

GLASSY WOOD. *Guectarda Soleriana* (Loes) Standl.

British Honduras.

The wood is a pale straw colour, with a very close, compact, straight grain; finer, but in texture not unlike Canadian rock elm, with a more glassy surface, although it might be mistaken for the latter. A very valuable wood for many purposes, if regular supplies were available.

The pores are very small indeed and very numerous. There is a close concentric layer discernible to the naked eye. The medullary rays are very numerous, well-defined, and exceedingly fine.

Gluta tavoyana Hook. f.

Weight 53 lbs. (Pearson & Brown). S. Burma.

VERN—*Chay, thoomay*, Karen—*Thayetthitse*, Burm.

This wood, known as Burma gluta, is reported upon in *Commercial Timbers of India* by Pearson and Brown, who speak of it as "a very handsome timber but variable in colour. . . . Not more than 20 per cent of fine timber being obtained from the round. . . . Not quite so finely marked as *G. travancorica*, but is very similar in appearance."

Gluta travancorica Bedd.

Weight 46–58 lbs. Southern India.

VERN—*Shencurungi*, Tinnevelly—*Shenkurani, shenchanthanam*, Tam.

This tree is fairly plentiful in the Ghats of the Tinnevelly district and in the Travancore forests. There is generally a large proportion of sap-wood, but the heart-wood is dark red and beautifully mottled with light and dark, *i.e.* black and orange, streaks. It is hard, close-grained, seasons well, and works and polishes admirably ; takes a smooth surface from the tool, and stands well in all conditions where decorative wood is used.

It is practically indistinguishable from the ringas of Borneo, *Melanorrhoea* sp., and the *Melanorrhoea usitata* of Burma ; all these three belong to the Order Anacardiaceae.

From many sources reports have been received of the beauty of this wood, hitherto little known outside Madras, and belief in its value for the European markets has been freely expressed, but notwithstanding the considerable efforts made to popularise it, it does not find favour with cabinet-makers and other users of decorative wood.

The pores are moderate sized, scanty, and filled with resin. The medullary rays are very fine, very numerous, prominent, and visible on the radial section as narrow bands of silver grain. There are numerous pale, undulating concentric lines, often interrupted.

Gmelina arborea Roxb.

Weight 38 lbs. (Gamble). India, Burma.

VERN—*Gumhár, khammara, kambhar, kumar, gambari, sewan, shewan*, Hind —*Gúmár, gúmbar*, Beng —*Kambar*, Oudh—*Kumara*, Garhwal—*Khammara, batinj*, Kumaon—*Sewan*, Merwara—*Gamınea*, Jeypore—*Gambari*, Nep., Uriya—*Gomari*, Ass.—*Numbor*, Lepcha—*Gumai*, Cachar—*Bolkobak*, Garo—*Kasamar*, Kól, Sonthal—*Gumadi, cummi*, Tam —*Gúmar-tek, peddagomru, tagumuda, gumudu*, Tel —*Shivani, kuli*, Kan.—*Shewan*, Mar.—*Chimman, sag*, Bhil—*Gamberi*, Khond—*Peddu gumu*, Reddi—*Kumbulu, kumbil*, Mal —*Kurse*, Gondi—*Kassamar*, Kurku—*Kumala*, Trav. Hills—*Et-demata*, Cingh.—*Ramani*, Magh—*Yamane, yemane*, Burm.

The wood is of a pale yellowish-white colour and resembles white mahogany or prima-vera in colour, texture, and grain, while it possesses the roe and mottle figure common in mahogany. It is a useful and attractive furniture and cabinet wood, for apart from its decorative qualities it is a sound timber, easy to work, and very durable. Gamble says " it is the chief furniture wood of Chittagong, and is in some demand in Calcutta, where it has been used for making the show-cases of the Imperial Museum. It has also been used on the Bengal North-Western

Railway for the linings of railway carriages." He quotes Captain Baker, writing in 1829, as speaking of its use for " . . . organ pipes, sounding boards, and other such work where shrinkage is to be avoided."

The resemblance between this wood and that of Quassia is so close that it suggests that they are related, but the wood of *Gmelina arborea* has no bitter taste.

The fairly numerous pores are irregularly distributed, and are often subdivided. The undulating medullary rays are very fine and numerous. At varying intervals there are fine, white concentric lines of loose tissue.

GOAPIBA. Source unknown.
Weight 59 lbs. Brazil.

This is a pale olive-brown wood, with a close, firm texture. The specimen contains two worm-holes, indicating liability to the attack of worm.

The numerous pores are so exceedingly small as to be scarcely discernible ; they are linked together by wavy concentric lines of loose tissue. Exceedingly fine medullary rays intersect these.

GOIA BEIRA. Source unknown.
Weight 40 lbs. Brazil.

The colour of the wood is a pale greyish-brown. No information is available as to the sizes which are procurable, but the specimen suggests that only small sizes can be obtained. It has a hard, smooth, and slightly lustrous grain.

Both pores and medullary rays are very fine and numerous. Bands of darker coloured tissue show in the form of concentric rings.

GOITY CORO. Species unknown.
Weight 60 lbs. Brazil.

This is a light reddish-brown wood with a close, firm texture. It is one of the little known woods of Brazil, and calls for no special comment.

The pores, though exceedingly minute, are separate and distinct. The fine medullary rays are very obscure ; there are concentric bands of loose tissue at varying intervals.

GOLD WOOD.
See ZEBRANO.

GORORÓBA. Source unknown.
Weight 69 lbs. Brazil.

The colour of this finely grained wood is a light salmon-pink to brown. There is a liability to split in fine straight parallel cracks along the tangential surface.

The pores are very prominent and are plugged with a whitish substance ; they are arranged in bands following the line of the concentric layers. The fine medullary rays radiate in undulating lines, and are only visible under the lens (+ 10).

GRAPIA-PUNHA. *Apuleia praecox* Mart.
Weight 50–60 lbs. (Record). Brazil.

VERN—*Iberá-peré, yberá-pere, iberá-piapuña, grapiapuña, madera manchada,* Arg.—*Grapiapunha, grapiapunha branca, jutahy (jitahy, jatahy), amarello, garapa amarella,* Braz

This is a yellowish-coloured wood, with a clean, free, straight grain, moderately heavy, strong, and one of the most useful woods for planking or timbering. It contains only medium dimensions, but may be turned to account in many ways in the domestic arts. *Brazilian Woods* speaks of this timber as being of first-rate quality for building and naval architecture.

GREENHEART. *Nectandra Rodioei* Hook.
Weight 66 lbs. 4 oz. British and Dutch Guiana, The West Indies.

VERN—*Greenheart* (brown, black, white, yellow, etc.), *Demerara greenheart,* Eng., gen.—*Bebeeree, bebeeren, bebeeru, bibir, bibira, bibiri, bibiroo, bibiru, cipiri, sepira, sepeira, sipeiro, sipira, sipiri, supeira, tugui, tugul, wainop, rora-ek,* B.G. Indians—*Greenheart de la Guyane anglaise,* Fr. G.—*Beberu, beberuboom, geelhart, groenhartboom, maratakka, pakouli,* Sur.—*Bibiru, itaúba,* ? Brazil—*Viruviru,* Venez.—*Grunherzbaum, grunholz, beberubaum,* Germ.—*Torchwood, queenwood,* Misc.

The best quality of greenheart is that coming from British Guiana, and the principal supply is from Demerara, whence it is received in hewn logs nearly square, from 24 to 65 feet and even longer, and from 12 to 24 inches square, with waney edges, and in planks, scantlings, etc., manufactured to special orders. The colour is a pale yellowish-green, while sometimes it is quite dark with brown and black streaks. The black greenheart is considered to be the best. More than forty years ago (1932), when the Port Elizabeth jetty on the south-east African coast was being built, sawn timber was imported direct from Demerara, and since this time a certain number of sawn planks and boards have been imported.

The logs are generally very straight in the grain, and remarkably free from knots and defects. They contain a considerable thickness of sap-wood, which is not distinguishable from the heart-wood.

This was one of the woods tested by Foxworthy and Woolley, and which survived five years of that test. (See PYINKADO.)

The strength of this wood exceeds that of most others, whether it be tried by the transverse or tensile strain, or by a crushing force in the direction of the fibres. Tried by the latter process it exhibits a peculiarity unshared probably by any other timber except sabicu. It bears the addition of weight after weight without showing any signs of yielding; and when the crushing force is obtained, it gives way suddenly and completely with a loud report, nothing being left of the pieces but a loose mass of shapeless fibres. Very rarely it is liable, like sabicu, to a cross-fracture of the longitudinal fibres. Although not subject to side-shakes, it is somewhat liable to end-splits, and great care has to be taken in sawing it up. On rare occasions the sap-wood is attacked by a worm, which does not affect the heart-wood. Immediately the saw has entered the wood, and the air is admitted, the log may split with a loud report; on one occasion this happened, and the log flew upwards through the roof of the mill in which it was being sawn. On this account it is desirable, as soon as the log has passed the saw, to chain it round, securing the chain with strong dogs spiked into the wood, which will hold it sufficiently, so that all that can occur will be a severe split, without the risk of damage to the sawyers or saw-frame. It is largely used for piles for sea jetties and docks, as, although not entirely immune, the wood is partially proof against the attack of the teredo worm. Stone and Freeman quote W. T. Oldrieve as authority for saying that it resists *Limnoria terebrans* and teredo, and ranks next to teak in resisting white ants. The grain is smooth and fine, and cold to the touch. It is the general experience that this wood is poisonous, and workmen are very careful not to get splinters into their hands. Fifty to sixty years ago it was used rather extensively for stair-treads and other joiner's work, if heavy wear was anticipated, and much of the woodwork in the old Post Office at St.-Martin's-le-Grand was of greenheart; it is difficult to understand why its use in this direction has been discontinued. It forms the best wood when used solid for salmon, trout, and other fishing rods. A fine sample of greenheart can be made into an exceedingly small top joint for such a rod, and will bend to an extraordinary extent without breaking.

The pores, which are sometimes subdivided, are very numerous; they are often filled with a shining substance, and are generally surrounded by a patch of loose tissue. The medullary rays are very distinct and clearly marked; the distance between the rays is less than the transverse diameter of the pores.

GREENHEART, AFRICAN. Species doubtful.

Weight 63 lbs. Tropical Africa.

A few logs of so-called African greenheart have been included in general cargoes of mahogany from the West Coast of Africa. The wood bears little, if any, resemblance to the true greenheart, excepting in the colour, which is somewhat similar. The grain is coarse and open, and suggests a likeness to the anan (*Fagraea fragrans*), Indian or Burman. Most of the African logs were badly worm-holed.

The pores are small and very scarce; they are linked by numerous wavy concentric lines of loose tissue. The medullary rays are clear, distinct, and very numerous.

GREENHEART, SURINAM. *Nectandra* sp.

Weight 74 lbs. Dutch Guiana.

The Dutch Surinam greenheart has not been commercially known in England, but a shipment intended for Le Havre was diverted to London on account of the war in 1915. The wood is generally darker in colour and heavier in weight, but otherwise similar to the Demerara wood (*q.v.*).

The pores are slightly more numerous and smaller than in the Demerara wood. The medullary ray is very pronounced, generally rather more than the width of a pore apart.

Grewia elastica Royle, syn. *G. vestita* Wall.

Weight 48 lbs. India, Burma.

VERN—*Farri, phalwa, dhamman,* Pb—*Pharsia, dhamún, bimla,* Hind.—*Pharsuli,* Kumaon—*Pharwason, pharsanyi,* Garhwal—*Pharson,* Dotial—*Poto dhamun,* Palamow—*Sealposra,* Nep.—*Kúnsúng,* Lepcha—*Pershuajelah,* Mechi—*Dhamin, hása dhamin,* Merwara.

This is a whitish-brown wood but much lighter in appearance than *G. tiliaefolia* (*q.v.*). My specimen shows a pretty ripple grain on the radial and tangential sections. The timber has not yet been imported commercially. It is tough and elastic, and is used in India for the same purposes as *G. tiliaefolia.*

The pores are very numerous and are smaller than the latter. The medullary rays are very prominent and numerous. There are concentric rings of darker coloured wood which show in lines on the tangential section.

Grewia tiliaefolia Vahl.

Weight 48 lbs. India, Burma, and Ceylon.

VERN—*Pharsa, phalsa, dhamin,* Hind.—*Pharsia,* Kumaon—*Pharsai,* Garhwal—*Klesla, kasul,* Gondi—*Dhamni,* Kurku—*Olat,* Sonthal—*Kehel mohru,* Khond—*Tara,* Palkonda—*Unu,* Tam.—*Charachi, jana, tharra,* Tel.—*Dhamono,* Uriya—*Thadsal, balala, tadasala,*

Kan.—*Damnak*, Bhil—*Daman*, Mar.—*Sadachu, chadache*, Mal.—*Damınıya*, Cıngh.

This timber has not been known commercially in the United Kingdom. It is of a brown colour, somewhat resembling walnut, and has a close, firm hard texture, with minute flecks of silver grain which show on the radial section. Among its uses in India, Gamble mentions shafts, masts, golf clubs, tool handles, and oars, and he adds that it can be used for all purposes for which elasticity, strength, and toughness are required. Having been tested for the shafts of golf clubs in England, it was found to be too heavy for the purpose. Its most advantageous use would be in decorative woodwork, for furniture, fittings, etc.

The pores are generally fairly large, though they vary in size : they are very numerous. The medullary rays are fine, numerous, and undulating. There are concentric lines of darker coloured tissue.

GUAJADA. Species unknown.

Costa Rica.

This is a soft light wood of a pale yellowish-brown colour. There is a finely marked silver grain on the radial section.

The small pores are very irregularly distributed ; they vary somewhat in size, the larger ones being surrounded by a patch of loose tissue. The fine medullary rays are very numerous.

GUALLACAN. *Guaiacum* sp. ?

Costa Rica.

Gamble refers the specimen tentatively to *Guaiacum officinale* (lignum-vitae), and this may be correct, although it differs somewhat in colour and grain from the ordinary supplies of lignum-vitae. Record in his pamphlet *Lignum-vitae* mentions over thirty common names for the species, but that given above is not included.

The colour is a greenish-brown with darker streaks. The fibres are very twisted, they sometimes reverse in direction, three or four times in the width of an inch, on the tangential section. The wood exudes a sticky gum, and possesses the fine and regularly disposed cross lines, or " ripple marks," on the longitudinal surface, which are typical of true *Guaiacum*. These are only visible with the lens.

The pores are exceedingly minute and are generally arranged in short, radial lines. The very fine medullary rays are only visible under the lens. Darker coloured concentric rings are clearly marked.

GUANANDIRANA.

Brazil.

The colour of the wood is a reddish-grey, with fine, light and dark veins ; it has a fairly hard, close grain, yielding a very smooth surface from

the tool and showing numbers of small, open pores. The wood has not been imported into the United Kingdom on a commercial basis.

The numerous pores are of moderate size, even, and open, surrounded by a halo of bright tissue, with strongly marked medullary rays.

GUARABU. *Terminalia acuminata* Fr. Allem.
Weight 68 lbs. Brazil.

The wood is of a light purple colour, with a very hard, close grain and texture, and is capable of an exceedingly smooth surface from the tool. It resembles purpleheart, but is of a finer grain. It has a metallic lustre somewhat like brazilleto, and might be a good substitute for that wood for violin bows. Reported as being used in Brazil for furniture, wheel-spokes, beams for civil construction, and deck flooring. It is apparently obtainable in long lengths and large sizes.

In Col. Gamble's collection of Brazilian timbers there is a specimen of guarabu against which he notes an alternative spelling of " garabu." This resembles mine very closely, though it is of a duller brown, and lacks the light purple colour referred to above. Baterden says that guarabu is the produce of *Peltogyne macrocarpus*. This suggests a confusion with purple-heart, which is the produce of *P. paniculata*, but my authentic specimens of these two woods are distinctly different.

The pores are numerous and small and are mostly filled with a gummy substance. The medullary rays are strongly defined, parallel but irregular; they are joined at right angles by finer white lines, forming a spider's-web appearance. The medullary rays show on the radial section as in beech, but rather finer.

GUATECARE. *Lecythis laevifolia* Gris.
Chytroma Idatimon Miers. (Record).
Weight 75 lbs. Trinidad, Brazil.

VERN—*Idatimon*, Fr. G.—*Mutunata*, Braz.—*Watercare, guatecare, guatecaro, acquatapana*, Trin.

The colour is light brown, with a very hard grain, difficult to work and season. It is reported as immune from attack of insects, suitable for work where durable timber is required, but containing a tannin which makes it unsuitable for casks.

GUIRI or GUIRO. *Crescentia Cujete* L.
Weight about 37 lbs. (Record). British West Indies, South America.

VERN—*Calabash*, B.W.I.—*Higuero, cotumo*, P.R.—*Guira, guira cimarrona*, Cuba—*Calabasse*, Guad.—*Calebassier*, Fr. G.—*Cuiera, cabaceira, cuite, cuiete, arvore de cuia*, Braz.—*Calabas, kalabose*, Curaçao—*Taparo, totumo*, Venez.—*Totuma*, Col.—*Cujete, guiro,*

jicara, jicaro, morro, tecomate, tigulate, temante, palo de melon, melon tree, Mex., C.A.—*Jicaro,* Salv.

This wood, generally called calabash, is of a brownish-red colour with dark streaky lines resembling more the growth of a palm. The grain is hard with rather a coarse texture. It is reported as used for saddletrees.

The very small pores, plugged and surrounded by a halo, are very irregularly placed, in part singly and subdivided, and again, grouped together in wide belts and bands, without apparently any order or regularity; exceptionally fine medullary rays almost indistinguishable under the lens, close and parallel.

GUIZO or GUIJO. Source unknown.
Weight 50 lbs. Philippine Islands.

The timber has not been imported into the United Kingdom, and is unknown in ordinary commerce. From the limited opportunities available for judgment and reference, it would appear from the specimens sent lately by Mr. A. T. Gillespie, of Manila, to be in all respects similar to the sal (*Shorea robusta*) of India, and likely to prove as satisfactory and durable in use. The weight of these timbers, which makes their cost when imported so high, will militate against the use of the wood, but if the difficulty of cost could be overcome, it should be in great demand for sleepers, and important heavy constructional work, where hardness, heaviness, and durability are necessary.

For description see SAL.

GUM, BLUE. *Eucalyptus Globulus* Labillardière.
Weight 43–54 lbs. (Stone), 69 lbs. (Post Office Compt.).
Tasmania, Australia, India.

The timber is named blue gum because of the colour of the young growth, which is of a glaucous or greyish-blue tint; a very good reason for naming the tree, but a very bad reason for naming the wood, which has suffered in popularity, in common with other timbers, through bearing an unsuitable title. The tree attains a height of from 200 to 300 feet, with a diameter of from 4 to 10 feet. The wood is of a pale straw colour, with a close, compact, firm texture, producing a smooth surface from the tool, although having a somewhat twisted or curled grain.

In seasoning deep shakes occur from the surface, and it shrinks, expands, and warps considerably. It has been used extensively in England for railway waggon building, for which purpose it is satisfactory. It has also been tried for sleepers, but has not generally found favour, as the chairs make an almost clean cut through the wood, probably because of its hardness and want of elasticity. As the weight of the train passes

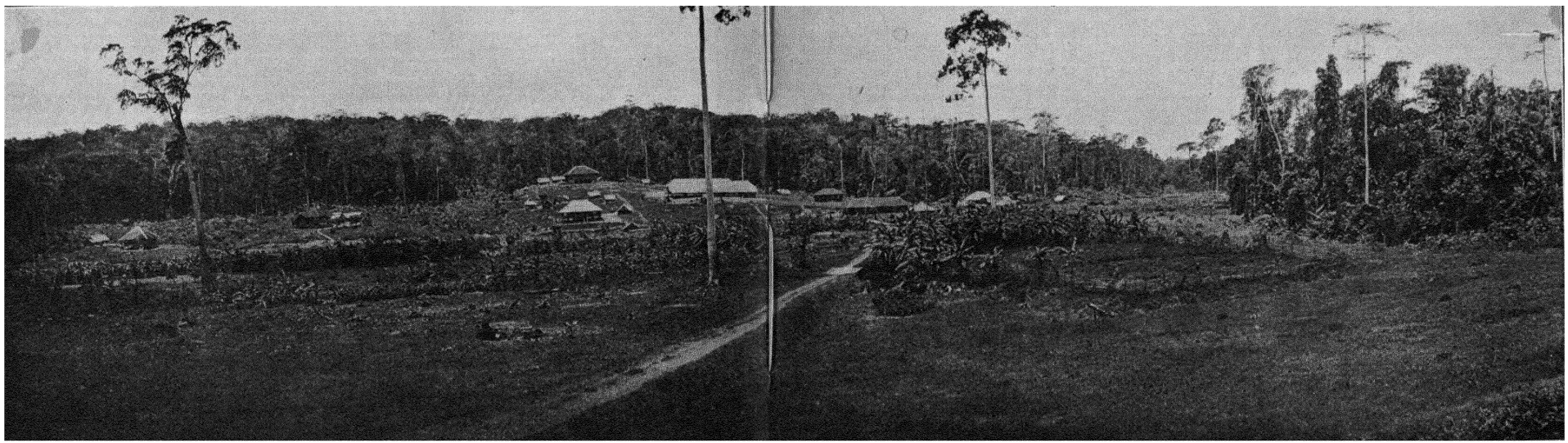
over the ordinary softwood sleeper the chair compresses it, and rebounds when the weight is removed, while there is rather a crushing effect in the case of blue gum Used as fencing exposed to wet and dry conditions, it stands well without protection of creosote or tar. It has been used extensively by the Post Office for telegraph and telephone arms, with satisfactory results. A late Comptroller, Mr G Morgan, provided a table of results of experiments made with various Australian and Tasmanian timbers, as follows :

SIZE OF SAMPLES SELECTED FOR EXPERIMENT (54 inches × 5½ inches × 4 inches)

Timber	Breaking Load in lbs	Weight in lbs	Specific Gravity
N S W Ironbark	24,750	74	1 19
Spero (Spotted Gum, *Eucalyptus maculata*)	24,000	54	·87
Tallow Wood	22,000	64	1 025
Blackbutt	19,570	57	915
White Box	19,500	73	1·17
Forest Mahogany	19,200	59	·946
Turpentine	16,200	62	·997
Blue Gum	20,100	69	1·11
Jarrah	14,125	67	1 075
Karri	11,600	59	95
British Oak [1]		54	·87

[1] In English Oak, "K" = 16,800 to 21,000

It has given satisfaction for platforms, and deckings for wharves, and also makes a good hard-wearing flooring, although perhaps somewhat liable to become slippery. Blue gum and stringy-bark are remarkable for their fire-resisting qualities In September 1903 a disastrous fire occurred in the West India Docks timber sheds which contained stocks of all kinds of soft and hard woods , everything was destroyed except some sleepers of blue gum, and planks and logs of blue gum and stringy-bark ; these were charred, but showed little deterioration as the result of the fire See



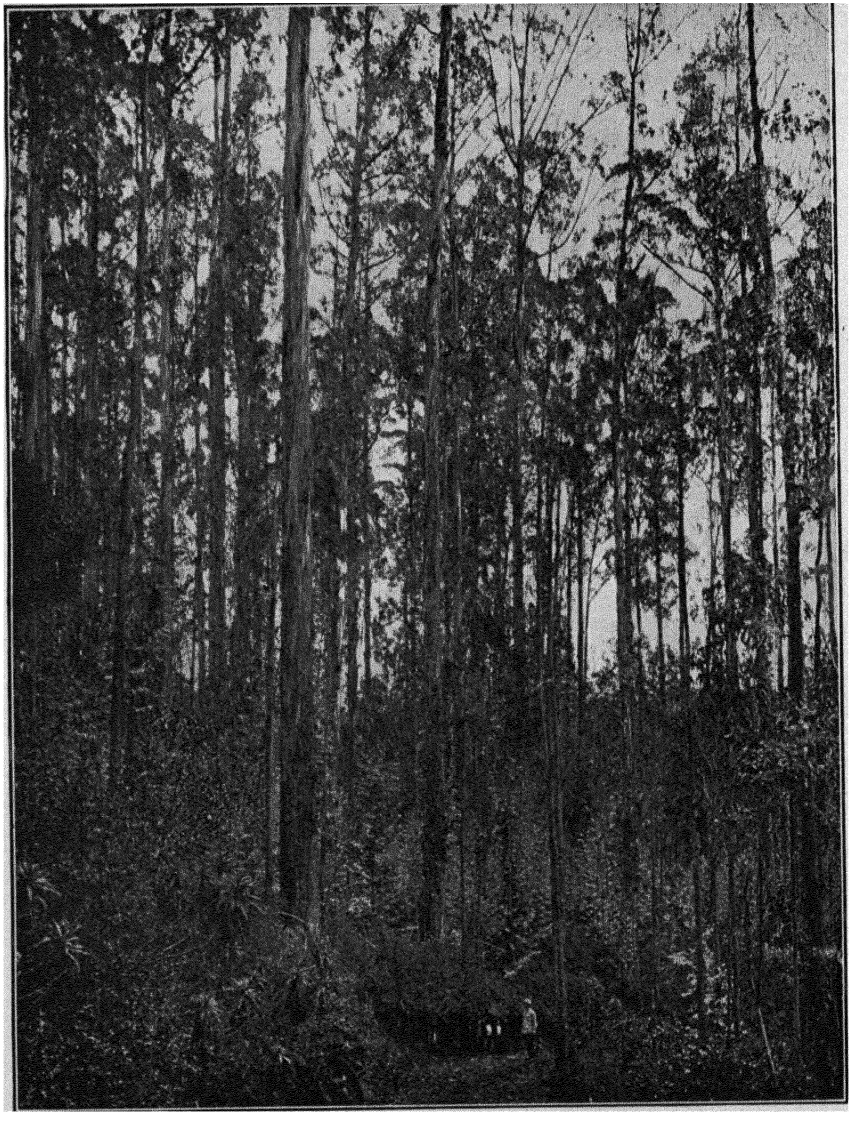
CENTRAL FOREST CAMP, MIDDLE ANDAMAN ISLANDS

Showing large gurjun trees (*Dipterocarpus turbinatus*), possibly more than 500 in number, of which the value would be about £75,000

illustration of the sheds after the fire All the remaining planks which are seen in the picture are blue gum and stringy-bark

Trees have been planted in the Nilgiris in India, where they have made rapid growth, producing in thirty years an average height of 143 feet, with an average girth of 3 feet 11 inches The wood was reported to be somewhat indifferent, with a great tendency to warp and split. It has been planted in South America, where the wood was used for sleepers, but without giving much satisfaction, and has been extensively planted in Ceylon, where it makes exceptionally rapid growth Up to the present (1930) its cultivation has been only for the purpose of providing fuel, although inspection of a specimen cut from a tree grown in Ceylon showed a good quality of wood Mr Carmichael Lyne, in *Tasmanian Timber*, reported : " It is specially esteemed for piles, owing to the large size that

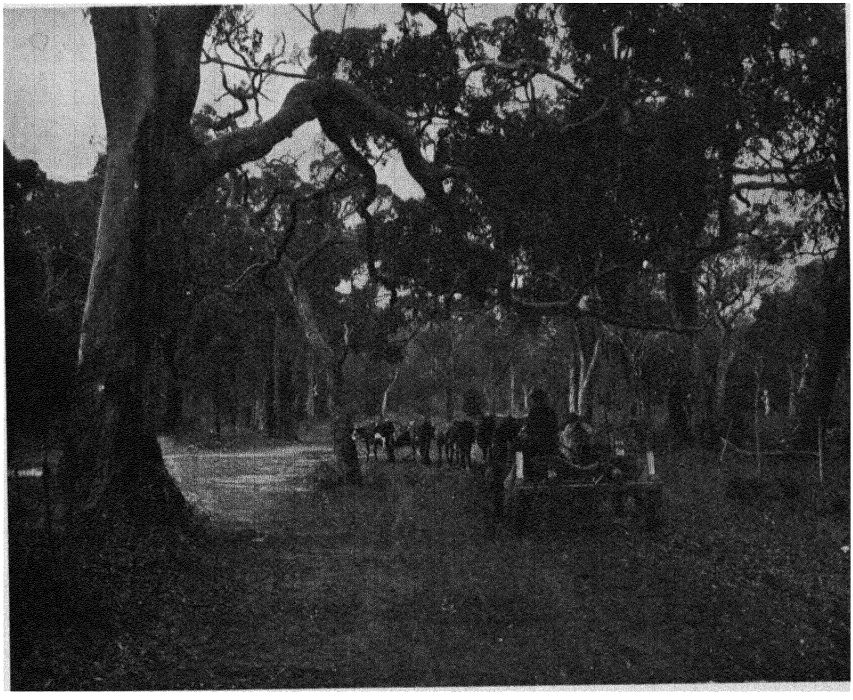
it attains, and the comparative immunity it enjoys from the attacks of the Teredo." He also states that the oldest wharf now in use was erected in 1868, and stood till 1902 without renewal, and mentions a sample of bridge-



BLUE GUM (*EUCALYPTUS GLOBULUS*) PLANTATIONS OF THE NILGIRIS, INDIA

decking which had been fifty years under foot traffic, and was still (1894) hard and sound, while yet another timber formed part of the original Bridgewater Ferry punt, built in 1818. The punt had been destroyed by

blasting about fifty years before, and the wreck had been lying on the foreshore between high- and low-water mark, exposed to the attack of teredo ever since, yet the timber cut in 1894 showed no signs of decay. Mr. Charles Geddes, of Port Pirrie, writing in 1905, says that he prefers Tasmanian blue gum to jarrah for girders, beams (piles), and decking. Nine years previously he had constructed 500 feet of wharf with this timber, using it with success in preference to jarrah or karri for cross-heads, girders, walings, sheet piles, and decking (K. C. Richardson, in a



TIMBER HAULING IN NEW SOUTH WALES

By kind permission of the Agent-General for New South Wales

Report on Tasmanian Timbers). An immense quantity was used in the construction of the Admiralty Harbour Extension Works at Keyham, in fender piles and rubbing pieces.

The concentric layers of growth are marked, although difficult to locate. Pores numerous, small, singly and in bands or belts surrounded by light sparkling haloes of gum ; the very numerous, very fine medullary rays are difficult to locate, even with the lens (+ 10).

GUM, FOREST RED. *Eucalyptus tereticornis* Sm.

Weight 63 lbs. (Baker). New South Wales, Queensland, Victoria.

The Forestry Commission, N.S.W., report it as being " very closely related to the Murray red gum. . . . Supply abundant."

It is generally of a paler and more salmon colour than the latter, and is used for rough purposes.

GUM, GREY. *Eucalyptus punctata* DC.
E. propinqua Deane et Maiden.

Weight 64 lbs. (Baker). New South Wales.

The name of this timber is very misleading, as the wood is of a light brick-red colour, and according to the report of the Forestry Commission, N.S W., it is impossible to discriminate between red ironbark and grey gum. It has not been seen in commerce in England, but is valued in Australia for many purposes where strength, wear, and durability are required.

GUM, MURRAY RED. *Eucalyptus rostrata* Schlecht.

Weight 51½ lbs. (Baker). Eastern States of Australia.

The Forestry Commission, N.S.W., report the wood as red in colour, renowned for its strength, durability, and resistance to fungus diseases, white ants, teredo, etc. Very hard to work up when dry. It is largely used for posts and piles on account of its durability, also for railway sleepers, where, although valuable, it is considered inferior to ironbark, but is good for wood-paving.

GUM, RED. *Eucalyptus calophylla* R. Br.

Weight 56 lbs. (Baker). Western Australia.

Julius reports: " This tree is widely distributed, and of very handsome appearance, growing to heights of over 100 feet and an average diameter of about 3 feet. The wood is yellowish-red in colour, of lighter weight than the other local eucalypts, though fairly dense and hard, and splits readily. It is apt to be much intersected with gum veins, which impair its suitability for important or permanent works of construction. The exuding gum has an acknowledged value for medicinal and tanning purposes. . . . The timber is very strong and tough, but not very durable under ground."

The name red gum from the timber point of view is misleading, as the colour of the wood is distinctly a dirty light yellowish-brown. Baker reports it as " one of the commonest West Australian timbers, and generally found growing amongst Jarrah, Wandoo, York Gum, and Karri " : adding,

" It is a splendid tree for parks and streets." He refers to its use " for handles, spokes, shafts, or anything requiring toughness, elasticity and strength, with moderate weight. It is fissile, planes and dresses well, and altogether should rank as a good timber." Both he and Julius refer to the prevalence of numerous gum veins, a defect which is prominent with many of the Eucalypts, and which greatly deteriorates from the value of the timber. Baker also quotes J. E. Brown as speaking of " its durability, both in the ground and water, and . . . its immunity from the attacks of white ants."

GUM, SALMON. *Eucalyptus salmonophloia* F. v. M.
Weight 66 lbs. (at 12 per cent moisture). Western Australia.

Concerning this timber C. E. Lane-Poole writes (1918): " [It is] an exceedingly dense wood, the second strongest in Australia. It is questionable whether the gold mines of Western Australia, which have up to date yielded £80,000,000 of gold, would have been developed had it not been for this tree and its sisters Mulga (*Acacia aneura* and *A. steresophylla*) and Gimlet (*Eucalyptus salubris*)."

GUM, SLATY. *Eucalyptus Dawsoni* R. T. B.
Weight 66 lbs. (Baker). New South Wales.

The colour is bright red, darkening on exposure, with a close hard grain, capable of a high polish. Considered altogether an excellent timber for all purposes and reported as standing well under all conditions, and ranking with the best ironbarks in quality.

The pores are fairly numerous and plugged ; with numerous medullary rays.

GUM, SPOTTED. *Eucalyptus maculata* Hook. f.
Weight 61 lbs. New South Wales, Queensland.

The colour and grain are similar to those of tallow wood (*q.v.*), so that it is difficult to distinguish between them. Baker points out that it can be differentiated from tallow wood because of the presence of sap-wood, which should be removed before the timber is used, as it is liable to be affected by a borer, and on this account, as a wood-paving timber, it has not a good reputation.

He says also that the common term " spotted gum " is a little confusing, as several species with a smooth bark are known by that name, and further reports that the Queensland *E. citriadora* is sometimes placed as a variety of *E. maculata*, but the two are quite distinct.

The Forestry Commission, N.S.W., report it as particularly tough, and one of the best timbers for bending, even when cold. Very durable, and unequalled for wheelwrights' and coachbuilders' work. It is used for

cross-pieces, shafts, poles for drays and buggies, naves, spokes, handles, agricultural implements, framing and house-building generally, tram rails, bridge decking, and ship planking.

The pores are very small to medium-sized, mostly ranged in very wavy belts, often in duplicate and more, and surrounded by thin lines of light tissue, with very numerous medullary rays, ranging in wavy strands, the larger and more pronounced with intermediate rays between.

GUM, SYDNEY BLUE *Eucalyptus saligna* Sm.
Weight 46 lbs. (Baker). New South Wales.

The colour is a pale to deep brick-red, with a close, hard grain similar to most of the other Eucalypts. Some of the logs produce a mottled and other descriptions of figure. It has only been used experimentally in the United Kingdom, but has been reported as being a favourite wood in Australia for all kinds of purposes where hard and figured woods are required, and as being very durable.

GUM, YORK. *Eucalyptus Loxophleba* Benth.
Weight 67 lbs. (at 12 per cent moisture, Lane-Poole).
Western Australia.

According to Julius, " the wood is reddish in colour, is exceedingly hard, heavy, dense, and tough " ; it is said to have a very interlocked grain. He also reports that it " does not grow to heights much above 80 feet or diameters exceeding 3 feet, and the stem is apt to be more or less gnarled. . . . The principal use of this timber has been in naves, felloes, and all kinds of wheelwrights' work, its acknowledged peculiar excellence for which is recognised beyond the limits of the State. It is also employed for farming requirements and other local purposes."

GUMBAR.
See *Gmelina Arborea.*

GURJUN. *Dipterocarpus turbinatus* Gaert. F. and other species of *Dipterocarpus.*
Weight 42–50 lbs. Burma, India, Chittagong, The Andaman Islands.
VERN—*Gurjun, tilıya-gurjun,* Beng.—*Kanyoung,* Magh.—*Kanyın, kanyınnı, kanyın-wettaung, kanyın-nı,* Burm.

This magnificent tree attains to a height of 200 feet and produces a clean, straight bole, which often grows to a height of 90 feet and over, clear of branches.

The wood is of a brown colour, and in appearance it resembles eng

(*D. tuberculatus*), yang (*Dipterocarpus* sp.), and Borneo camphor-wood (*Dryobalanops aromatica*). It has an even and regular grain, and does not show the alternate hard and soft grain generally found in similar hardwoods. It also possesses a very agreeable aromatic scent, persistent through many years, which becomes distinctly noticeable on entering a room where it has been used.

The first supplies came to this country about the year 1899, in the form of sawn planks, intended for wood paving, but for this purpose it proved entirely unsatisfactory. In 1903 it was laid as flooring with satisfactory results. The floor, after nearly thirty years of wear, shows no sign of deterioration, and is much admired (1932). The absence of any fibrous grain, or variation, such as is found in many other woods which possess both hard and soft layers exposed to the surface, renders this wood peculiarly suitable and durable for floorings. Continued friction caused by rough tread or nails across the grain of the wood has little effect on the wearing surface, and gurjun floorings consequently do not wear to a ridgy or uneven surface in the same way as many other hardwoods. For more than ten years no further shipments arrived, but after 1914 they became regular and continually increased. During the war a large quantity of logs, hewn in squares from 11 to 20 inches, and in lengths up to 50 feet and over, were produced and shipped to more than one seat of hostilities, and especially to Mesopotamia. One steamer cargo intended for that country, which contained many hundreds of logs and large quantities of planks, boards, and scantlings, was diverted to London, where the wood was absorbed in all kinds of constructional and decorative woodwork. Since the war, round logs, logs sawn square, large-sized planks, and flooring strips, have been imported regularly. Large quantities were utilised for constructional work and in high-explosive filling factories during the war, where the wood proved satisfactory in every respect, sufficient even to call for special remark.

It has also been used in many places for constructional work exposed to the weather, where it has proved durable, except perhaps when in the ground. For railway carriage construction in both timber and decorative woodwork it has proved satisfactory. A panel 3 feet wide, made up of three boards joined together, has remained sound and good after ten years of hard usage.

Gurjun, in common with many other hardwoods used to a fairly considerable extent, has not hitherto proved to be useful or durable when used in India or Burma, and in 1920 it was found difficult to persuade the members of the Forest Service that it was a valuable and durable wood when used in a moderate climate. But a railway official writing from India says that he " considers this an extremely useful timber for carpentry and joinery work, especially for railway coaches, as the long

lengths make it very suitable for roof boards," and mentions that the railway in question is again about to buy largely as a substitute for teak, which shows their confidence in it. This is a reflection upon the failure of the members of the Forest Service to realise the great importance of an extremely valuable timber.

It has been noticed that although as a hard wood, possessing a life longer than any other, and capable of resisting the hardest wear, it yet is most silent to walk upon, more so indeed than any other hardwood that has been tried. At the Wembley Exhibition in 1924, a very attractive room was shown in which roof, panelling, floor, and all the furniture was made of gurjun, which received universal admiration. Although the room was further from ventilation than any others, being almost entirely enclosed, it was remarked that even on the hottest day the air remained cooler than in any other part of the Exhibition, and experiments showed that at times of heat or close atmosphere the difference was about ten degrees.

Careful seasoning is requisite, when it is found to stand well under almost all conditions, but the timber should not be used in an unseasoned state. Gurjun exudes small whitish beads of " resin " or " gum " which provides a first-class natural polish. If the wood is rubbed with a cloth soaked in alcohol at the time when these beads appear, a perfectly natural polished surface can be obtained.

Experiments made as to breaking strains prove its strength to be very great, exceeding that of British oak. They also disclosed a strange quality, namely, that whatever means are adopted to cause the break, when the final cleavage takes place, a small band remains which refuses to fracture, but acts as it were as a kind of hinge, persistently resisting complete severance.

The numerous pores are moderate in size and fairly evenly distributed. The medullary rays are exceedingly fine and very numerous, while at intervals some are thicker, broader, and more prominent. These latter show in strong flecks on the radial section. At right angles are many wavy, light concentric bands.

GYO. *Schleichera trijuga* Willd.

Weight 72–73 lbs. India, Burma, Ceylon.

VERN—*Kosum, gausam*, Hind.—*Rusam, kusumo*, Uriya—*Púskú, may, roatanga*, Tel.—*Pává, pú, púvan, púvú, kúla, pulachi, zolim-burnki*, Tam.—*Sagdi, shargadi, sagade, chakota, akota*, Kan.—*Chendala*, Coorg—*Puvatti*, Kaders—*Kassumar, koham*, Panch Mehals—*Kusumb, koon, kohan, peduman*, Mar.—*Komur, púskú*, Gondi—*Baru*, Kurku, Kól—*Kosengi*, Palkondi—*Púvam*, Mal.—*Gyo*, Burm.—*Cóng, kon*, Cingh.

This tree is called the lac tree and Ceylon oak. The colour is yellow-

brown, with a very hard, strong grain, giving a rough surface, hard to work. It is reported as being used in oil and sugar mills, for rice pounders, agricultural implements, carts, etc., and is the best tree for yielding lac.

The rather scarce pores are mostly plugged, with concentric layers marked by faint, white lines, with exceedingly numerous, very fine medullary rays, which are hardly discernible under the lens.

HACKBERRY. *Celtis occidentalis* L.

North America.

Also known as " nettle tree " and " sugarberry." It is a light yellow straw colour, soft and rough, much resembling that of the Australian nettle tree (*q.v.*).

HALDU. *Adina cordifolia* Hook. f.

Weight 45 lbs. India, Burma, Ceylon.

VERN—*Haldu, hardu, karam,* Hind.—*Bangka, keli-kadam, petpuria, dakôm,* Beng —*Karam,* Nep —*Tikkoe,* Bahraich and Gonda—*Hardu, paspu, kurmi,* Gondi—*Holonda,* Uriya—*Shangdong,* Gáro—*Roghu,* Ass —*Kurúmba, komba,* Kól—*Karám,* Sonthal—*Mandugram,* Khond—*Manjakadambe,* Tam.—*Manja kadambu,* Mal.—*Bandaru, kamada, rudrakadapu, kanapu, rudraganapu, dúdagú, paspu kadambe,* Tel.—*Hedde, yettéga, yettagal, pettega, arsanatéga, yettada, ahnau,* Kan.—*Hedu, heddi, honangi,* Mar.—*Kolon,* Cingh.—*Thaing,* Magh—*Hnaw, o-aw,* Burm

This wood, of which haldu is one of the Indian names, is well known as hnaw in Burma. It is a bright yellow, or satinwood colour, with a very fine, close texture, and is capable of a very smooth surface. The evenness of the grain is pronounced, so that it can be cut either with, or across, or on the transverse grain equally well, and on this account it is a valuable wood for carving. An exquisitely carved figure of Joseph Conrad (1½ times life size) was executed in this wood by Miss Dora Clark, and its colour gave a flesh-like appearance. Although a little checking took place after the work was completed, no serious splitting occurred.

The wood stands well under all conditions and is highly suitable for cabinet-making, brush work, and all kinds of decorative woodwork. Haldu furniture was first exhibited at the Empire Timber Exhibition in London in 1920, and after exposure to light the colour has greatly improved, so that it vies with satinwood. A large quantity was used in the Bareilly depôt bobbin factory at Clutterbuckgunj, where bobbins were made of this wood, and found satisfactory.

Medium to large-sized trees are frequent throughout India and Burma. In January 1921 I took a photograph of a tree in the Kunzan forest, Upper Burma. The tree was felled and eventually brought to London ; the butt measured 19 feet in length, with a girth of 17 feet. The second cut produced a perfectly cylindrical log, which measured 49 feet, with a girth of

11 feet 2 inches, and the top section was 55 feet in length, with a girth of 7 feet 6 inches. Beyond this there were sundry branches yielding pieces which could be made use of in timber sizes. Excluding the big branches, this one tree produced approximately 918 cubic feet of solid timber.

The exceedingly numerous pores are very small indeed. The medullary rays are so fine that it is difficult to see them through the lens (+12).

Hardwickia binata Roxb.

Weight 82 lbs. (Troup). India.

VERN—*Anjan*, Hind , Mar.—*Acha, altı*, Tam.—*Yepi, nar yepı, yapa*, Tel. —*Kamrá, karachi*, Kan.—*Chhota dundhera*, Gondı—*Bone*, Karku. —*Parséd*, Singrowlı.

This is a very valuable wood, which should be imported into the United Kingdom and used for many important purposes. It appears to possess the very durable qualities of pyinkado (*Xylia dolabriformis*), without the oily or sticky surface which the latter possesses, which property in pyinkado, while doubtless making it more durable, also renders it less suitable for cabinet and decorative work. It is capable of a very smooth surface from the tool, almost, as R. S. Troup says, making it comparable with African blackwood (*Dalbergia Melanoxylon*). The same authority recommends it for turnery. It would be invaluable in those parts of decora tive cabinet work where a hard smooth surface is required, and where an undoubted, good standing wood, which will neither shrink nor warp, is necessary. Its qualities as a decorative wood are further enhanced by its handsome colour and appearance.

In colour it varies from brick-red to a dull dark brown, with black streaks. It would give much the same appearance in finished work as that which can be obtained with Italian walnut. Unfortunately, in common with so many valuable Indian timbers, it has no European name, nor has it ever been imported in commercial quantities. One log was sent to the Imperial College of Science and Technology, South Kensington, a few years ago, and can be seen there.

The pores are regular and uniform in size and position. The medullary rays are very faint and obscure even under the lens (+12). There is a small faint ripple-mark on the radial section.

Hardwickia pinnata Roxb.

Weight 45–47 lbs. (Gamble). India.

VERN—*Koláva*, Tinnevelly—*Matáyen, sampráni*, Travancore—*Yenne*, Manjara-bad—*Shuralı, kolla*, Mal.—*Uram*, Trav. Hills.

For many years before the war a few logs came to London at irregular intervals, generally roughly sawn square, which were sold as East Indian mahogany at prices insufficient to cover the cost of transport.

The colour is a lightish red-brown mahogany, which retains its agree-

able light shade without either darkening or bleaching when exposed to air and light, an unusual and very desirable characteristic. The wood has a close, firm texture, and takes a good polish, but has an unfortunate and continuous tendency to exude small spots of a rather sticky resinous gum, which defect, while actually being of little consequence, as the gum can be rubbed off, somewhat militates against its popularity.

The wood bears a strong resemblance to the well-known French "Salmis," coming from Indo-Chin. Examples of woodwork made in this timber were exhibited at the Empire Timber Exhibition, Holland Park, in 1920; and in the 1924 Empire Exhibition at Wembley, a most handsome French boudoir, executed by Melliers, was shown in the India Pavilion. The framework of the panelling and doors was of this wood, in conjunction with coral-wood (*Adenanthera pavonina*) panels. In the Madras section a large threefold screen was exhibited, with framing and panels also made of this wood, which was greatly admired.

The rather small pores are scarce and open, irregularly placed, with ill-defined rather obscure medullary rays, which show on the radial section in very small flecks.

HAREWOOD. Source unknown.
Weight, 54 lbs. San Domingo.

This timber, known in London as "harewood," and in Liverpool as "concha satinwood," is imported in square-hewn logs, from about 8 to 24 inches square and 8 to 20 or more feet long. In San Domingo it is named "pino macho" (male pine), and thus distinguished from satinwood, which is known as "espanello." At first sight these two woods appear to be very similar in colour, weight, and texture. Harewood, however, though yellow in colour and displaying a beautiful satiny lustre, is more dull, and greyer or browner in tint, and is often traversed by black "gum" streaks; moreover, on exposure to light and air its greyness gradually increases until with age the wood acquires the silver-grey hue characteristic of genuine old harewood, and has been imitated by staining sycamore to produce artificial harewood (*q.v.*). The majority of logs imported show abundant roe and mottle figure, with a preponderance of the fiddle mottle effect. Some of these have realised very high prices (£3 or more per cubic foot) for veneers. When used for panelling and banding in cabinet work, the wood produces attractive and artistic effects. It might with advantage be used for the backs of brushes of the highest quality. Harewood was employed in the form of marquetry in a seventeenth-century Flemish and German backgammon board which is exhibited in the South Kensington Museum.

Though the wood shows a striking resemblance to West Indian satin-

wood in the structure of the growth-rings, and even in the great variation of their width, yet in my specimen of harewood the pores are larger, and they, as well as the medullary rays and boundary lines of the annual rings, stand out in cross-section more sharply from the darker general mass of the wood. It is probable that harewood and West Indian satinwood belong to the same family, if not to the same genus. Record refers to timber dealers' and cabinet-makers' reports of the use of this wood in America, and also to a complaint made by an English trading firm that in an expected consignment of satinwood, concha satinwood was included, to their disadvantage. None of these incidents, however, affect the attractive qualities which harewood undoubtedly possesses. An examination of the wood certainly tends to contradict the report of the New York people that concha satinwood is coarser textured and less heavy and firm than satinwood, the average weight of the latter being 51 lbs. and the weight of concha satinwood about 52 lbs. A careful examination of several specimens of each displays little difference in the texture and smoothness or otherwise of the grain. As regards the other remarks, it is quite natural that a merchant who contracted for and expected to receive satinwood should complain if he found the shipment consisted of another kind, and in the matter of the American cabinet trade it is not unnatural that the operator should notice the difference if he were desired to employ satinwood. The appreciation of one wood or the other is essentially a question of taste, and in this respect, although perhaps a novel point of view, concha satinwood can hold its own as one of the most beautiful of all artistic decorative cabinet woods.

As regards the texture, a careful comparison of the transverse grain reveals a structure equally fine, with the advantage, if anything, in favour of concha satinwood.

The annual rings (or zones of growth) are sharply marked by narrow light lines at the successive boundaries. The scattered little groups of pores are visible to the naked eye by reason of the light halo surrounding each. The numerous medullary rays are likewise visible.

HAREWOOD, ARTIFICIAL. (Stained Sycamore or Maple.)

The so-called "harewood" of recent years has been produced by staining sycamore or maple by a chemical process. The colour is induced by the action of iron salts (*ferrous sulphate*, for instance), which stain the drops of tannin present in the wood, particularly in the medullary rays. This process, which was first secretly practised in Paris, was subsequently carried out in Germany, and in more recent years in London also. Several timbers, either white or verging on white, are capable of treatment, and the stain penetrates through the whole of the wood, the chaste beauty of

which has resulted in its being used for handsome suites of furniture, also in the panelling and furnishing of rooms in leading hotels and famous steamships, including the *Mauretania* and *Balmoral Castle*. Yet the beautiful furniture made of this stained wood cannot vie with the antique specimens in which genuine harewood has been used. Moreover, the pure silvery-grey gradually becomes discoloured with yellowish-brown, or changes to a bronze colour. It is claimed that under competent supervision this deterioration can be avoided, but certainly up to the present all the work in this stained wood has, in course of time, suffered the change of colour referred to.

Harpullia imbricata Thw.

Weight 40 lbs. (Gamble). Western India, Ceylon, The Andamans, Java.

VERN—*Harpulli*, Beng.—*Chittila madaku*, Trav. Hills—*Na-imbul, pundalu*, Cingh

The colour is a light nut-brown red, with a very straight smooth grain, like a rather inferior African mahogany. The wood has not been seen in commerce.

The pores are rather small, very scarce, irregularly placed, with innumerable very fine medullary rays, wavy, crossed at irregular intervals by very faint white lines.

Harpullia pendula Planch.

Weight 58 lbs. (Baker). New South Wales, Queensland.

Known as tulip lancewood in Queensland, this is the tulip-wood of Australia, and is described by Baker as being " close-grained, hard and heavy, yet works easily, and has a pretty figure produced by a dark brown or almost black colouring with whitish streaks." It is considered suitable for cabinet work, turnery, ornamental boxes, etc., and it is stated that neither the sap-wood nor the heart-wood is subject to borer attack.

The Forestry Commission, N.S.W., report it as " one of the handsomest of Australian woods . . . much esteemed for cabinet work, billiard tables, panels of doors, etc. It resembles olive-wood somewhat in general appearance, is a very durable timber."

HAWTHORN or WHITETHORN. *Crataegus monogyna*
C. Oxyacantha L.

Weight 41 lbs. Europe, North and West Asia, North Africa.

The wood of the well-known " May " tree. Yellowish-grey in colour with perhaps a tinge of red in it, an exceedingly smooth, hard grain, comparable with that of African blackwood. Notwithstanding the small sizes which the tree will produce, its unique qualities should render it

suitable for some work of importance. It has been used for engraving and found to be as good as ordinary boxwood.

The concentric layers of growth are apparent to the naked eye ; the innumerable, tiny pores and the fine medullary rays are hardly discernible under the lens, but show on the radial section in the tiniest flecks.

HAZEL. *Corylus Avellana* Linn.

Weight 35–45 lbs. (Stone). Europe, Africa, Asia.

Also known as " nutwood." The colour of the wood is a pinkish-white with dark lines ; it is knotty, with a hard and rather open grain, said to be soft and elastic, to split easily, and is not considered durable. The tree does not usually exceed 30 feet in height, but the smaller branches are useful for hoops of barrels, and similar purposes. Baterden states that the roots are used for veneers, and the larger wood for charcoal.

The medullary rays show faintly on the radial section.

Hemicyclia sepiara W. & A.

Weight 58 lbs. (Gamble). British India, Ceylon.

VERN—*Virai*, Tam.—*Wira*, Cingh.

The wood has a yellow-brown colour like Venezuelan boxwood, which it also resembles in grain, although a little harder. Trimen says it is one of the commonest trees in the dry forest, but it grows in a gnarled and twisted manner. Mr. Turner says that owing to its gnarled and twisted condition, and being a small tree, wood large enough for ornamental furniture is difficult to obtain, and remarks that it is a pity that, being so close-grained, it is good for fuel, with which expression and information I quite agree.

The minute pores and the exceedingly fine medullary rays are hardly discernible under the lens, the transverse section showing very much like that of the Venezuelan boxwood referred to above.

HEMLOCK, MOUNTAIN. *Tsuga Mertensiana* Sarg.

British Columbia, North-western United States.

Elwes states that this botanical name is now given to *Tsuga Pattoniana* by American botanists, instead of to *T. Albertiana* as formerly.

The wood is pale brown or red in colour, soft, close-grained, fine in texture, not strong. It is suitable for rough lumber and fuel.

Baterden treats *Tsuga heterophylla* (*q.v.*) and *T. Mertensiana* as the same wood. He says : " To get the timber into the market it is manufactured into flooring and scantling and sold as spruce or fir, and an attempt has been made to introduce it as Alaska pine " ; which attempt appears to have been successful. Takes a good polish, and is used for wainscot panels and newels, and also largely for pulp. It is liable to black knots, and very liable to attack by boring insects.

HEMLOCK, WESTERN. *Tsuga heterophylla* Sarg

British Columbia, North-western United States.

Also known as Alaska pine.

The wood is of a pale brown colour, tinged with yellow, light, hard, tough, stronger and more durable than other American hemlocks. Being larger, straighter in grain, and less knotty than the Eastern species, it is a more useful wood. Very suitable for interior work, joinery, etc., and for general construction, sleepers, piles in fresh water.

Heritiera Fomes Buch., syn. ***H. minor*** Lam.

Weight 67 lbs. (Troup). India, Burma.

VERN—*Sunder, sundri*, Beng —*Pinlèkanazo*, Burm.

This wood is brownish to dark red in colour, hard and close-grained, strong, elastic, and durable. Mr. F. I. Dalton cites instances (in India) of rough trimmed posts placed in water-logged soil within reach of the tide, having lasted thirteen years, and of posts placed in a somewhat more elevated, though very damp situation, having lasted for eighteen years. The timber is extensively used in boat-building, and there is a standard market for it in Calcutta.

It is a valuable wood for many purposes, but hitherto difficulties of transport and conversion have curtailed its usefulness ; if these could be overcome, there would undoubtedly be a good market for it in this country.

The regularly disposed pores are rather scarce and are sometimes plugged. The medullary rays are fine and uniform. There is a faint ripple marking on the tangential and radial sections.

Heritiera littoralis Dryander.

Weight 52 lbs. (Pearson & Brown).

India, Burma, The Andamans.

VERN—*Sundri*, Beng.—*Pinlè-kanazo*, Burm.—*Mawtdá*, And.—*Chomuntiri*, Tam —*Etuna*, Cingh

Pearson and Brown, in *Commercial Timbers of India*, state that the colour of the wood is " light yellowish-red to dark red or reddish-brown, sometimes faintly streaked with black. . . . A very durable timber, both on land and in water. . . . It is used for boat-building, as knees, and as piles of bridges in Burma."

Heterophragma adenophyllum Seem.

Weight 47 lbs. Burma.

VERN—*Petthan, Măyu-de*, Burm.

The colour of the wood is a yellowish-red, with an inclination to green. The grain is hard and the texture close and firm ; in both colour and grain

it resembles Demerara greenheart (*Nectandra Rodioei*), but examination of the end grain reveals dissimilarity. The greatest possible care is required in the manner of its felling and conversion on account of a liability to split. It is a valuable wood, with possibilities; being extremely strong and elastic, it would be a suitable substitute for greenheart. Favourable reports have been received from India as to trials of this wood for aeroplane work, and for fishing rods, billiard-cue butts, and mouldings, exhibited at the Empire Timber Exhibition of 1920.

There is a fair quantity available in good lengths and good-sized squares.

The numerous pores are small and are generally filled with a bright sparkling yellowish-green gum. The medullary rays are well-defined, and show on the radial section in minute flecks. The rays are crossed at right angles by similar white lines.

Heterophragma Roxburghii DC.

Weight 40 lbs. India.

VERN—*Baro-kala-goru*, Tam—*Bondgu*, Tel—*Pullung, wurus, panlag*, Mar.—*Kalavada*, Koya—*Pambapena*, Reddi.

This wood is of a greyish-brown colour, rather resembling French walnut, to which the grain is also similar. It is easily worked and is capable of a smooth surface from the tool; altogether a very useful cabinet wood.

The small pores are generally plugged. The medullary rays are very fine.

HICKORY. *Hicoria ovata* Britt.
H. laciniosa Sarg.
H. glabra Britt.

Weight 46 lbs. 13 oz. Gibson gives it as 50–52 lbs.
North America, Europe.

Although there is nearly always a use for which one wood is better fitted than another, it is an outstanding fact with this timber. For many purposes there is no wood which can compare with hickory. The supplies are drawn from all botanical species of *Hicoria*, it being impossible to separate them, and the natural result is that there is a wide divergence in the quality of different shipments as regards soundness, toughness, and absence of faulty pieces. One of the worst faults encountered is that of the holes, caused by a boring worm or beetle, which destroy the value of a large quantity of the timber. It is imported into this country in clean boles with the bark on, but on the Continent before the war a high price was paid for split billets, which were in much demand. The logs should be converted as soon as possible after arrival, as, if left for any length of

time, even protected from weather, they split badly. When fresh the logs weigh heavily, so that the inexperienced are surprised at the cost of freight, the timber averaging as much as one ton, and sometimes more, for 26 feet cube of Hoppus' measure.

The colour varies from almost white through shades of yellow to brown, with fine, straight, darker lines crossing the surface. The grain is even and straight, and a very smooth surface can be obtained from the tool.

On the Continent and in America it has been largely used for cart-wheel spokes and felloes, carriage shafts and coach-builders' work, all manner of bent work and hoops for casks, and handles of picks and axes. Throughout the United Kingdom it is in great demand for golf shafts, for which purpose, on account of its springy toughness combined with its light weight, no other wood can compete. It is also used for pick handles and bent work. The Navy demands a considerable supply, and although perhaps on account of its scarcity it has not been used to a large extent in aeroplane work, many consider it suitable for this purpose. The tree thrives well in England, and many good specimens may be seen in various places ; it should be more extensively planted, both for its utility and its graceful appearance.

Gibson mentions that all the hickory in Europe was utterly destroyed at the close of the Ice Age, but that America was more fortunate. A specimen taken from a tree grown in Ireland shows a wood equally good in all respects to that quality provided from America.

The numerous pores are variable in size, some being very large ; some are partially plugged. The medullary rays are very fine, parallel, and clearly defined ; they are crossed at right angles with even more strongly defined white lines.

HICKORY, QUEENSLAND. *Flindersia Ifflaina* F. v. M.
Weight 54–55 lbs. North Coast of Queensland.

Known as " Cairns hickory." The colour is a yellowish-brown, and it has a hard, smooth grain and wavy veins. There seems to be no apparent reason for the name hickory, as it bears little resemblance, if any, to the well-known hickories.

Baker reports it as being useful for heavy beams, constructional work, parts of ships, machine-bearings, cogs, and other purposes requiring a strong, close-grained timber.

HINAU. *Elaeocarpus dentatus* Vahl.
Weight 36 lbs. New Zealand.

The Board of Agriculture, New Zealand, reports that this wood is " light dull-brown colour, heart-wood darker, tough, strong, and durable.

Procurable in lengths of 20 feet and up to 12 inches in width. Used for fencing-posts, bridges, and culverts."

HINOKI. *Cupressus obtusa* Koch.
C. formosensis Mats., syn. *Chamaecyparis obtusa* S. & Z.
Weight 22–28 lbs. Japan, Formosa.

The hinoki timber from Japan and from Formosa appears to differ in general character although the species are the same. The Japanese wood is of a pale yellow straw colour with wavy marks caused by darker streaks ; it possesses a lustrous sheen and the scent is very fragrant and agreeable. Only a few logs have been imported, and commercially it is unknown. Elwes and Henry say : " No coniferous timber is now so highly valued in Japan for the finest buildings, as well as for interior work . . . and Sargent says that the palaces of the Mikado as well as the temples are built of it. . . . A large slab 3 feet across, brought to England by Elwes . . . was quite free from flaws, sound to the centre and showed a very twisted and wavy grain ; in colour resembling satinwood. . . . Hinoki is one of the five royal trees which were reserved for Imperial and religious uses in ancient times."

The Formosan wood is of a clean, bright yellow-brown colour, much resembling the appearance of marsh or bald cypress (*Taxodium distichum*). It is harder and heavier than the Japanese hinoki, and has a more marked grain. It gives a strong aromatic scent which is not particularly pleasant, and is quite unlike the fragrant scent of the Japanese wood. This is one of the Formosan woods which till now has never been imported, but which, if a regular supply could be maintained, would become a useful timber.

The annual rings are distinctly marked by a narrow dark-coloured belt. The medullary rays are rather obscure but show faintly on the radial section.

HOJOCHEE. Species unknown.
Costa Rica.

This wood is of a yellowish-grey, rather dirty colour, and has a close hard grain, with no particular quality to recommend its export for commercial purposes.

The pores are numerous and very minute, and are often joined in strings of four to eight. The medullary rays are fine and numerous and just visible to the naked eye, and there are concentric bands of lighter coloured tissue.

Holarrhena antidysenterica Wall.
Weight 40 lbs. (Gamble). India, Assam, Burma.
VERN—*Karra, kaura, kora, kúra, kúar, kari, karchi, dhúdi,* Hind.—*Kor,* Kashmir—*Kogar, kiam,* Pb.—*Kural,* Kumaon—*Kachri,* Oudh—

Samoka, girchi, Gondi—*Kurakat,* Kurku—*Ankhria,* Bhil—*Dhowda,* Guz.—*Kirra, karingi,* Nep.—*Dudhali, dudhkuri,* Mechi—*Dudcory,* Ass.—*Madmandi,* Gáro—*Patrukurwan, pita korwa, kherwa,* Uriya—*Dowla, kura, indrajau,* Bombay—*Karru,* Jeypore—*Dudhiári,* Berar—*Dudi, kurakhatto,* Melghát—*Korkoria,* Oraon—*Kurchi,* Bhumij—*Kuria,* Kharwar—*Hát,* Sonthal—*Kurdu,* Mal Pahari—*Towa, kuti,* Kól—*Pardali,* Khond—*Pal,* Koya—*Pala,* Reddi—*Vepali, kodagapalei,* Tam—*Pala, Kodaga,* Tel—*Kurra,* Mar.—*Lettôkkyi, lettôkthein, lettôk,* Burm.

A pale straw-coloured wood with a close, firm texture, Rather attractive, capable of a smooth surface from the tool, but not likely to be of any commercial importance.

The exceedingly numerous pores are very small, and a few are plugged. Medullary rays exceedingly fine and hardly discernible under the lens.

HOLLY. *Ilex aquifolium* Linn.

Weight 47 lbs. (Baterden). Europe.

The wood, which is white to grey in shade, is exceedingly close-grained in texture, and capable of a very smooth and hard surface. Generally the degree of whiteness, on the excellence of which its value rests, depends, as in many other cases of white wood, upon the time when it is felled, the manner of its conversion, and the care with which the converted parts are preserved. It should be converted immediately after the tree is felled and the produce very carefully stored and stacked under cover, in a moderately dry and sunless place.

Holly is chiefly valued for inlay work. Holtzapffel says: "Holly is the whitest and most costly of those woods used by the Tunbridge-ware manufacturer, who employs it for a variety of his best works, especially those which are to be painted in water-colours. It is closer in texture than any other of our English woods, and does not readily absorb foreign matters, for which reason it is used for painted screens, etc."

The beautiful Italian sixteenth-century walnut coffer, of which mention is made in the section on walnut, is inlaid with holly, which gives a very fine contrasting effect.

Gibson quotes the American varieties for much the same purposes, *Ilex opaca,* which would appear to be the principal one, and also *I. cassine, I. vomitoria, I. monticola,* and *I. decidua.* There are about twenty-three different species of holly in India, but these are as yet quite unknown to commerce.

The pores, which are exceedingly small, are very regular. The very clearly marked medullary rays are parallel and equidistant. They are distinct on all surfaces, but show most strongly on the tangential section, where they are exceedingly regular in their marking.

Homalium tomentosum Benth.

Weight 59 lbs. Burma and India.

VERN—*Myaukchaw*, Burm.

This large tree with its very straight, smooth, greyish-white bark, is a prominent and picturesque object, standing out as it does among the mixed forest trees in the jungle. It has been well named " Moulmein lancewood " by Skinner, according to Gamble. The wood, indeed, closely resembles the other lancewoods of commerce. The colour is rather light yellow-brown, having a very hard, close, compact grain, easily to be mistaken for lancewoods from other sources. At the 1920 Empire Timber Exhibition at Holland Park it was used for many different articles, including fishing-rods, for which work it was considered suitable. Great difficulties have been experienced in handling the timber without undue splitting, and the wide boards appear also to be liable to split in seasoning, after sawing. There is little doubt, if these difficulties could be overcome, that the timber would eventually prove to be of great value. This is one of the valuable timbers possessed by Burma which suffer eclipse on account of the richness of the more easily secured teak.

The lines of concentric growth are very clearly marked. The innumerable tiny pores, mostly plugged, cover the transverse section. Medullary rays extremely fine and numerous, close together, equidistant, and very regular.

Homalium zeylanicum Benth.

Weight 35 lbs. Ceylon, India.

VERN—*Liyan, Liyangu*, Cingh.

A pale straw-coloured wood with darker patches and a rather soft grain, but giving a fairly smooth surface from the tool, and a very smooth surface on the transverse section.

The pores are irregular in size and position, with very fine and numerous medullary rays. The concentric layers are marked by pronounced dark bands.

Hon-huan-shi. Source unknown.

China.

Professor Chung says that the Chinese name is applied to *Sloanea* sp. and that the tree bears a fruit or seed which is eaten by the monkeys.

The wood is of a greenish colour, straight and close-grained, resembling American poplar (*Liriodendron tulipifera*).

The concentric layers of growth are plainly marked with dark lines. The pores and medullary rays are extremely small and ill-defined.

HOOBOOBALLI. *Loxopterygium Sagotii* Hook.

Weight 40½ lbs. (Stone & Freeman). South America.

VERN—*Hoobooballi, hububalli, hubaballi, houbooballi, hoeboeballi, hoboballi,* Arowak—*Kooel piallı,* Caraib—*Snaki hoodoo, boosi mahoni,* Negro English—*Slangenhout,* Dutch—*Surinam snakewood,* Eng.

This wood, also known by the name of " hububalli," which has been quoted as being *Mimosa guianensis,* is apparently now fixed to the species as named above. Mr. B. R. Wood, Conservator of Forests in British Guiana, explains that the source *Mimosa guianensis* " is a misnomer," this being a synonym for the " bois serpent " of French Guiana, and the " angelim rajado " of Brazil.

The colour is a light yellowish-brown with dark streaks. The wood is hard and close-grained, and reported from British Guiana as being very rare and scarce.

Record reports it as " easy to work, finishes smoothly, polishes fairly well, but is likely to become stained with oily exudations ; appears durable."

HOOP PINE. *Araucaria Cunninghamii* Lamb.

Weight 30–33 lbs. New South Wales, Queensland, New Guinea.

The wood, known also as " Moreton Bay " pine, is reported to be very plentiful and is in considerable use in Australia for all purposes where softwood free from odour is required. Light in colour and weight, straight-grained, relatively strong, it is natural that it should be highly valued. Of late years (1930) a considerable quantity of ply-wood has been manufactured in which this wood is employed, and is reported to be in great demand in Australia ; also a limited quantity has been exported to the United Kingdom, where the demand for Empire timbers has caused it to receive unusually welcome attention.

The Forestry Commission, N.S.W., report : " Planks often show a peculiar dotted appearance, comparable to a bird's eye maple figure, though less handsome."

Hopea odorata Roxb.

Weight 39–58 lbs. (Gamble). India, Burma, The Andaman Islands, Borneo, Cochin.

VERN—*Thingan, thitsingan,* Burm.—*Rimdá,* And.

This wood was not met with in commerce until 1920, when small experimental shipments were made for the purposes of the Exhibition. The colour is rather a dull, dirty grey-brown or yellowish-brown, with a somewhat rough, uneven grain, not attractive, and requiring considerable effort to produce a smooth surface. Foxworthy says it is probably the commercial equivalent of yacal from the Philippines, but Indian and Burma

thingan is milder, lighter in weight, softer in texture, and much less interwoven in the grain. The wood possesses no quality to make it sufficiently attractive for export. But Gamble reports it as very durable, and capable of resisting white ants ; also that boats made of it are said to last twenty years. The general indication is that it is a very useful wood for all kinds of purposes in its own country, but not worth the charges upon shipment to other markets.

The pores are confused, irregular, and plugged ; the medullary rays fine, parallel, and not very prominent. Gamble speaks of a beautiful silver grain on the radial section, but it is not apparent on my specimen.

Hopea parviflora Bedd.

Weight 54–63 lbs. (Gamble). Malabar, Southern India.

VERN—*Kongu*, Tam.—*Kiralboghi*, *tirpu*, Kan.—*Thambagam*, *kambagam irubogam*, Mal.

Whether a large supply of this valuable timber is available or not, the Indian forest authorities have never yet reported. Bearing in mind its beautiful qualities, and that, according to F. Foulkes (quoted by Gamble), it is immune from the attack of the white ant and that it reproduces naturally, it is remarkable that greater effort has not been made in its exploitation.

The colour is an agreeable lustrous, golden yellow-brown, with a very close, fine grain, yielding a very smooth surface from the tool, a wood far too valuable to be wasted as stated ; being very strong and durable, it is suitable for high-class decorative woodwork and turnery.

In studying the history of Forest Research by the Indian Forest Service during the sixty-odd years of its existence, the student is struck by the limitations of the Service. The authorities would never seem to have risen above suggestions that timbers might be useful for tea-boxes, paving-blocks, or sleepers.

Gamble says it is suitable for sleepers, and, according to F. Foulkes, is used in shipbuilding, etc. Excepting for this report, and that some very fine sleepers were sent over to the Empire Exhibition, there has been no exploitation.

The pores are very small to small, largely plugged with atoms of shining gum between strong, well-marked medullary rays, irregularly placed, varying in size, and crossed at right angles at irregular intervals by thin bands of light tissue.

Hopea Wightiana Wall.

Weight 61–62 lbs. India.

VERN—*Kalbow*, *kiralboghi*, *haiga*, Kan.—*Kavsi*, Mar —*Ilapongu*, Trav. Hills.

The timber is of a yellowish-brown colour, with a very hard, close,

compact grain. My specimen appears a good deal heavier than the weight attributed to it, and is strongly marked with a fiddle mottle figure. It would be valued for brush-backs, cabinet work, inlay, and turnery, and perhaps for some of the purposes for which boxwood is used.

The pores are very small and numerous and are largely plugged. The medullary rays also appear in great numbers and are exceedingly fine and clear-cut, parallel, and equidistant.

HORNBEAM. *Carpinus Betulus* Linn.
Weight 51 lbs. 13 oz. Great Britain, Continental Europe, America.

The wood is yellowish-white in colour, close in the grain, hard, tough, strong, and of moderate weight. There is no distinguishable sap or alburnum ; it may, therefore, be worked up to great advantage. Hence we find it employed for a variety of purposes : it is useful in husbandry, and agricultural implements made of the sound and healthy wood wear well, as it stands exposure without being much affected by it. It is also used by engineers for cogs in machinery, a purpose for which it is well suited. The hornbeam tree, if pollarded, becomes blackish in colour at the centre, owing to the admission of external moisture and parasites. This renders it unfit for many purposes where a clean, bright surface is required, and generally it proves detrimental to the quality and durability of the timber. This wood, when subjected to vertical pressure, cannot be completely destroyed ; its fibres, instead of breaking off short, double up like threads, a conclusive proof of its flexibility and fitness for service in machinery.

A considerable trade has been carried on of late years in Continental supplies of hornbeam, from France particularly, for use in pianoforte work, especially the keys, for which it is highly suitable. These supplies have been of a quality rather milder than most of the British wood, and of an exceedingly white appearance.

The concentric layers are clearly marked. The pores, which are very small and rather obscure, are very regular. The medullary rays are not very clearly marked, but show on the tangential section as fine, rather dark lines of uneven length.

HOROEKA. *Pseudopanax crassifolium.*
New Zealand.

This wood, commonly called lancewood, is reported by the Board of Agriculture of New Zealand as follows : " [The colour is] lightish-brown, sometimes of a satiny lustre ; dense, even, and compact. Procurable in short lengths and up to 4 inches wide. Used for wheelwrights' work."

HORSE CHESTNUT, JAPANESE.
See TOCHI.

Huai-ch'ai. Source unknown.

China.

A yellow-brown wood with a close, hard grain, resembling New Zealand kauri pine, or rimu, *Dacrydium cupressinum* Soland.

Professor Chung says the Chinese name means the wood of *Sophora japonica.*

Hua-li-mu or ***Cang-szu.*** Source unknown.

China.

The specimen submitted by Professor Chung is inscribed: "This is the famous flower wood, highly esteemed for all kinds of furniture and cabinet work."

In answer to a question as to whether this wood is not "Castanospermum," Record says: "The flower wood has always had my interest and I made many efforts to find out exactly what it is. I am positive it is one of the Leguminosae, and the nearest approach that I have made, apparently, is *Cassia siamea.* . . . It *does* resemble *Castanospermum* . . . but the bands of parenchyma are more sharply defined."

The specimen which is included in the collection sent to Kew by Professor Chung is of a golden yellow-brown colour, so closely resembling the appearance and grain of Tasmanian black bean that it would pass for that wood anywhere.

The grain is hard and close with a wavy, feathery pattern caused by light-yellow reddish and dark reddish streaks interspersed, and showing a pretty pattern on the transverse section, a decidedly handsome, decorative wood. (For a full description see BLACK BEAN.)

Concentric layers of growth are marked by clear, light bands, the pores, almost invariably plugged, forming wavy belts intersected with very fine, but distinct medullary rays, presenting a very pretty appearance. The medullary rays do not show on the radial section.

Huang-nun-mu. Source unknown.

China.

Professor Record says this wood is near to *Machilus* sp. It has a fairly hard grain, and a grey-greenish tinge of colour.

The concentric layers of growth are marked by thin dark lines. The pores are very numerous, regularly placed, regular in size, and very small. The medullary rays are fine and confused, showing on the radial section in tiny flecks.

Hung-ch'ai. Source unknown.

China.

The colour is a bright, strong, rich plum, with a metallic lustre, hard, heavy, and close-grained. Professor Chung says: " This wood is said to be the wood of Ormosia sp." Record says: " I doubt if I should have thought of Ormosia if Professor Chung had not suggested it," and that, at Yale University they have numerous specimens of Ormosia from various parts of the Tropics, and none exactly match this, although they are built on the same general plan. He goes on, however, to say that he is " certain that it is *Leguminosae.*" I am unable to confirm this opinion, as the specimen submitted from the Amoy University bears no resemblance to any I have seen of *Ormosia* sp., but it resembles in colour, appearance, and grain the Borneo wood called ringas, *Melanorrhoea usitata.*

The pores are numerous and largely plugged; medullary rays are strongly defined, parallel, but not showing on the radial section.

Hung-li.

China.

The specimen sent by Professor Chung to Kew is a wood agreeing in every respect with the North American magnolia, *Magnolia acuminata* (*q.v.*).

Hymenodictyon Excelsum Wall.

Weight 31 lbs. (Gamble). India, Burma.

VERN—*Bartu, barthoa,* Pb.—*Bhaulan, bhalena, bhamina, dhauli, kúkúrkat, bhurkúl, phaldu, bhohár, potúr, purgur,* Hind —*Bauranga,* Kumaon —*Lunia, lamkana,* Merwara—*Bhorsál,* Melghat—*Bhorkoru,* Monghyr—*Bhawasar,* Kurku—*Sali,* Kól—*Burkunda,* Bhunij—*Dadhippa,* Reddi—*Dondru, dandelo,* Panch Mehals—*Bhoursál,* Mar.—*Sagapu, peranjoli,* Tam.—*Dudi-vetta, dudippa, chetippa, burja, bandara, monnabillu,* Tel.—*Vella kadamba,* Mal —*Bodoka, konso,* Uriya—*Kusan, kuthan,* Burm.

" The wood is soft but of good quality for purposes for which a soft wood is useful " (Gamble, p. 407).

It is of a brown-yellow straw colour, with a nice medium grain comparable to that of a hard sample of African mahogany, but has never been exported on a commercial scale, although it would find a ready market. Gamble reports it as useful for tea-boxes, but the Government specimen in my collection shows a wood of comparatively hard texture, and much too valuable for such purposes.

Pearson and Brown, in *Commercial Timbers of India,* speak of it as the nearest approach to beech, and suitable for similar purposes for which beech is required.

Pores scarce, very small, in groups or bands. Concentric layers prominent, medullary rays very fine indeed, but conspicuous and numerous. On the tangential section the surface shines with very small specks of gum.

IBICUIBA. Source unknown.
Weight 39 lbs. Brazil.

This is a dull brown wood with a slight lustre. It has a fine, close, hard texture and a straight grain, resembling that of Cuba mahogany, but slightly milder and softer than that wood, although it would easily pass for it. It would form a highly suitable wood for good-class cabinet work.

The pores are fairly frequent, and are occasionally joined together, so that they form a patch of loose tissue. The medullary rays are very fine and numerous. Dark-coloured lines follow the concentric layers.

IMBERIBA BRANCA. Source unknown.
Weight 54 lbs. Brazil.

The specimen indicates that the wood is only obtainable in small sizes, and that it would, therefore, be of little use in commerce.

The pores are scarce and irregular. The strongly marked medullary rays are continually intersected by pretty lines of loose tissue, forming a fine lace-like appearance.

IMBIU AMARELLO. Source unknown.
Weight 60 lbs. Brazil.

This is a dirty yellowish-brown wood ; it has a straight grain, and takes a smooth surface from the tool. My small specimen has a pin worm-hole, suggesting its liability to this defect.

The exceedingly small and numerous pores are plugged. There is a strong, well-defined medullary ray, intersected by extraordinarily fine, straight, white concentric lines.

INGYIN. *Pentacme suavis* DC.
P. siamensis Kurz.
Weight 54 lbs. Troup). India, Burma, Cochin China, Malaya.

The wood has a pleasing nut-brown colour, a little lighter than teak, but otherwise resembling it, capable of a smooth surface from the tool. On this point Gamble says : " It resembles Sal in the peculiarity that on the vertical section it has alternate belts in which the grain changes, so that a very sharp plane indeed is required to smooth it. It is used in India for house-building and bows " ; also, according to Troup, for " bridge

construction, piles, telegraph poles, boat-building, carts, shafts, strong articles of furniture, and bows ; suitable for trial for paving blocks." It is mentioned by both these authorities for its durability, while Foxworthy notes that it is indestructible in water. It is one of the woods tested by Foxworthy and Woolley, and which survived five years of that test (see under Pyinkado). It is a valuable wood for which many uses could be found if the difficulties of a regular supply were overcome.

Gamble gives the name ingyin also to the produce of *Aporosa macrophylla* Muell., but the wood from this source is unknown in commerce in the United Kingdom.

The pores are arranged in belts, which are made more clear by the halo surrounding them. The numerous fine, clear, equidistant medullary rays, which also show on the radial section as in beech, but rather smaller, are crossed at right angles by similar irregular, fine white lines.

IPÉ.

See PÁO D'ARCO.

IRA ROSA.

Costa Rica.

It is probable that this wood belongs to the mahogany family, although no mention of it is made by the leading authorities, and its scientific name is unknown. It has a soft grain similar to that of a plain Honduras mahogany, with a reddish-brown colour and lustrous surface. It takes a good polish and would be suitable for decorative woodwork.

The oval-shaped pores are fairly large and are distributed very irregularly ; they are often joined in wavy lines of five and six together. The medullary rays are very numerous, but so faint as to be only discernible under the lens. There are faint concentric lines of loose tissue.

IROKO. *Chlorophora excelsa* Benth. & Hook.

Weight 41 lbs. 14 oz. West Coast of Africa.

VERN—*Simmé*, Fr. G—*Iroko, bouzo, edoum*, Ivory Coast—*Rokko*, Dahomey—*M'vule*, Lagos—*Bang, bing, adoum*, Cameroons—*Mandji, eloun, kambala*, Gaboon & Moyen-Congo—*Kambala, amoreira*, Portuguese Cabinda—*Kambala, kamba, molundu, bolondo, M'bara, sangasanga*, Belgian Congo—*Odum*, Guinea—*Muamba-Camba*, Angola—*M'bundu*, Uluguru—*Rock elm, oroko, uloko*, Benin—*Iroko, African oak, African teak, kambala, odoum*, Trade.

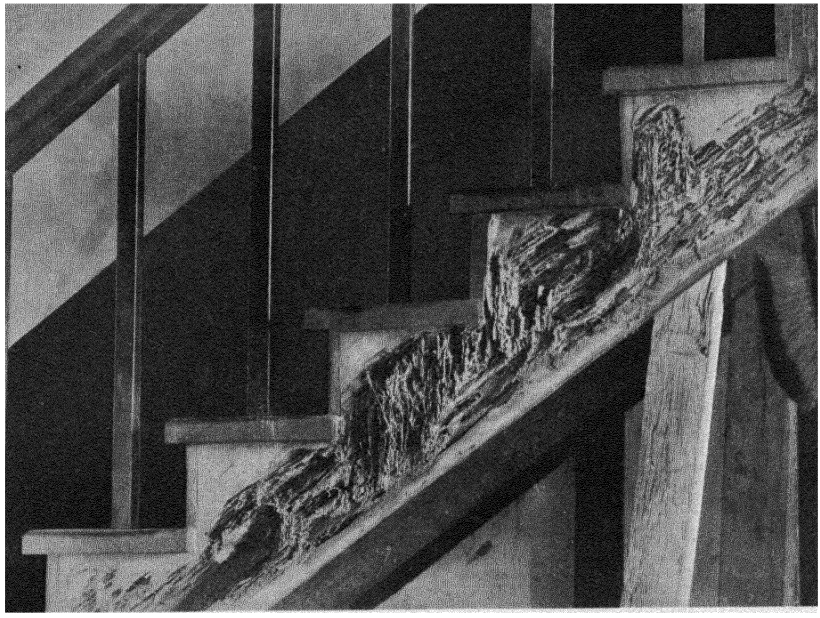
This timber, the product of the m'vuli tree, generally called " iroko," also African " teak " and sometimes African " oak," has been imported from several districts on the West Coast of Africa.

According to the Association Colonies-Sciences et Comité National des Bois Coloniaux : " Iroko grows over a wide area, from French Guinea to

the interior of the Belgian Congo. It is very abundant on the Ivory Coast, particularly on the edge of the north forest; more sparsely, but still common, in the Cameroons, Gaboon, and in all the forests of the Congo; it grows in isolated places in the forest zones of Togo and Dahomey."

Professor Troup says: "This tree has a wide distribution in Tropical Africa, occurring on the West Coast, in Uganda, Kenya, Tanganyika, and south into Nyasaland. I even saw it in Pemba Island (Zanzibar) last year."

The name African teak is quite unjustifiable as it possesses no resemblance to the true teak (*Tectona grandis*), even in appearance, while in



STAIRCASE AT AMANI, TANGANYIKA

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quality and texture it is totally dissimilar, besides which, iroko, while not possessing those unique qualities which render teak valuable for special work, has a distinctive quality of its own, sufficient to justify its specific name. In the early days of its importation it was often called African oak, another name to which it was not entitled.

The colour varies from a very light golden brown to a rich warm brown, always inclined to bleach after exposure. The grain is somewhat interwoven, and possesses hard and soft layers which makes it difficult to get a smooth surface with the tool. The trees have very faulty, wandering heart-wood, generally badly shaken, making the wood wasteful in conversion; but exceedingly wide boards can be secured from the outside of

the tree, which remain sound, and form a useful medium for counter-tops or similar work. It has been used in the United Kingdom for heavy felloes for gun-carriages, and for the heads of golf clubs, and this year (1931) for general fittings, trim, doors, etc., for the London Electrical Railway buildings, one station being entirely fitted throughout with iroko. It has also been used in a great many cases as a substitute for teak, having been described as African teak.

Mr. H. N. Thompson described it as " the best all-round timber in tropical Africa (and) the most useful wood in West Africa," and expressed the opinion that it was thought to be termite resistant. Mr. Mellor, however, has set this matter at rest by showing that it is apparently completely proof against the ravages of the white ant. He contributed to *The Field* of 1st October 1932 a picture of a staircase in a house in Tanganyika, showing all the wood other than iroko entirely destroyed, while the iroko remained untouched (see illustration). Mr. Mellor did not know whether the wood was grown in Tanganyika or brought there. This information places iroko on an entirely different basis of value, and the supplies should undoubtedly be reserved for use in those parts of the world where the white ant exists rather than in moderate climates where this great quality possesses no value.

In transverse section concentric layers are formed by the occurrence at intervals of thin, concentric light lines of soft tissue. The pores are visible, and are linked together by shorter or longer light, wavy lines that stand out well in the section. The medullary rays are invisible. The wood is cross-grained and slightly wavy ; the coarse vessels (pores), imbedded in soft, light tissue, score the surface with their furrows.

IRONBARK.

The mistake of naming a wood by the appearance or quality of the bark is nowhere more clearly demonstrated than in the case of ironbark. The Forestry Commission, N.S.W., while reporting it as " the king of New South Wales," mentions no less than six different sorts, three of which are stated to be of special value. Baker mentions nine different sorts.

As there is a very distinct difference between each, and the single name is misleading, the six principal timbers are reported here separately, viz. :

	Weight per cu ft
Eucalyptus Fergusoni R. T. B., " Bloodwood Ironbark " . .	72 lbs.
,, *crebra* F. v. M., " Narrow-leaved ". . . .	63 ,,
,, *siderophloia* Benth., " Broad-leaved " . . .	72½ ,,
,, *Nanglei* R. T. B., " Pink Ironbark " . . .	69 ,,
,, *paniculata* Sm., " White," " Black," or " Grey "	64–69 ,,
,, *Beyeri* R. T. B., " Narrow-leaved " . . .	71½ ,,

IRONBARK. *Eucalyptus Beyeri.*
See *E. paniculata.*

IRONBARK. *Eucalyptus crebra* F. v. M.
Weight 63 lbs. (Baker). New South Wales, Queensland, Northern Australia.

Known as " narrow-leaved ironbark." Baker describes this as " one of the finest of the Ironbark timbers . . . it is close-grained, occasionally interlocked, reddish in colour, very hard, heavy, and very durable, for which latter quality it is especially highly prized. . . . In great demand for sleepers, storey-posts, girders, heavy waggon and wheelwrights' work, bridge work, and wharves.

" The pores are numerous, but comparatively small. . . . The rays are very small, and very numerous . . . the cells are nearly all filled with a reddish deposit."

IRONBARK. *Eucalyptus Fergusoni* R. T. B.
Weight 72½ lbs. (Baker). New South Wales.

Known as " bloodwood ironbark." According to Baker the colour of this timber is mostly a deep red, or reddish-chocolate, but rather lighter when aged. " It is hard, heavy, straight, or interlocked in the grain . . . planes and dresses well for an Ironbark. . . . In seasoning it splits with the rings.

" A close-textured timber with specially thick-walled fibres. . . . These fibres are arranged in regular rows of varying diameters. . . . The vessels are numerous . . . the wood parenchyma is sparse. . . . Ray parenchyma numerous."

IRONBARK. *Eucalyptus Nanglei* R. T. B.
Weight 69 lbs. (Baker). New South Wales.

Known as " pink ironbark." Reported by Baker as " a very fine timber with a distinct clear pink, or red colour . . . close-grained, heavy, hard, but does not plane to so bony a surface as Ironbarks, the fibres having a tendency to lift almost immediately after planing." Probably the " lightest in weight of any of the other Ironbarks, and not quite so hard. . . . This species differs from *E. paniculata,* principally in the physical properties of its timbers, such as colour, texture. . . . Suitable for heavy works of all kinds.

" The vessels are fairly numerous, with bordered pits on the walls and mostly plugged with tyloses. The most conspicuous features of the wood are multiseriate bands of wood parenchyma running in the direction of the annual rings."

IRONBARK. *Eucalyptus paniculata* Sm.
Weight 70 lbs. New South Wales, Queensland.

Known as "white," "black," or "grey ironbark." The colour ranges from a light to a very warm brown walnut shade, with a hard, compact grain, strong and heavy. In Australia it is considered to be one of the best of the ironbark timbers, the hardest of all, and difficult to work. It is used for waggon and carriage work, spokes, naves, and heavy constructional purposes.

Baker groups in one category *Eucalyptus paniculata*, *E. angustifolia*, and *E. Beyeri*.

The pores are numerous, rather small, surrounded by light bands of tissue, generally plugged; the medullary rays exceedingly fine, very numerous, and irregular.

IRONBARK, RED. *Eucalyptus Siderophloia* Benth.
Weight 72½ lbs. (Baker). New South Wales, Queensland.

Known also as "broad-leaved ironbark." The colour of the wood is brown tinged with red, with a rather coarse, open, interlocked grain. It is specially noted for its strength and durability, and is much used for large squares, piles and constructional building work, spokes and naves of wheels, sleepers, waggon work, scantlings, and it is said that after twenty-five years of constant use the wood is as good as when first used.

The Forestry Commission report this wood and *E. crebra* as resembling each other in quality, and as "really valuable timbers."

"The pores are comparatively small and more numerous than in *E. crebra*. The vessels are all plugged with tyloses, and of rather narrow diameter. . . . The rays are numerous, the cells being filled with a red substance" (Baker).

IRONBOX, BLACK. *Eucalyptus Raveretiana.*
Weight 65–72 lbs. (Swain). Queensland.

The wood resembles West Indian lignum-vitae, is brownish-black in colour, very heavy and very hard, but still comparatively easy to work. It is highly durable in and out of weather or in the ground. The wood is somewhat rare now, but has been largely used for sleepers, posts, and rails.

IRONWOOD.

Throughout all hardwood-producing countries the name "ironwood" is sure to be given to one or more of the timbers, so that it has now become

a common name for many heavy, hard woods. Among those for which the term is used are the following :

Olea Hochstetteri.
Xylia dolabriformis.
Xylia xylocarpa.
Mesua ferrea.
Eucalyptus virgata.
Dialium divaricatum.
Cyrilla racemiflora.
Bumelia lycioides.
Ostrya virginiana.
Prosopis juliflora.
Tarrietia actinophylla.
Acacia excelsa.
Geijera salicifolia.
Notelaea ligustrina.
Eucalyptus squamosa.

Of the above only the first six species are generally met with in commerce. The Indian *Xylia xylocarpa*, the Burma *Xylia dolabriformis*, and the Indian and Ceylon *Mesua ferrea* undoubtedly possess the qualities which justify the term. The remainder differ so widely in species, character, hardness, and durability, that the use of a common name is misleading.

IRONWOOD, EAST AFRICAN. *Olea Hochstetteri.*

East Africa.

VERN—*Musharagi.*

This wood should be called East African olive wood and not ironwood. It has a hard, dense, compact grain, much resembling in appearance the European olive, but considerably harder in texture, and with a marked contrast between the hard and soft grain: difficult to work to a smooth surface. The wood has been divided into what is called " ordinary " and " figured," but there does not seem to be sufficient difference to warrant any such grading.

The pores are very numerous and regularly placed, exceedingly small, and plugged. The medullary rays are parallel and regular, extremely fine, and clearly marked. The tangential grain shines with innumerable tiny spots of gum.

IRONWOOD, RED. *Erythrophloeum Labourcherii.*

Weight 78 lbs. (Swain). Queensland.

Also known as Cooktown ironwood and leguminous ironbark.

The colour of the wood is mahogany red with a lustrous glaze, and a very hard, compact, tough grain, taking a high polish. It is reported to have great durability above or under ground, with strong resistance to white ant. Used for sleepers, fences, turnery.

The West African species is *E. guineense*, sasswood (*q.v.*).

RED IRONBARK—NEW SOUTH WALES

By kind permission of the High Commissioner for Australia

ITAUBA PUANA.

Weight, 40 lbs. Brazil.

The colour and grain of the wood, although somewhat finer and straighter in grain, resembles Cuba mahogany so nearly that it would pass for it at any time, but is not quite so hard or heavy.

The pores are rather larger than is usual in Brazilian timbers: they are unevenly distributed and are generally surrounded by a patch of loose tissue. The medullary rays are numerous and very fine; as many as four sometimes appear in the width of one of the pores. The rays show on the radial section in minute flecks.

IVORYWOOD. *Siphonodon australe.*

Weight 50 lbs. (Swain). Queensland.

Ivory-white in colour, with a fine, even texture, straight-grained; used for fine engraving, wood-carving, small turnery and cabinet work, scales and rulers. Requires careful seasoning.

IVY. *Hedera Helix* Linn.

Great Britain, U.S.A., Western Himalayas.

Those who have discovered the ease with which a sharp axe will cleave its way through a trunk of ivy growing round a tree, will be amazed when they find how extremely hard the wood becomes when seasoned. The colour, which is a dull grey, is rather attractive, and the grain firm and hard, almost like bone. There appears no record as to its durability, but there is no reason to suppose that it would not be durable, and it might be interesting to see whether the wood could not be actually used as a medium for decorative cabinet work.

The pores are very numerous and small, mostly plugged, between strong, well-pronounced rays, very numerous but rather rough-edged, showing boldly on the radial section.

JACKWOOD.

See *Artocarpus integrifolia.*

JACUA or **JAGUA.** *Genipa americana* L.

Weight 59 lbs. Brazil.

VERN—*Jagua*, Span., gen—*Genipa, genipat, genipayer, genipo, bois de fer, lana*, Fr. W.I.—*Caruto*, Venez., Trin.—*Genipapa, genipapo, genipapeiro, genipapo do matto, junipapo*, Braz.—*Irayol*, Salv., Guat.—*Jagua azul, jagua blanca, maluco*, Mex.—*Nandipá*, Arg., Par.—*Hagua, jagua, xagua, janipha, junipa*, Misc.

The specimen is marked "jacua on pirutinga," but on the accompanying list the name is given merely as "jacua." The timber is a light straw yellow, and is hard and straight-grained.

The transverse section presents a pretty pattern even to the naked eye. The pores, which are very small and plugged, are arranged in wavy bands which form an irregular pattern. The medullary rays are very fine and numerous, and crossed at right angles by white wavy lines following the growth of the concentric layer; these lines are thicker and more prominent than the medullary rays.

JAMBA.

See *Xylia xylocarpa*.

JARANA PRETA. Source unknown.

Weight 69 lbs. 7 oz. Brazil.

VERN—*Jaraná*, Braz.

This hard, heavy wood is very liable to split: it has somewhat the grain of greenheart. The colour is yellow-brown, alternating with a salmon shade in light and dark streaks. It takes a very smooth surface from the tool, and its qualities suggest that it would be useful for fishing-rods, walking and umbrella sticks. The transverse grain shows like a dark-coloured pine (*Pinus sylvestris*). The wood has a distinctly unpleasant smell.

The pores are irregular, small, and mostly filled with gum or oil. The medullary rays are clear and strongly defined, joined at right angles by very distinct and fine, similarly coloured lines, making a kind of honeycomb pattern.

JARRAH. *Eucalyptus marginata* Sm.

Weight 57 lbs. Western Australia.

The wood is a bright brick-red colour and of close texture, with interwoven grain, occasionally figured like mahogany. In general appearance it very much resembles karri, and great difficulty has been experienced in distinguishing between them. A simple means of achieving this is to burn a small piece of the wood. Jarrah will leave a black, and karri a white ash.

The State Royal Commission on Forestry, reporting in 1904 on the available supplies, stated that virgin jarrah forest to the north of Blackwood River, which is suitable for milling, is estimated at 2,000,000 acres. To the south of this river there are also considerable supplies of this timber, while in addition to these areas there are several millions of acres of jarrah country, not of sufficient commercial value for milling purposes, but which will afford immense scope for sleeper-hewing.

Quoting the report of the late Mr. O'Connor, Engineer-in-chief of the State of Western Australia, Julius says: "For durability and general construction work of all classes, jarrah is undoubtedly one of the best of

all State timbers. In building where there is much traffic, and also in private houses, jarrah planks furnish a durable, cleanly floor capable, if desired, of high polish. Skirtings, dadoes, rails, architraves, door frames, transoms, mullions, doorsteps, staircases, more particularly in public buildings and large houses, have been and are being increasingly made of this wood, with very handsome results."

Jarrah is eminently suitable for high-class cabinet work, but care must be exercised in order to get it thoroughly seasoned before use. Some very handsome furniture and panelling has been on view at the London office of the Agent-General for Western Australia, and this can still be seen by appointment. It has been used in England for railway waggon and platform construction, and is in the third highest class for shipbuilding purposes at Lloyd's. According to a report from the Chief Engineer of the North Eastern Railway Company, jarrah piles driven about ten or twelve years ago (1919) are still in good condition, and have proved quite satisfactory for wharf work. At Hartlepool, where the same wood was used for piles, there is only slight indication of attack by sea worms.

Concerning other uses to which it may be applied, Julius says that it "has been employed for telegraph and telephone poles and signal posts and has been found exceedingly suitable and durable; while its miscellaneous uses in the State generally, for almost every purpose and requirement of all the industries, are innumerable."

Contrary to general practice in the case of other chief timbers of the world, the heart-wood core of the Eucalypts is to be avoided, and specifications for cut jarrah timber should therefore require freedom from heart-wood, except in the case of piles, which are better round than squared. Sap-wood, on the other hand, rarely measures above an inch in thickness, and being often almost as hard as the inner wood, scarcely needs to be particularly excluded, except in cases of special importance.

The British Fire Prevention Committee made some careful inflammability trials with jarrah timber a few years ago, with the view of obtaining reliable data as to its fire-resistance capabilities, when severe tests were applied. The results were regarded as generally satisfactory and as indicating that a building constructed of jarrah would be unusually resistant to fire, especially in the case of floors and floor-beams.

A sample, cut from a pile which has been in use for forty years, produces a wood harder and smoother than when first used, and presents a far more pleasing and better surface than can be obtained from any less dry specimen.

Quoting other State authorities with regard to the durability of this timber, Julius writes: "Its suitability for piles and any works requiring immersion in salt or fresh water has been practically noted. Specimens obtained from piles and girders sixty years old, and used in local harbours

and bridges, appear to be perfectly sound and free from any signs of decay. If anything, the wood seems to be harder, more solid, and apparently more durable than freshly cut timber. . . . It is destined to supply one of the most lasting of hardwood timbers for a long time to come, at the least costly rate, to very many parts of the world." He adds: "Notwithstanding the superiority of this timber over so many other kinds, it has not been found to give altogether satisfactory results for scantlings for railway wagon building (for which karri has been found so good (A. L. H.)). Probably the nature and grain of the wood render it unsuitable."

Jarrah has been used very extensively in England for wood-block pavement with varying results, some being unsurpassed in excellence, while others were somewhat discouraging. The causes for these variations can, however, in most cases be ascertained. Perhaps the most important factor is the question of the pavement foundation, while the time which is allowed for carrying out the work has also some bearing on the result. Unfortunately the laying of pavement is in most cases much too hurried, and probably too little time is allowed both for making a proper foundation, and for seeing that this is sufficiently settled before proceeding with the work. It is also doubtful if engineers have even yet specified either sufficient solidity or enough regularity for the foundation of a hardwood pavement. The force which the jarrah block has to sustain from the heavy weights continually striking the surface is transferred to the foundation in a quite different manner from that which takes place with a softwood block, which is much more resilient and consequently acts as a kind of buffer. Possibly a medium between the concrete and the block to take this strain would make a considerable difference. As it is, any weakness which develops causes the foundation to give way and brings about the beginning of the "holey" places which characterise hardwood pavements. Immediately one block sinks even a little below the level of those surrounding it, every wheel bumps on the edges and increases the strain enormously, and this again enlarges the area and deepens the hole. Again, if the foundation be carelessly laid, or on account of urgency an insufficient time is allowed for it to set completely, the same trouble ensues. A careful inquiry into the question of foundations for hardwood pavements should be instituted, as there is no doubt that, as the cost of labour is nearly as much for laying the softwood as for the hardwood, a great saving of expense could be assured if this difficulty were overcome. Even in the present circumstances a 5-inch jarrah block pavement has, since 1906, withstood the exceedingly heavy traffic in the Euston Road, London, with fairly good results, and had in 1919 sustained thirteen years of continual use.

Some of these blocks were taken up for repairs that year, and appeared

as sound and hard as when they were laid. I had one sawn into 1-inch thicknesses and planed, and not only is the wood in splendid condition, but neither manure nor other deposits which it has had to withstand have impregnated the pores, as so generally found with softwood blocks after a much less time. Again, the variation of hardness in individual jarrah blocks is much greater than in the case of softwood, so that if only one of the softer kind is surrounded by harder, the same result referred to above occurs. It has been noted that the outer growth of jarrah trees is very much harder and closer than the heart growth, and there is also, of course, a variation in the trees themselves. To guard against this danger it is generally specified that only the harder wood should be used, but in practice sufficient care has not been taken either by the shipper, merchant, or contractor. Probably the most prevalent cause for this, and also for doubtful foundations, is the system of competitive tendering, and the endeavour to get work carried out at the lowest cost.

These difficulties have militated against the use of jarrah for block pavement, and it is not so eagerly sought for as it was a few years ago ; but considering the cost of labour and the inconveniences of more frequent stoppage of traffic, jarrah pavement should be much more largely used in the future. In 1899 Hornsey Road, northward from Shaftesbury Road, was paved with samples of jarrah, white oak, creosoted deal, and red gum blocks. The white oak and red gum mostly failed, but the jarrah and creosoted deal were in good condition, practically nothing having been spent in repair after over six years' traffic.

According to a report of Mr. W. N. Blair, Surveyor for the Borough of St. Pancras, Park Street was paved with jarrah in June 1893, and in 1907 was in good condition, very little having been spent in repair. Pancras Road, in front of the Town Hall and round into Great College Street, was paved with jarrah in 1892, and, excepting the tramway tracks and margins, was in good condition in 1907, very little having been spent in repair. Mr. Blair speaks of the life of jarrah blocks under very heavy traffic as nearly four years and considers it satisfactory, and also that the life is about 50 per cent longer than that of creosoted deal. In his report he makes this very significant statement, which should receive the very greatest attention of all pavement engineers : " It was not until some of our earliest laid jarrah pavement had worn into holes that the cause of the holes was discerned to be due to the presence of blocks with certain characteristics in their grain, which for several years past we have been rejecting, with the result that more recent work will wear more evenly, and, therefore, will have longer life than the earlier work. . . . The following may be taken as conditions characteristic of the two timbers :

" JARRAH.—Easily cleansed ; very durable ; good foothold generally ; becomes noisy by wear on edges of blocks.

"CREOSOTED DEAL.—Holds the dirt, and becomes greasy; less secure foothold; takes frost readily, therefore slippery; wears evenly, but quickly; more silent under traffic. Exudes an oily film, causing slipperiness, and an unpleasant odour for some time. The effect of creosoting at first reduces porosity, but this protection diminishes." He concludes by saying that all the motor omnibus companies were unanimous in favour of jarrah paving for safe travelling for rubber-tyred vehicles. In a later note in 1914 he thinks that "having regard to their relative prices and life and to certain characteristics attaching to each, such, for instance, as the greater smoothness of surface and as causing less noise under traffic, I think preference must now be given to creosoted deal if it be selected from the most suitable class of timber."

In reference to this last report it is not improbable that the relative costs may change to the advantage of hardwoods and that greater care with foundations and selection of timber may improve the hardwood pavements. For sleepers it is probable that nothing can be obtained which surpasses jarrah for durability and fire resistance, if indeed there is any timber to equal it in this respect. Some jarrah posts taken up in 1931, having been in the ground to the depth of some 3 to 4 feet in clay soil for forty years, were found to be perfectly sound and hard, only the outside edges showing a slight decomposition to a thickness of less than $\frac{1}{16}$ inch. Every year fresh reports come to hand increasing its reputation; its use is therefore epecially justified in this country, which, on account of the damp climate, calls for particular consideration, although the termite-proof qualities of the wood are not called into question.

The pores are very large and open, and are plugged with gum. The numerous medullary rays can be seen very faintly under the lens.

JARUL.

See *Lagerstroemia Flos-Reginae.*

JELUTONG. *Dyera costulata* Hook. f.
D. laxiflora Hook. f.

Malay Peninsula, Sumatra, Borneo.

In *Malayan Records*, No. 3, this is stated to be a very large tree, but not abundant.

The wood is very soft, light, and even-grained, the colour whitish, with no distinction between sap-wood and heart-wood, and not durable. Being easy to work it is used for many purposes, such as pattern-making, match-sticks and boxes, packing-cases, planks, but it is not suitable for structural work.

JEQUITIBA. *Cariniana* spp.

Brazil.

Record's account of Brazilian jequitibá may be summarised as follows : There are at least three species, all trees of immense size :

C. excelsa Casar. *Jequitibá branca* (Province of Rio).—Used for sugar-boxes.

C. domestica Miers (Goyez Province).

C. brasiliensis Casar. *Jequitibá rosa* (Rio Province) —Used for ship-building.

Various botanical specimens from Brazil have been identified as *C. legalis* (Mart) Kuntze ; the common names of this species being *jequitibá, jequitibá amarella, j. branca, j. rosa, j. vermelha,* Braz.—*Brazilian mahogany.*

Record quotes Mr. Curran as describing Jequitibá to be " light brown in colour and easily worked."

Colonel Gamble's specimen is of a light nut-brown colour with dark streaks. A note written by him on the specimen says that the tree grows to a height of 100 to 115 feet, and 10 feet in diameter, and the timber is used in joinery. The grain is very smooth, comparable with that of pencil cedar, *Juniperus* sp., with a close dense texture, a fine grain, and a lustrous surface ; it is altogether an excellent cabinet wood. The specimen has one pin-hole in it, which suggests its liability to insect attack.

Record reports it as of Rio de Janeiro, " a tree of immense size, with very broad, lofty, spreading branches. Its trunk producing a timber of much value, useful in works of construction and shipbuilding, which is known by the name of 'jequitiba rosa'." He also quotes Miers, who regarded *Cariniana rubra* as synonymous to *Couratari rubra,* and Record considers *Couratari legalis* Mart. as synonymous to *C. brasiliensis.*

Brazilian Woods mentions the last-named Jequitibá, *C. legalis,* and jequitibá branco, *C. speciosa,* and this book, issued by the Ministry of Agriculture in 1921, mentions these two names and that of *J. cedro* merely as variations in the name of one timber.

The pores are very sparse and irregularly distributed. There are many fine wavy concentric lines, and also bands of darker-coloured tissue at varying intervals, in the same direction. The medullary rays are very fine and numerous.

Jsing-p'i-hsiang.

China.

The colour is grey-brown, similar to that of the American live oak, but with a smoother, closer grain, showing the medullary ray on the radial section very small as in the plane tree.

Professor Record identifies this wood as the product of *Ilex* sp.

The pores are exceedingly small, and invisible to the naked eye, with strong, wide medullary rays.

JUCA. *Caesalpinia ferrea* Mart.

Weight 89 lbs. Brazil.

The wood is a deep purplish-brown colour, with a very hard close texture, almost comparable with that of African blackwood (*Acacia Melanoxylon*). The resemblance of juca to the *Dalbergia cultrata* of Burma, sometimes known as Burmese ebony, is marked, although the colour of the former is deeper and darker. The structure as displayed on the transverse grain also resembles *D. cultrata*, the principal difference being rather in the relative sizes of the different features of the structure than in general character. Colonel Gamble's specimen shows three worm-holes approximately one-sixteenth of an inch in diameter, which indicates that the wood is liable to this defect.

The small pores are unevenly distributed, and are joined together by light, wavy concentric lines or loose tissue. The medullary rays are straight and very fine and numerous.

JUG. *Ouriria* sp.

British Honduras.

A dull brown-coloured wood, with very strong, hard and soft contrary grain, showing little attractive quality.

Pores exceedingly numerous, very small, generally plugged, with minute and extremely small medullary rays, hardly discernible under the lens.

Juniperus chinensis Linn.

China, Mongolia, Japan.

The wood has not been seen in commerce.

Elwes says: "It attains a great age; the largest I saw were at the Temple of Confucius, which were said to be over 700 years old . . . one tree was about 40 feet by 17 feet, and another covered with burrs was 14 feet in girth." The wood resembles that of the English yew, but possesses a very strong and pleasant aromatic scent, rather like pencil cedar. A specimen taken from a tree grown at Powerscourt Castle, in Ireland, shows an attractive furniture wood.

The concentric layers of growth are clearly marked by dark rings.

KAKARALLI, BLACK. *Lecythis* sp.

Weight 74½ lbs. (Wood). The Guianas.

Record reports this as ? *Eschweilera corrugata* Miers, and gives the name of the wood as "manbarklak."

In colour and grain this wood resembles that of the Brazilian sapucaia (*q.v.*).

The pores are rather scarce and plugged. The medullary rays are exceedingly fine, very numerous, and crossed at right angles by wavy belts of light tissue, making a very pretty pattern.

KAKI. *Diospyros Kaki* Linn. f.
Weight 48 lbs. 10 oz. Japan.

This beautiful decorative wood shares with African blackwood the distinction of being capable of almost the smoothest surface obtainable in any timber; it has a marble-like coldness to the touch. The grain is very close and even, although it is lighter in weight than other ebonies. The ground colour is a dense black, with beautiful streaks of orange-yellow, grey, brown, or salmon colour imposed upon it; occasionally all these shades are seen together. It is highly valued in Japan, where it is used for ornamental decorative work in boxes, desks, and in mosaics. It possesses a slightly disagreeable scent.

The pores are fine and scarce, and are generally plugged. The medullary rays are exceedingly fine, though irregular; they appear in parallel lines.

KAMAP. *Strombosia rotundifolia* King.
Malay Peninsula.

VERN—*Petaling gajah.*

The wood is a light olive-brown colour, with a very hard, close, compact grain somewhat similar to that of boxwood but yielding a rougher surface from the tool. Foxworthy reports it as finer grained and denser than that of petaling, and used for the same purposes, but it could not be used as a substitute for boxwood. As in the case of the latter the innumerable tiny pores are plugged, with minute medullary rays crossed at right angles by similar light lines, forming a very minute network pattern.

KARRI. *Eucalyptus diversicolor* F. v. M.
Weight 53 lbs. Western Australia.

We are probably only just beginning to realise the value of this important Australian timber, the product of a magnificent tree which grows to an immense height, and of which that part of the British Empire possesses such a princely supply. Julius speaks of it as "one of the finest and most graceful trees in the forests of Australia," and as occasionally reaching the wonderful height of "300 feet . . . over 180 feet to the first limb and from 20 to 30 feet in circumference at the base."

The timber is red in colour, heavy, tough, dense, elastic, and closely similar to jarrah in appearance. This similarity, however, is actually

A KARRI FOREST

Photograph by the kind permission of C. E. Lane-Poole, Esq., Forest Department, Perth, Western Australia

harmful, and the absence of due investigation and comparison of the two woods has led to the same deplorable results as noticeable with the Indian timbers, eng and gurjun, which have suffered by their similarity to teak.

Karri is a much stronger wood than jarrah, but is not so durable in the ground, and is not termite proof. It has been largely used in England for railway waggon scantlings, and telegraph arms, and has given most satisfactory results ; it is doubtful indeed whether it has not been proved to be better for these purposes than any other timbers available. C. E. Lane-Poole says : " It is on Lloyd's list of shipbuilding timbers, and is suitable for all purposes where large sections of great strength are necessary. It has been found very satisfactory for wooden pipes and it makes a good waggon spoke." Julius reports that " piles of unusual straightness and regular taper, of either ordinary or exceptional lengths, can be obtained with facility and in large quantities, and have been not a little used in water not infected with marine pests. Karri also readily affords baulks of exceptional section and planks of great width." It has been found very satisfactory as sliding beams for mines, and has been made use of in this manner both in South Africa and the United Kingdom, and on the Continent, especially in Germany, with satisfactory results. Mr. H. M. Howe, State Mining Engineer at Perth, Western Australia, received (1931) from Mr. H. A. Reid, of Johannesburg, the following report : " Since writing to you I have inspected one of our mines equipped some thirty-five years ago and found that the Karri king posts as well as Karri support for tanks, main framing of crusher stations, etc., are still sound and in good condition. Attention has been drawn to this and consideration is being given to the possibility of using Karri for heavy constructional work."

For the durability of karri in contact with the ground when processed, there is not so much evidence yet available, but there is good reason to anticipate that in the course of time, and when sufficient trials have been made, the results will prove satisfactory.

Perhaps the most important consideration from our point of view, having in mind its size and abundance, is its employment in fireproof construction, for in a marvellous degree it is able to withstand the ravages of fire, and is therefore of very great value. In a disastrous fire that occurred in the West India Docks, the logs and planks of Australian hardwoods were found afterwards to have received only very slight damage, little more than a thin charring on the outsides.

Logs of this wood should be stored in the water, as otherwise they are liable to split and crack up badly. Planks, boards, and blocks should be stowed entirely under cover, packed as closely as consistent with a sufficient admission of air, to prevent fungus growth or other harm. The place chosen should also be entirely free from sun and rough winds, preferably

below the level of the ground, and in a slightly damp rather than very dry situation.

The pores are large and numerous, and are usually filled with gum. The medullary rays are not discernible even with the lens.

KATSURA. *Cercidiphyllum japonicum* S. & Z.
Weight 22 lbs. Japan.

A large quantity of this timber was imported into London and Liverpool before the war, in logs, boards, and planks. At first it was not sought for, but its good qualities were soon realised and a considerable demand has since existed. It excels all similar soft and light hardwoods in its extraordinary smoothness of grain and the sharpness of the edge which can be obtained from either machine or hand tool. This renders it very suitable for mouldings, however intricate the pattern. In these respects it will compare favourably with pencil cedar (*Juniperus virginiana*), which wood, however, can never be obtained in such long lengths and wide widths, free from defect. It is of a light nut-brown colour, and is very similar to kauri pine ; it has been used for a great many decorative purposes, such as cabinet-making, shop-fitting, and panelling, largely in place of American whitewood (*Liriodendron tulipifera*). While perhaps it does not stand in unfixed work as well as this wood, being a little liable to warp if used in wide widths, it far surpasses it in its very fine, smooth, silky grain and hard surface. It is reported by Goto (*Forestry of Japan*) as being used for wood-engraving in that country.

The pores, which are very fine and obscure, are largely filled with a bright, glistening gum, which sparkles on all sections. The medullary rays are hardly visible under the lens (+ 12).

KAYA. *Torreya nucifera* S. & Z.
Weight 32 lbs. Japan.
VERN—*Hongaya, Shirogaya*

The colour is a bright yellowish-white with a lustrous surface, and a hard, close, very smooth grain, harder than but otherwise like Port Orford cedar, though without any aromatic odour, the scent being somewhat unpleasant. It is reported as being used for chests and boxes, and also for chessmen. The wood has not been met with in commerce.

The concentric layers are marked by well-defined, strong, dark lines.

Kayea assamica King et Prain.
Weight 55–58 lbs. (Pearson & Brown). India, Assam.
VERN—*Sia Nahor*, Ass.

Pearson and Brown, in *Commercial Timbers of India*, state that the wood is " light red to reddish-brown . . . somewhat lustrous . . . heavy . . . inter-

locked-grained, fine-textured. . . . The timber is considerably more elastic, stronger and harder than teak . . . nor is the timber durable in water, but as house posts or as beams it is durable."

KELEDANG. *Artocarpus lanceaefolia* Roxb.

Malaya.

The colour of the wood is bright yellow to dark yellow, darkening on exposure to the air to a deep walnut colour, similar to that of *A. integrifolia* in Ceylon, with a firm, close, compact grain, capable of a very smooth surface and possessing innumerable fine specks of gum (?) which provides on the surface a lustrous sheen. Foxworthy recommends it as suitable for heavy construction and some classes of furniture, but the wood should be carefully reserved for only a high-class decorative woodwork.

The very scarce pores vary in size from small to large, and are almost invariably open; with ill-defined, irregular medullary rays coarse-edged, but showing on the radial section in light flecks.

KEYAKI. *Zelkowa acuminata* Pl.

Weight 39 lbs. 9 oz. Japan.

This is a very handsome, hard, fine-grained, golden-brown decorative wood, somewhat resembling English elm in colour, but with a much finer quality of texture, which after finishing from the tool displays a bright metallic lustre. It stands well, does not warp or twist, and if imported commercially into the United Kingdom, should, when known, make a very handsome timber for decorative purposes, panelling, and furniture. Professor C. S. Sargent (*Forest Flora of Japan*) describes it as *Zelkova Keaki*, and says: "The wood is more esteemed by the Japanese than that of any other of their trees. It is noted for its toughness, elasticity, and durability, both in the ground and when exposed to the air. It is considered the best building material in Japan, although it has become so scarce and expensive that Keaki is not now used for this purpose except in temples, where the large, light brown, highly polished columns which support the roof are always made of this wood." He also says that it surpasses American oak in "compactness, durability, and lightness; for Keaki, in comparison with its strength, is remarkably light." Elwes and Henry say: "The most beautiful trays and cabinets which come from Japan are made of dark, irregularly-grained and wavy-lined wood of the Zelkova." Two good specimens of this tree can be seen in Hyde Park, London, 10 to 12 inches in diameter, and very healthy.

The annual layers are very clearly marked, close, and numerous; the medullary rays are strong and well-defined. The pores are single, very

large and open in the spring wood, but very small and scattered in the autumn growth.

KING TREE. *Mora* sp.

British and Dutch Guiana,
Tropical South America.

In an interesting account of some of the colossal trees of the primaeval forests of Para, given by Bates in his *Naturalist on the Amazons*, the author says that amongst "these grand forest trees was the moira-tinga, the white or king tree," and he suggests that it is probably the same as, or allied to, the *Mora excelsa*, which Sir Robert Schomburgkh discovered in British Guiana.

For the description of this timber see MORA, *Dimorphandra Mora*.

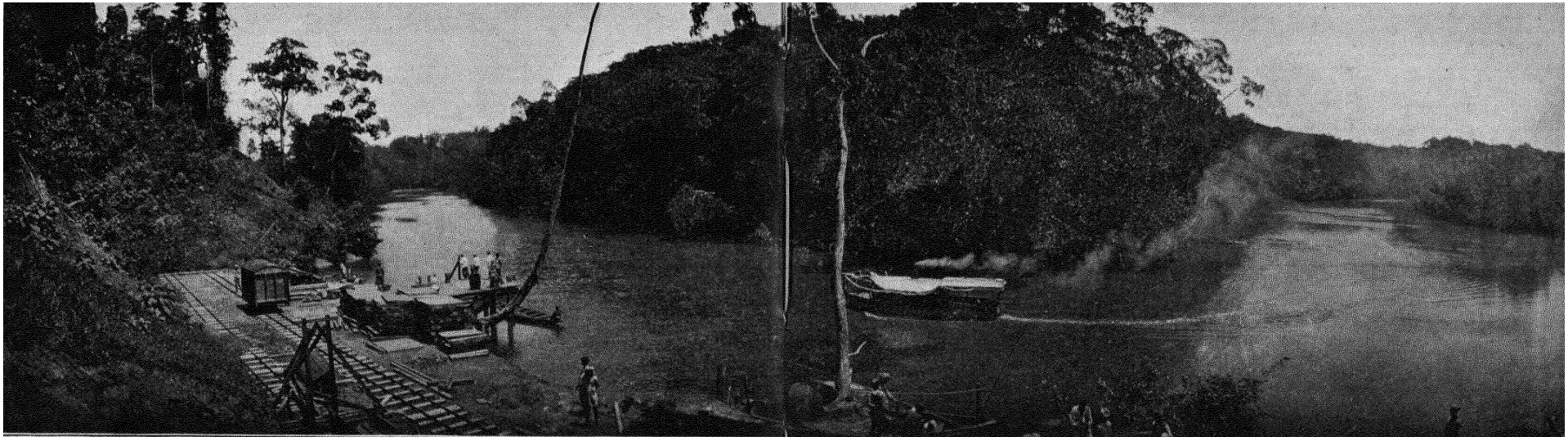
KINGWOOD. *Dalbergia* sp.

Weight 75 lbs. 13 oz. South America.

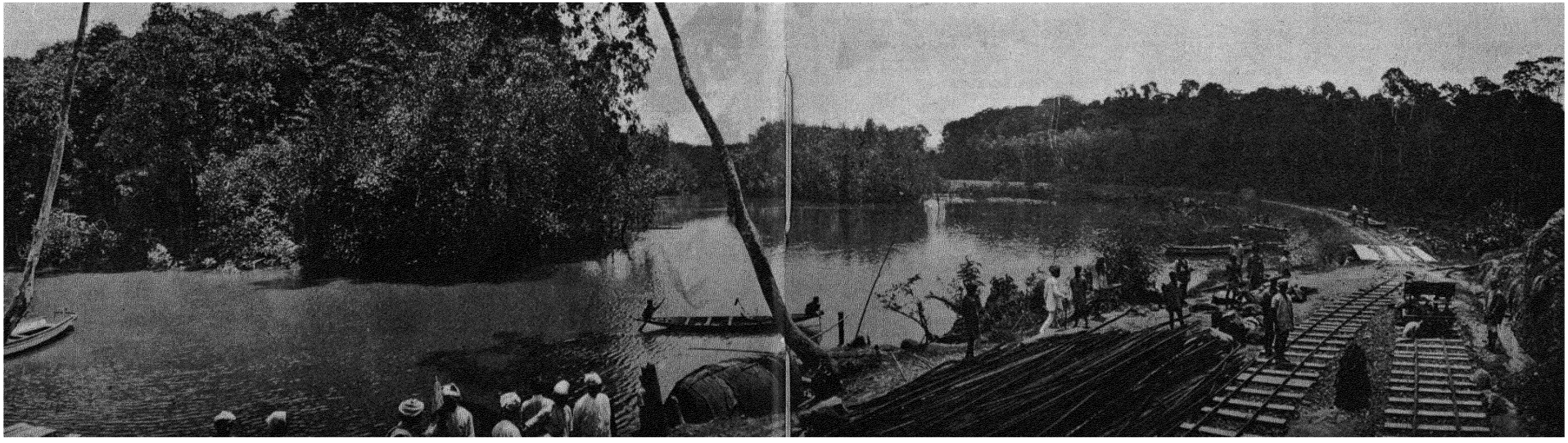
For a number of years the wood which for commercial purposes has been called "kingwood" has been the produce of a number of different varieties, which have possessed in a greater or lesser degree the characteristics of the original wood. Holtzapffel speaks of it as being "called violet-wood—imported from the Brazils in trimmed logs from 2 to 3 inches diameter." He calls it one of the most beautiful hardwoods in appearance. Foxworthy says that kingwood or violet-wood is "probably (derived) from species of *Dalbergia* and best known under these names from Madagascar and South America." I have a specimen of sissoo (*Dalbergia Sissoo*) which, although not quite the same, would pass for kingwood. Old cabinets, especially of French manufacture, display a wood which possesses a very transparent surface, and a strong metallic sheen. The beautiful effect of the wood when so used can be seen in an English cabinet of the early eighteenth century, which is veneered with kingwood, and is exhibited in the South Kensington Museum.

The wood is of a rich violet-brown, shading sometimes almost to black, and streaked with varying lighter and darker markings of golden yellow; it has a bright lustre, and a very smooth surface is obtainable. Always a beautiful cabinet wood, it is still more so when it has become toned with age.

The wood in cross-section shows concentric marking, mainly dark, and marked by thin, light lines at irregular intervals. The cross-pores are large enough to be visible to the naked eye. The medullary rays are invisible, though on very smooth sections a hazy pattern may be seen. The fine light-coloured rays stand out, and are crossed at right angles by similar concentric lines, either singly or several close together. Under the lens the pores seem to be plugged with a red substance.



FOREST RAILWAY IN THE ANDAMANS



THE BEGINNING OF THE FOREST RAILWAY, MIDDLE ANDAMAN ISLANDS

KIRI. *Paulownia tomentosa* (Thunb.) H. Bn.
P. imperialis S. & Z.
Weight 20 lbs. Japan.

The wood is extremely light in weight, being scarcely more than half as heavy as poplar. Of a very light nut-brown or reddish-brown colour, it somewhat resembles light-coloured wych elm. In Japan it is used for making musical instruments, bookcases, clogs, and floats for nets. Its charcoal is employed for polishing, and is reported to be indispensable in the manufacture of gunpowder. The Japanese excel in high-class cabinet work, and select this wood in preference to all others for linings and drawers of small cabinets, because its shrinkage and swelling are infinitesimal. Such cabinets are not considered to be well made unless the drawers run easily with the slightest pressure, and the pushing in of one drawer causes the opening of another. The wood is very costly in Japan.

It is largely cut into very fine veneers which are used for a great number of quite different purposes, including the lining of small articles, such as ink-stands, clock cases, etc., also for visiting-cards with the name printed upon the veneer, and for wall coverings. A music studio in a well-known London house is decorated throughout with a veneer pasted on a stout backing.

The annual rings, marked by the very distinct spring zone of numerous large pores, are often very wide. Outside this zone the small pores are grouped in short, peripheral lines and thus produce a pattern reminiscent of plum. The pores are all plugged. The medullary rays are fine and just visible or quite invisible, though in the radial section they stand out as light shallow bands.

KOA. *Acacia Koa.*
Weight 52 lbs. Hawaii.

A few logs of this wood have been imported into Liverpool, of late years (1920). They are of good size and length. According to Baterden it is " related botanically to the blackwood of Australia and Tasmania (*A. Melanoxylon*) . . . is the one fairly abundant Hawaiian tree which is valuable for its timber. It is a highly prized cabinet wood, a good deal used on the island." It is a red mahogany colour, capable of a very smooth surface with a glossy sheen. The texture is fine and close, and in appearance the wood shows a similarity to Australian blackwood.

A report in *Tropical Woods* states that *A. koa* has been used for furniture, musical instruments, in veneer for radio cabinets and furniture, and that the curly-grained wood is specially prized.

The pores are medium in size and fairly numerous. The medullary rays are parallel, very fine, and rather faint.

Ko-ch'ai.

China.

Professor Record identifies this as *Castanopsis* sp. The specimen submitted is that of a poor quality wood of the colour and appearance of American hickory, but with neither strength nor toughness, and with a liability to twist and warp.

The pores are very dense and irregular. The medullary rays are not discernible on transverse section, but show very faintly on the radial.

KOKO. *Albizzia Lebbek* Benth.

Weight 47 lbs. (Troup); my sample 65 lbs.

India, The Andamans, Burma, Ceylon.

VERN—*Sirıs, sirín, sirái, kalsıs, tantıa, garso,* Hind.—*Gokıru,* Kumaon—*Sırısha,* Beng.—*Hırıh,* Ass.—*Harreri,* Panch Mehals—*Vaghe, kat vaghe,* Tam —*Tınıa,* Uriya—*Dırasana, darshana, kat vage, pedda duchırram,* Tel.—*Kal baghı, bengha, sırsúl,* Kan.—*Chıchola,* Mar. —*Kôkko,* Burm —*Beymadá, gachodá,* And —*Mara,* Cingh.

This wood is the produce of the siris tree, and is common as an ornamental tree all over India and Burma. It is not common in Ceylon, where it is called mara, but some trees are to be found there. Up to the present time (1930), the shipments which have found their way into European and American markets have been entirely from the Andaman Islands, where the wood is obtainable in large sizes, up to 3 feet square. It seems that in parts of India, Burma, and Ceylon the tree rarely attains such a large size. On first exportation of this timber from the Andamans nearly all was shipped to America, where it would seem to have been given the name of East Indian walnut (see *Tropical Woods*, No. 18, S. J. Record). But there is reason to believe that these shipments consisted of a mixture of koko, *Albizzia Lebbek*, and laurel-wood, *Terminalia tomentosa*. The timber also appeared on the London market, in small quantities mixed with padauk, but it is probable that these shipments included the produce of *A. procera* and *A. odoratissima*. While a difference can be noticed in individual logs of the different varieties, a sufficient general resemblance exists to prevent a certain separate identification.

C. E. Parkinson, in *A Forest Flora of the Andaman Islands*, quotes Gamble as an authority for the use of the name of East Indian walnut in the European markets, but no confirmation can be found. In the latest edition (1922) of J. S. Gamble, under the heading *Albizzia Lebbek*, the following has been added: "The 'burrs' are especially valuable and fetch ten to twenty times the price of plain wood. It is probably the 'East Indian Walnut' of the European market." Gamble made few mistakes, but an inspection of all the imports of the United Kingdom during the last forty years has failed to display one single burr, and including a visit to the

Andamans in 1921, when I made special inquiry, all my efforts have failed to produce evidence of even one having occurred on this tree, nor have I ever been able to find any burrs of koko wood. In the United Kingdom the name of East Indian walnut has been used for the produce of *Terminalia tomentosa*, but I have never seen it applied to that of *Albizzia Lebbek*.

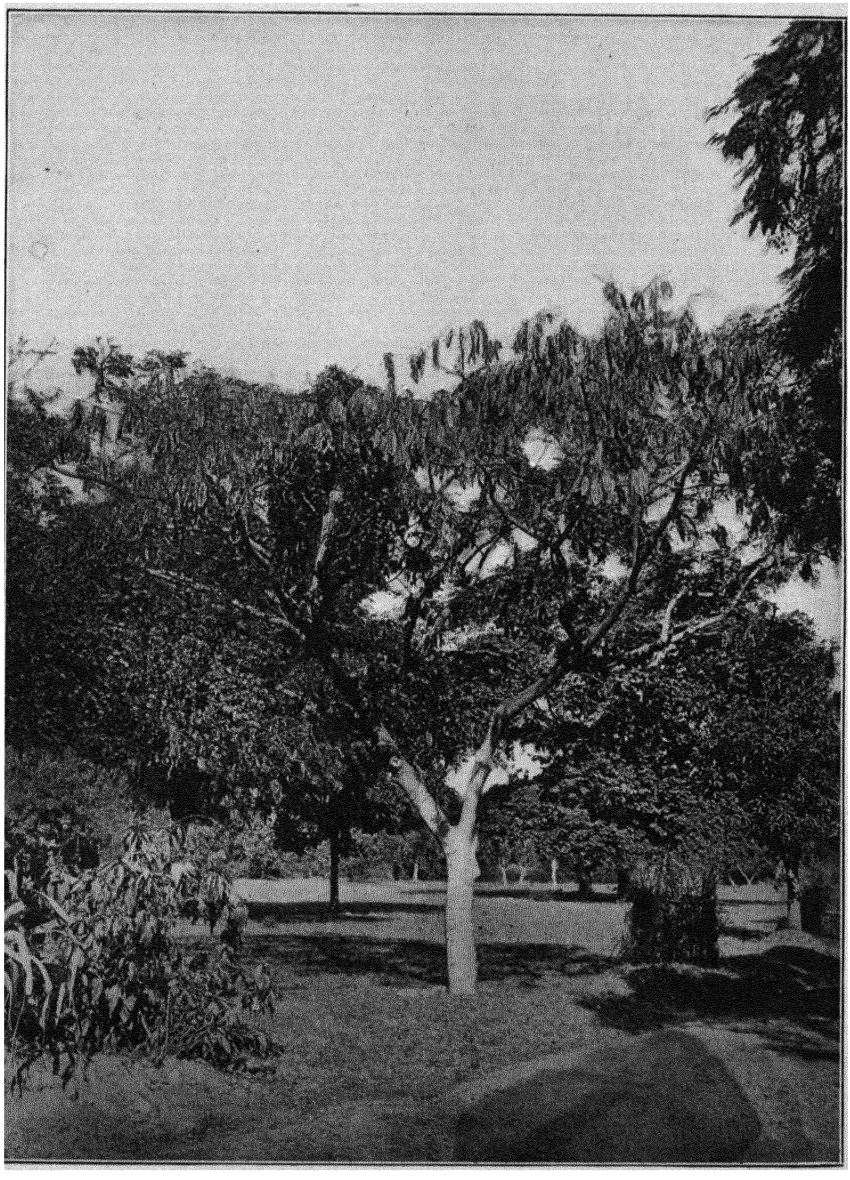
The task of describing the colour of any given wood is always one of the utmost difficulty. Degrees of colour are so numerous and minute that it becomes almost impossible to find adequate words to express the differences. Of all the timbers, the colour of koko might be said to be the most difficult to describe, as in different lights the grain reflects curious and unexpected colours and displays a unique, lustrous sheen, so that while it would be correct to describe the wood as brown, it can also be seen golden, almost yellow-golden, and sometimes with a distinct green shade. It is a very attractive wood for a great variety of decorative woodwork, and excellent for turnery. The dust given off in working is reported to be irritant. It has been imported in logs hewn and sawn square, in lengths of from 8 to 20 feet, and in sizes from 16 to 36 inches.

Among the many different kinds of hardwoods which India possesses, and until lately considered of little value, koko is an outstanding exception, as the demand has been regular and consistent. In the Andamans it was the principal wood used in the convicts' workshops.

There has been a moderate but continuous demand from America, where a considerable quantity has been used for decorative furniture and panelling, and by the Pullman Company in coaches, restaurants, and smoking-carriages.

In the new India House, London, a handsome exhibition of woodwork in koko can be seen, in the form of panelling and framing, chairs, and other furniture. At Grosvenor House the panelling and furniture in the reception room, parquet flooring, and chairs in the library, were furnished in this wood. The late Henry John Elwes had a number of dining-room chairs made in koko which were shown at the Exhibition at Holland Park in 1920, and their condition to-day (1930) leaves nothing to be desired. At the 1924 Wembley Exhibition many examples were shown of decorative woodwork in koko, especially the chairs in the dining-room, which were originally intended for presentation to H.R.H. the Prince of Wales. These magnificent chairs were a copy of the Chippendale Peacock chair in the Victoria and Albert Museum, with the Prince of Wales' feathers substituted for the peacock back. During the six years (1930) since the Exhibition, they have been in continual use, and it can be seen that the wood provides a chair wood equal in every respect to Spanish mahogany. The dining-room of Government House, Port Blair, in the Andaman Islands, panelled with koko thirty years ago, is still in splendid condition, also a magnificent partition screen, carved by the convicts and erected at

the Club House, Port Blair, thirty-two years ago (1930), is still in good preservation.



Photograph by J. B. Chitrekar

EAST INDIAN WALNUT (*ALBIZZIA LEBBEK*) IN FRUIT

The pores are large and open, scarce, and irregular in position. The medullary rays exceedingly fine, wide apart, and irregular.

KOWHAI. *Sophora tetraptera* Ait.
Weight, 48 lbs. New Zealand.

This wood, according to the Board of Agriculture, New Zealand, is pale brown in colour, heavy and compact, and possesses great strength, toughness, and elasticity. It is only procurable in short lengths and up to 6 inches in width, and is used for shafts and machinery, agricultural implements, and for cabinet work.

KRANJI or **KERANJI.** *Dialium* spp.
Weight 50 lbs. Malay Archipelago.
VERN—*Kuran, mempanjor.*

The colour is a bright brown-red to a rich red, with a very hard, close grain, often with narrow contrary layers of hard and soft grain, and possessing an exceptionally bright lustre. Laslett in 1875 described the wood as exceptionally tough, and one of the strongest with which he was acquainted. He tested one piece for tensile strength, and the average weight required to cause breakage was about ten times that of British oak.

Foxworthy, in *Bulletin No.* 1, published in 1916, speaks of keranji as being one of the finest furniture woods of the country. He mentions also a number of other species of Dialium which occur in British India and Malaya. Although isolated cases of commercial activity in keranji have occurred from time to time, the wood has never been common in the European markets.

The rather scarce pores, almost invariably open, are irregularly placed, with small wavy belts of light tissue ranging along the concentric layers of growth, and very fine, hair-like medullary rays at right angles, the radial section showing a cross network of light tissue, and the tangential section fine, rather inconspicuous ripple rays.

K'RUNTUM. Source unknown. ? *Helicia* sp. (Foxworthy).
Weight 51 lbs. 13 oz. North Borneo.

This is a hard, moderately heavy wood, light brownish-red in colour, and resembling shee oak (*q.v.*). Foxworthy described the wood as durable, and as being used in the building of houses. He tentatively attributes it to a species of *Helicia* (*Proteaceae*). Professor Groom says that although it does recall certain proteaceous woods that have broad medullary rays, it is probable that it is with equal possibility derived from a species of *Casuarina* ; for it shares with species of this genus the possession of numerous fine (invisible) rays, and thin lines of broken tangential (concentric) soft tissue, as well as the remarkably broad rays that often locally divide and become reunited. No distinct annual rings are visible, but very striking are the numerous, very thick, often dividing medullary

rays that cover half any surface of the wood, and produce the boldest silver grain. The pores being large, by their openness somewhat spoil the appearance of the surface, and often have light-coloured contents that cause chalky lines along the grain.

Kuei-ch'ai.

China.

Professor Chung reports this as *Cinnamomum*, which opinion is confirmed by Professor Record. The specimen submitted to Kew is that of an attractive, light red-brown, close-grained wood, with roe and mottle figure, and the medullary ray prominent on the radial section. It bears no resemblance either in texture, grain, or colour to that of the well-known *Cinnamomum* sp., nor does the wood possess the scent which is customary with these. The specimen is more like a brownish-coloured East India satinwood.

The pores are exceedingly small, mostly plugged. The medullary rays are very fine, parallel, showing strongly on the radial section.

KUNGKUR. *Pithecolobium confertum* Benth.

Malaya.

VERN—*Medang buaya, medang kok,* Kedak.

The wood is a nut-brown colour with a pronounced lustre, so resembling the wood of the Rain Tree (*q.v.*) that it is covered by that description. Foxworthy reports it as easy to work, keeping its shape well, and used for furniture. The expert would have difficulty in describing the difference between the two woods.

The very coarse pores are single and double, surrounded by a band of light-coloured tissue, very sparse ; with sparse medullary rays irregular but rather wide apart, not prominent.

KUREN. *Melia japonica* Don.

Weight 66 lbs. Formosa.

This is a light-brown, very open-grained timber, which in general appearance resembles wych elm. It is an inferior wood, and is not likely to be useful for anything but the commonest purposes. It has never yet been commercially imported into England.

It has large open pores showing marked gum streaks. Many of these pores appear to wear away, so that the surface becomes irregular. The annual rings are marked by a belt of large pores, the outer part of each ring containing a few smaller-sized pores which are joined by light wavy bands of loose tissue. The medullary rays are faint and very numerous, and show in flecks on the radial section.

Kurrima zeylanica Arn.

Ceylon.

VERN—*Konnai*, Tam.—*Palen, etheraliya, uruhonda*, Cingh.

The wood of this tree is a light-brown, dirty colour, stained with blue, with a short grain yielding a rough surface when worked. It is reported as being used in Ceylon for tea-chests and packing-cases ; it is not suitable for export.

The pores are very scarce, irregularly placed, mostly plugged, with strong, rough medullary rays, crossed at irregular intervals by light bands of larger and smaller pores.

K'u-szu. Source unknown.

China.

This rather attractive wood resembles olive-wood so nearly that it might pass for it, although much lighter in weight, being only about 25 lbs. to the foot cube.

It is of close, dense growth ; both pores and medullary rays are indiscernible under the lens (+10).

Kydia Calycina. Roxb.

Weight 36 lbs. India, Burma.

VERN—*Pola, púla, púli, patha, potári, choupultea*, Hind.—*Barranga, bhoti*, C.P.—*Kakhi*, Oudh—*Kubindé*, Nep.—*Sedangtagla, tagla*, Lepcha —*Mahow, moshungon*, Mechi—*Boldobak*, Gáro—*Kopásia*, Uriya —*Potri, pandiki, peddapotri, pedda kunji, kondapatti*, Tel — *Buruk, bosha*, Gondi—*Bendi, bende-naru, bellaka*, Kan.—*Warang, iliya, rán-bhendi*, Mar —*Bitha gonyer*, Kól—*Derhi*, Kharwar— *Wala*, Khond—*Pulan*, Jeypore—*Puska olat*, Sonthal—*Bothi*, Melghát—*Petshat, tayawni, tabo, dwabôk, dwalôk, myet-hlwa, balumashaw*, Burm

The wood is of a whitish-yellow colour, with a straight soft grain ; on the radial section it shows the medullary rays in flecks, in a manner resembling beech. Its qualities would not recommend it for export, and it does not appear to be reported upon very favourably in India.

The pores, though not large, are numerous. The medullary rays are broad and conspicuous.

LABURNUM. *Laburnum vulgare* Berchtold & Presl.
Cytisus Laburnum Linn.

Weight 53 lbs. (Elwes). Europe.

The beautiful greenish-brown wood of the laburnum, in common with many other English-grown woods, is seldom used ; yet it is as suitable for the smaller work of turnery, inlay, and cabinet-making as many exotic timbers. It is occasionally found in the form of " oysters," which

are obtained by taking a cross-section of the wood; these are used in originals and reproductions of furniture in the Queen Anne style. Elwes and Henry quote Sang "that in his time (1812) it was the most valuable timber grown in Scotland, and . . . sold at 10s. 6d. per foot." It was then used for cabinet-making, musical instruments, handles, and chairs.

The annual rings are marked by a belt of large pores, the smaller pores on the outer part of each ring being joined by wavy concentric lines of light-coloured tissue. The medullary rays are fine and numerous and are generally undulating.

LACEWOOD.

See PLANE, *Platanus orientalis*.

LAGERSTROEMIA.

The timbers produced by Lagerstroemia, except *L. parviflora* and *L. tomentosa*, so much resemble each other that, while it might be advisable on account of the different localities from which they are produced to describe them separately, yet from the timber point of view the characteristics and uses are so similar that they may well be classed together. In the development or exploitation of these timbers such a practice would prove advantageous. In the aggregate the quantity is considerable, but difficulties of transport, and other obstacles, prevent the continuity of supply. The wood known on the English market as "American oak" includes possibly twenty-two varieties: all are mixed together and brought into commercial use under the one common name. In like manner it would be advantageous if the supplies of the different species of Lagerstroemia could be mixed together, and labelled Pyinma, the name employed in the trade. In common with all other woods, there are slight variations to be found in different samples of the same wood; some being a little darker or lighter, harder or softer than others. These variations are not greater than in other sorts, and would not militate against its use.

Lagerstroemia Flos-Reginae would be supplied from India and Burma, *L. hypoleuca* from the Andamans, and *L. lanceolata* from Western India.

Most of the wood is of a red-brown colour, with a rather shining surface, produced by specks of bright gum. The grain is straight and even, with occasional exceptions, when highly figured logs are found. Such trees produce a beautiful timber, presenting a very attractive appearance.

Lagerstroemia Flos-Reginae Retz.

Weight 43 lbs. (Troup). India, Burma, Ceylon, Malay Peninsula.

VERN—*Jarúl*, Beng —*Ajhar*, Ass.—*Bolashari*, Gáro—*Gara saikre*, Kól—*Taman, mota bondara*, Mar —*Kadali, púmaruthu*, Tam.—*Challá hole dasál*, Kan.—*Adamboe, mani maruthu, nir maruthu*, Mal.—*Shem marutha*, Trav. Hills—*Kamaung*, Magh.—*Einmwe* or *Eikmwe, pyinma, pyinma-ni*, Burm.—*Muruta*, Cingh.—*Bongor, bunga*, Malay.

The wood varies according to different supplies, from a light red-brown colour to a darker and deeper tint, and has a slightly lustrous sheen. The grain is straight and even, producing good surface from the tool. It was shown at the Empire Timber Exhibition at Wembley in the form of panelling for the Westminster Bank, which was subsequently removed and set up in the branch bank at St. Martin's le Grand. The panelling was greatly admired. It has also been used by the Post Office for telegraphic and telephonic instrument cases, etc.

A considerable difficulty has been experienced in obtaining supplies, otherwise a much extended use would have been possible. Gamble reports it as " the chief timber tree of Assam, Eastern Bengal, and Chittagong, and one of the most important of the trees of Burma. . . . It is very handsome when covered with its large lilac flowers."

The pores are variable in size, and somewhat plugged. The medullary rays are exceedingly small and fine, and are very difficult to identify with the lens (+12).

Lagerstroemia hypoleuca Kurz.

Weight 44 lbs. The Andaman Islands.

The description of the wood is similar to that of *Lagerstroemia Flos-Reginae* (*q.v.*), varying more in colour from light to dark.

For all descriptions see that of *L. Flos-Reginae*, as also for identification.

Lagerstroemia lanceolata Wall., syn. *L. microcarpa* Wight.

Weight 53 lbs. West Coast of India.

VERN—*Benteak, venteak*, Tam.—*Ventaku*, Tel.—*Bolundúr, billi-randi*, Kan.—*Nana*, Mar.—*Senjál*, Mal.—*Venda, vengalam*, Trav. Hills.

For description and identification see that of *L. Flos-Reginae*.

Lagerstroemia parviflora Roxb.

Weight 45–60 lbs. India, Burma.

VERN—*Bákli, kat dhaura, dhaura, adhuari lendya, seina, sida, asid*, Hind.—*Sida*, Beng., Mechi, Ass.—*Bordheri, bordengri*, Nep.—*Kanhil*, Lepcha—*Shida*, Gáro—*Shej*, Banda—*Seji*, Bijeragogarh—*Kakria*, Guz.—*Sahine*, Chanda—*Chakrej*, Kurku—*Chinangi*, Tel.—*Chunji, pilugu*, Hyderabad—*Nana, bondara, nandi, bellinandi, sina,*

sokutia, lendi, Mar.—*Ventaku, chenınge*, Kan —*Lendya*, Baigas—*Sına, nellı, leria*, Gondi—*Chekerey*, Kurku—*Sıdha*, Uriya—*Nahua*, Khond—*Sıanangi*, Palkonda—*Saıkre*, Kól, Sonthal—*Tsambelay, Yaungbale, Kyettawra*, Burm.—*Lendıa.*

For colour and grain see description of Leza, *L. tomentosa*. This wood can be used in conjunction with *L. tomentosa* without distinction. It is perhaps a little more open-grained, but otherwise similar.

Pearson and Brown, in *Commercial Timbers of India*, liken it to *L. calyculata*, referring to it as a wood which, "if properly seasoned . . . has a most promising future." No difficulty has been experienced in seasoning the wood in England, and some very high-class cabinet work has been executed, suggesting that it is far too valuable a wood to be used for common purposes.

The pores are numerous and irregular in size and position, connected by a network of short, fine, irregular patterns or bands, making a wavy and pretty pattern. The medullary rays are very numerous and extremely fine, only just discernible by the lens, and do not show on the radial section.

LALONE. Source unknown.

Weight 69 lbs. Cuba.

In 1892, some hewn logs of about 15 to 18 inches square, to which this name was given, were imported into London. The wood is of a red plum colour, similar in density and texture to Spanish mahogany. It is capable of a fine smooth surface from the tool.

The pores are scattered and filled with a bright shining gum. The medullary rays are fine, uneven, and somewhat irregular. The tangential surface shows the pores also shining brightly, with minute specks of gum.

LANCEWOOD, MOULMEIN.

See *Homalium tomentosum.*

LANCEWOOD. *Oxandra lanceolata* S. W. Baitt.

Tropical South America.

VERN—*Lancewood*, Eng. gen.—*Lanzenholz*, Germ.—*Bois de lance, bois d'arc*, Fr.—*Palo de lanza*, Sp.—*Yaya*, Sp. Am.—*Yaya comun*, Cuba—*Black lancewood, white lancewood*, Jam —*Haya prieta, haya blanca, yaya, yaya blanca, purio*, P.R.—*Beriba, jerjerecou*, Fr. G. —*Yarı-yarı, yarrı-yarrı, arara, carisiti, carra-seri, kada-burichi, karaseri, howadanni, arrewawa* ? B.G.—*Guanabanillo*, Venez.—*Yaya, yalla*, Pan.—*Biribá, embyú branco, pinhão, envira, ouregou, pindahyba*, Braz.

The colour of the wood is a pale yellow, resembling a dull satinwood ; it has a very close, smooth grain which splits or rends freely. On account of its special elasticity and springiness it is the best timber for cart shafts. It is also used in a great number of different works, amongst

which are bows and measuring-rods, though these latter are generally supposed to be made of boxwood.

LANCEWOOD, ST. DOMINGO.

Weight 62 lbs. (Record). West Indies, British Guiana.

The prominent position which St. Domingo lancewood formerly occupied in the timber trade has been disturbed on account of the change which has taken place in the demand, largely caused through the advent of mechanical transport. Lancewood spars were in great demand, and high prices were realised for good quality. The demand came from different trades, and has now fallen off ; but supplies have also diminished, so that to-day the true South American lancewood is expensive and rare. The peculiar qualities of bending and resilience, and the general character, make the wood unique for many purposes, such as measuring-rods, rules, etc.

The colour is similar to that of boxwood, with a firm, close grain, very hard and tough. In the transverse section the characteristics are also similar to those of boxwood, the numerous pores being infinitesimal in size, with strong, well-defined medullary rays very thin, rather wide, and showing on the radial section in a marked fashion, as in sycamore.

LARANGEIRA. *Esenbeckia febrifuga* Mart.

Weight 49 lbs. Brazil.

VERN—*Larangeira do matto, quina do matto, mamonhinho, tres folhas vermelhas.*

The wood is of a pale-yellow straw colour, and has a dense, close grain, slightly lustrous. According to Stone, it would appear that this is the Brazilian orange-wood (*Citrus aurantium*). Colonel Gamble's specimen corresponds in all respects with Stone's account of orange-wood, though it could hardly be described as, in his words, " a wood of beauty."

Record reports it as only obtainable in small to medium sizes, and this, as well as its appearance, indicates that it might be serviceable as a substitute for boxwood.

The pores are very small and need the lens to be distinguishable ; they are sometimes joined in twos and threes. The medullary rays are very fine, numerous, and wavy. There are white concentric lines of loose tissue at varying intervals.

ARCH. *Larix europaea* DC.

Weight 47 lbs. 13 oz. United Kingdom, Europe.

This is one of the most valuable softwood timbers, found throughout the United Kingdom, chiefly in the north, and in the temperate and colder regions of the northern hemisphere. So far as England is concerned,

larch, although growing at our door, was despised and little cared for before the war. This is the more remarkable when it is realised that the Romans used this wood for their amphitheatres and other buildings.

The colour of the wood varies from a light, bright red to a warm brick colour, always with lighter and darker streaks similar to the well-known marking of pitch pine, to which it bears a strong resemblance. There is a great diversity of thickness in the growth of the concentric layers, which vary according to the climatic conditions under which the tree is grown. The annual rings in some cases are very regular and measure only $\frac{1}{32}$ inch, while in others, of exceedingly wide growth, they increase up to $\frac{3}{4}$ inch or more. This same divergence is also to be observed in individual trees, which range through nearly as great a latitude.

The wood requires care after conversion. To get the best results it should be taken direct from the saw, and carefully stored under cover, with sticks evenly and regularly distributed between the planks. It is apt to discolour while fresh, and more than in the case of ordinary soft timbers, is inclined to warp and twist. An exceedingly durable wood under all conditions. Perhaps this quality is best demonstrated by its use in the form of piles, or for wharfing timbers.

It is stated on good authority that the greater number of the houses in Venice are built upon piles of this timber, particularly those of which the supports are alternately exposed to wet and dry conditions; many of these piles after being in place for ages are said not to have the least appearance of decay. Elwes mentions that "churches and manor houses (in Poland) built 300 to 500 years ago of larch wood are still standing."

A specimen piece of a pile driven in 1854–55 in the river Nene was taken up in 1904, when it was found to be in a perfect state of preservation. Part of the wood was subjected during this period to the action of wind and weather, and alternate wetting and drying. Many notable Italian pictures have been painted on panels of larch. It makes excellent flooring, and if creosoted would be suitable for wood paving, as it is hard enough to resist the wear of traffic, while also giving a good foothold for horses. Used as sleepers, larch is superior to other softwoods, and its greater value in general is shown by the fact that the controlled price of larch during the war was 30 per cent higher than that of any other British softwoods. It is one of the most profitable timbers which can be planted in this country, though the prevalence of larch disease has of late years stimulated the planting of Douglas fir in its place. It is to be hoped, however, that as this disease has practically disappeared, larch will again take the premier position which it deserves. A plantation of this wood, when only thirty-nine years old, yielded timber more than 10 inches in diameter at breast height.

Before the war the use of larch was confined to such class of work as park and other fencing, but consequent upon the restricted import of foreign timbers, it began to receive honour in its own country. Its utility for a variety of purposes has become widely realised, and the continued demand in preference to other British softwoods proves its value. Amongst other purposes it has taken the place of pitch pine in the framework for bed-springs.

LARCH, ALPINE. *Larix Lyallii* Parl.

British Columbia, N.W. United States.

Light reddish-brown in colour, this wood is coarse-grained, hard, and heavy. Suitable for mining purposes.

LARCH, SIBERIAN. *Larix sibirica*
L. dahurica.

Siberia.

A steady importation of larch, described as Archangel, began about thirty years ago, and continued in a more or less irregular manner until the war. The wood was imported in logs, round and hewn square, and deals and planks, generally only in sizes of 3 inches by 9 inches and 3 inches by 11 inches, and the import is now continued under the name of Siberian larch instead of Archangel. This is probably due to the fact that in earlier days it was shipped from the White Sea, while latterly shipments were from the Kara Sea. These consist now of all sizes of boards, battens, deals, and scantlings. The grading of qualities is similar to-day to that which was originally adopted in regard to the red wood shipped from Archangel, and the prices generally ruling for larch are on a slightly higher level. The colour and grain are similar to the product of the Archangel pine (*Pinus sylvestris*) but a little redder, and the wood is very much heavier, harder, and stronger, and provides a first-class constructional timber which ought to be in great demand. There is hardly any data upon which to base the durability of Siberian larch, but there is reason to believe that it has a good record.

Elwes mentions a report from Morgan Gellibrand & Company that " all the lighters at Onega were built of larch timbers, which lasted a very long time," and that when " an old house at Archangel, which had been built on a foundation of larch logs, was pulled down, they were found to be quite sound after . . . possibly a hundred years." He also quotes Messrs. Pearson & Sons, who " used a large quantity of larch deals for their block moulds . . . and the wood has given entire satisfaction."

LARCH, WESTERN. *Larix occidentalis* Nutt.

Weight 34–42 lbs. (Baterden). British Columbia, N.W. United States.

Elwes, quoting Sargent, says: "Western larch surpasses that of all other American conifers in hardness and strength; it is very durable, beautifully coloured, and free from knots; it is adapted to all sorts of construction, and beautiful furniture can be made from it." He also states that until its old name of "tamarack" was changed to that of "western larch" the timber was little esteemed, but now it is extensively exported; the coarse grades are used for heavy constructional work, railway ties, etc., and the finer sawn into planks for flooring and other indoor finish, panelling, mouldings, cabinet-making. "Little inferior to oak in strength and durability" (Baterden).

LAUAN. Source unknown.

Weight 41 lbs. Philippine Islands.

It is difficult to give a reliable account of the woods, which have been known in commerce since 1920, called by this name. Foxworthy speaks of "White Lauan," "Almon," and "Red Lauan," giving the name of "Meranti" as "all the product of several species of *Shorea*, or of *Parashorea plicata* and *Pentacme contorta*, and possibly of *Hopea*." The activities of American lumbermen and others in the Philippine Islands during the last few years have produced very large quantities of timbers varying somewhat in quality and appearance, all of which may have been collected from the supplies included under the name of lauan. This timber has been shipped to America, Australia, Europe, and elsewhere. Various names have been employed, such as "Lauan," "Red Lauan," "White Lauan," "Apitong," "Bagac," "Philippine Mahogany," "Bagtikan," etc., and while the appearance and quality of the different shipments have varied, even in some respects in actual characteristics, there has been no great departure from the original authoritative specimen, the variation having been more in hardness or softness and colour. Father Gaspard de St. Augustine says, in his manuscript History of the Philippine Islands, that the outside planks of the old Manilla and Acapulco galleons were of lauan wood, and that it was chosen because it does not splinter with shot.

The timber varies from a light yellow colour to a brown-red or brown, with a fairly close grain, rather stringy, working only fairly well under machine or hand tool, without the necessary strength for mortice and tongue, so that it provides a substitute for only the lowest qualities of mahogany. A prolonged dispute has been carried on in America because of its introduction under the name of "Philippine mahogany." After a

long argument, and following apparently the decision by the Circuit Court of Appeals disallowing the term Mahogany, this decision was reversed and it has now been agreed that the trade name of " Philippine mahogany " may be used (1932).

A considerable quantity has been consumed in the United Kingdom in works of secondary importance, for linings and shelves of cabinets, and for various fittings where the wood is not seen prominently, but it does not command favour.

The concentric layers are clearly defined, pores very numerous, largely plugged, single and in duplicate. The medullary rays irregular, crossed at right angles at irregular intervals by similar faint white lines. While the medullary rays do not show in a very pronounced manner on the transverse section, they show very strongly in marked flakes on the radial.

LAUREL, COMMON. *Prunus Laurocerasus* L.

Asia, Europe.

This shrub, also known as " cherry laurel," had spread all over Europe at a very early date, and according to Evelyn was introduced into England in 1614. The colour of the wood is a pinkish-white, with a hard, rough grain.

The medullary rays showing very fine, like tiny beech grain.

LAURELWOOD. *Terminalia tomentosa* W. & A.

Weight 48–74 lbs. (Gamble). Throughout India and Burma.

VERN—*Saj, sein, sain, asan, assain, assaina, asna, sadri,* Hind.—*Piasal, usan,* Beng—*Jhau,* Rajbanshi—*Amari,* Ass—*Taksor,* Lepcha—*Sahâju, kala sahâju,* Uriya—*Athna, sadra, sadara, sadora, ain,* Berar—*Barsaj,* Bijeragogarh—*Karra marda, karú marúthú, anemúi,* Tam.—*Maddi, nalla maddi, nella-madu,* Tel.—*Matti, kari matti, banapu,* Kan—*Thembavu,* Mal.—*Sadri, hadri,* Guz.—*Murada, kali maruthai,* Arcot—*Karkaya, sadora, holda, dudi maddi,* Hyderabad—*Ain, madat, yén,* Mar.—*Saja,* Baigas—*Maru,* Gondi—*Madge,* Bhil—*Atana,* Sonthal—*Maddi,* Reddi—*Chouchong,* Taleing—*Taukkyan,* Burm.

This wood varies in colour from a yellowish-brown through all stages to a rich warm brown, with dark streaks; it is handsomely marked, and produces all kinds of figure, including stripy or straight roe, broken roe and mottle, generally resembling European walnut but more strongly figured, with a hard, close, firm, dense grain. The tree is distributed over a very wide area, covering almost all parts of India and Burma; the plainer wood, and lighter in colour, coming from Bengal and Northern India, while the best figured wood is practically limited to supplies from Southern India. Burma provides a fair proportion of slightly figured wood, and some with good figure, but generally the logs are of a very

faulty character, especially in the heart-wood of every tree, which is very shaky and defective.

A few logs hewn square and sometimes in the round were seen in the London market upwards of twenty-five years before the war, but they caused little notice, and the very beautiful qualities which the wood possesses remained undiscovered. About the year 1903 a shipment which arrived here was sent to New York, when the enterprise and knowledge of those concerned brought the wood into prominent notice. The figured logs were sawn or knife-cut into veneers, and the plainer logs into lumber. Some very high-class decorative woodwork was provided, particularly in Pullman cars on the railways, where the plain wood was utilised for framing and mouldings, and some very handsomely figured wood for the panels. There was little further development until in London at the Holland Park Exhibition in 1920, when laurelwood was again shown to great advantage, and in 1924 at the great Wembley Exhibition some magnificent work was shown, in which the wood was displayed with great effect, and resulted in its general acceptance as one of the finest of all decorative woods.

Among the outstanding works is the very large panelling in the voting lobbies at the London County Hall. The library in the late offices of the High Commissioner for India, in Grosvenor Gardens, was panelled with this splendid wood. The large committee-room of the new India House is trimmed throughout with laurelwood, and the immense committee-table shows a fine selection of mottled wood, while the large panels in this room present the appearance of " walnut " marble ; the small committee-room adjoining is panelled with a different class of the finest splash mottle figure. The whole of the ground floor of Messrs. Glynn Mills' Bank in Whitehall is furnished in this wood. Another outstanding work is that of one of the rooms in the new Melchett building at Westminster, where large-sized doors, finishing over 2 inches in thickness, have been provided in solid wood, and found to stand as well as any other hardwood, without warping, shrinking, or twisting.

It is very strong and durable, and is especially suitable for chair-making. Some chairs copied from original Sheraton patterns were shown at the 1920 Exhibition, which are in perfectly sound and good condition now (1931), the colour and figure having much improved with exposure to light and air.

The general objections to the use of a very hard wood have been freely circulated, and undoubtedly laurelwood is hard to work and wasteful in conversion ; but it has been demonstrated that modern machinery and methods of working have overcome the one difficulty, and although laurelwood is somewhat wasteful, it is not more so than is the case with many other beautiful, high-class, figured woods.

The pores are not numerous, open and surrounded by a light ring of

soft tissue, mostly connected in wavy belts by the same kind of light marking. The medullary rays are very indistinct even under the lens, and very fine and numerous, crossed at right angles at irregular intervals with similar light lines, which connect the pores.

LAURUSTINUS. *Viburnum Tinus* Linn.

The Mediterranean region.

The wood is a pinkish-white colour, with a close grain, very hard and heavy, like Venezuelan boxwood.

The pores are small and numerous, the medullary rays showing in tiny flecks on the radial section.

LEZA WOOD. *Lagerstroemia tomentosa* Presl.

Weight 50 lbs. (Troup). India, Burma.

VERN—*Lèza*, Burm.

The wood is of a grey-brown straw colour, with a fine, close grain, equalling the Mexican prima vera, and not unlike it in appearance. It is capable of a very smooth surface from the tool, and is an admirable decorative wood for high-class work. Gamble reports it as valuable for boats and spar-handles; it is also used for canoes and cart-wheels, but would provide a far better decorative furniture wood than the teak which is commonly used throughout Burma.

Pearson and Brown, in *Commercial Timbers of India*, refer to this timber as closely approaching that of *L. Flos-Reginae*; but in this opinion, as also in the suggestion that it should be tested for golf sticks, I am not in agreement.

The pores are regular and small, connected by a network of short, fine, light concentric bands. The medullary rays are exceedingly fine and numerous, parallel and equidistant, and show in a kind of fine ripple ray on the radial and tangential sections.

Li-ch'ai.

China.

Professor Record identifies this as *Liquidambar* sp., which American-produced wood it much resembles, but with a greyer colour and a harder grain. Like the American wood it is very liable to warp and twist unduly, which characteristic is noticeable in Professor Chung's four-inch-wide specimen. The surface is covered with minute specks of brightly shining gum.

The minute pores are very numerous and regularly placed. The medullary rays are obscure, but show on the radial section in tiny flecks.

LIGNUM-VITAE. *Guaiacum officinale* Linn,
G. sanctum Linn.

Weight 88 lbs. 9 oz. The West Indies, Central America.

VERN—*Lignum-vitae*, U.S., general trade—*Guaiacum-wood*, Eng.—*Holy wood, wood of life, Indian wood*, Lit —*Guayacan, guaiacan, guajacan*, Span.—*Lignum sanctum, guayacan blanco, hoaxacan*, P.R.—*Guayacan negro, guayacan prieto, palo santo*, Cuba—*Gayac jaune vert*, Mart.—*Bois de gaiac, bois de gayac, bois sant*, Fr.—*Pockholz, guaiacholz, guajak, guajakholz, franzosenholz, lignum sanctumholz*, Germ.—*Guaiaco nero, legno santo, legno benedetto, legno di guaicao*, Ital.—*Pokhout*, Dutch—*Guaiaco*, Port —*Congo cypress*, Brush-back trade, local.

According to Record, at least six species are recognised by botanists, but very little reliable information is available regarding their respective ranges. There are two species in the West Indies, namely, *G. officinale* L. and *G. sanctum* L. The best quality is that from San Domingo, which ranges in lengths of 12 to 18 feet and 8 to 12 inches in diameter.

In an exhaustive article by Record on *Lignum-vitae*, published in 1921, the latest information available regarding this wood can be found. He tells us that Oviedo in 1514 mentions the name of " guayacan " as a native tree ; also that lignum-vitae has been an article of trade since 1508, when it was supposed to contain marvellous medicinal qualities, but that it is now little employed in medicine.

The lignum-vitae received from San Domingo is that which contains the largest sap-ring. It has been customary to divide all the shipments into two sorts, these being described respectively as " thick sap " and " thin sap." In the former the sap-rings vary from anything between one inch to more than two-thirds of the tree, but in the latter generally from not more than half an inch to an inch. The heart-wood is of a greenish-black colour, and, upon being exposed to light and air, grows darker. The sap-wood is a bright light yellow, in colour very similar to East Indian satinwood. Lignum-vitae is one of the hardest and heaviest of timbers ; it is also one of the most useful, and for a great many purposes it has been found impossible to produce a substitute. The maintenance of a sufficient store of supply may indeed be said to be a question of national importance, for during the war the great demand practically exhausted all the available supplies. There is nothing equal to it for making sheaves for blocks, and when employed in this way it wears well and seems almost imperishable. Laslett said that he had examined some sheaves after they had been in use for fifty to seventy years, and found them perfectly good and fit for further service.

Perhaps the most important of the many uses to which it is put is for the bushing of the stern-tubes for propeller shafts in all, even the largest ships. In a private note Mr. S. Woodrow says : " Lignum-vitae

has been found by long experience to be the best material for this purpose, as, owing to the silky nature of the wood, and the oil contained in it acting in conjunction with the water, a natural lubricant is formed." The life of the material when used in this manner is extraordinary, and varies from three to seven years, the shortest period being the life of the wood for a fast ship like the *Mauretania*. It is also used for making bowls, for which purpose no other wood is so suitable, and for the packings between saws in machine-saw frames.

Holtzapffel says that " when first cut it is soft and easily worked, but it becomes much harder on exposure to the air. The wood is cross-grained, covered with a smooth yellow sap-like box, almost as hard as the wood, which is of a dull brownish-green, and contains a large quantity of the gum guaiacum, which is extracted for the purposes of medicine. . . . The fibrous structure of this wood is very remarkable ; the fibres cross each other sometimes as obliquely as at an angle of 30 degrees with the axis, as if one group of the annual layers wound to the right, the next to the left, and so on, but without much apparent exactitude."

In the Museum at Kew there is a remarkable specimen of a piece which was taken from a parcel, the whole of which, consisting of many tons, was attacked by a form of rot which spread from the centre to the circumference along the medullary rays in a continuation of perforations, and appeared as though attacked by a worm. The whole parcel was rendered valueless by this extraordinary condition of decay, strangely confined to the heart-wood and stopping abruptly short of the sap-wood, which was apparently quite unaffected. Professor Record says this serious defect of heart rot occurs in the growing tree, but the wood is durable after the tree is felled.

Strange to relate, lignum-vitae must have found its way into England in the early days of the seventeenth century. According to *Domestic Utensils of Wood*, by Owen Evans-Thomas, just published (1932), wassail-bowls dated *circa* 1640 were made of lignum-vitae, and apparently a great many specimens of early seventeenth-century work can be produced in this wood. Almost everything prior to that date seems to have been turned from British-grown pear tree, maple, sycamore, beech, etc.

Lignum-vitae was used in the form of marquetry for the decoration of a Dutch table of the late seventeenth century, which is to be seen in the South Kensington Museum.

The pores are exceedingly small and scarce. The medullary rays are hardly visible with the aid of the lens (+12). My specimen displays, on the transverse grain extending at right angles to the concentric layers, a very pretty marking which has an effect like moiré silk. Nothing can be seen under the lens to explain this appearance.

LILAC, CALIFORNIA. *Ceathus thyrsiflorus.*

California.

Also known as "blue myrtle." This is an uninteresting straw-coloured wood with a pink tinge, and a rather coarse grain, not comparable with the common lilac *Syringa vulgaris.*

The concentric layers are clearly marked by light, broad lines, with prominent open pores in a single line of concentric growth ; in later growth there are numerous exceedingly fine pores in short wavy belts. Very numerous, very fine medullary rays, which do not show on the radial section.

LILAC TREE. *Syringa vulgaris* Linn.

The British Isles.

The colour varies from a pale yellow to a darker tint of yellowish-salmon, with faint stripes resembling a bleached Brazilian tulip-wood, with a firm, hard grain capable of taking an exceedingly smooth surface. It is possible that the lighter or darker colour of the wood follows the colour of the lighter or darker flower. For delicate cabinet work or inlays it would be comparable with tulip-wood or king-wood.

The late Mr. E. N. Kent, of Letchmore Heath, had an auctioneer's or chairman's table hammer made from a lilac tree grown in his grounds, which proved to be as strong and useful as any made of lignum-vitae. A piece taken from a tree grown in West Sussex yielded up to a 6-inch width, which while lighter in colour is still very attractive.

The concentric layers are marked by dark lines. The innumerable minute pores are plugged, with very numerous clearly defined medullary rays showing on the radial section in tiny flecks.

LIME. *Tilia cordata* Miller.

Weight 37 lbs. 8 oz. Europe.

" The wood is very light-coloured, fine and close in the grain, and when properly seasoned it is not liable to split or warp. It is nearly or quite as soft as deal, and is used in the construction of pianofortes, harps, and other musical instruments, and for the cutting boards for curriers, shoemakers, etc., as it does not draw or bias the knife in any direction of the grain, nor injure its edges ; it turns very cleanly " (Holtzapffel).

Lime-wood is well suited for carving ; its smooth and even texture makes it a good medium for this art. A fine example may be seen in the Victoria and Albert Museum, South Kensington, where there are two beautifully carved oval plaques of the period of Henri IV., of the late sixteenth or early seventeenth century. Mr. Haycock, of the L.M.S. Railway Works, reports that he has used lime-wood very largely for artificial limbs, with great success.

A thin, light concentric band may or may not mark the annual layer of growth. The pores are very small and obscure. The numerous parallel medullary rays are fine and are clearly marked.

Limonia acidissima Linn.

Weight 61 lbs. (Pearson & Brown). India, Burma.

VERN—*Beli*, Hind.—*Tor-elaga*, Tel.—*Kawat*, Mar.—*Bharassi*, Jeypore—*Keiri, kari*, Merwara—*Belsian*, Palamow—*Bhenta*, Uriya—*Naibela*, Kan.—*Thihaza, thanatka*, Burm.

Pearson and Brown, in *Commercial Timbers of India*, report that this wood is " light lemon-yellow when first exposed, turning light brownish-yellow with age . . . hard, straight-grained, even and very fine-textured. . . . Reported to be very durable and immune to insects and fungus attack (J. W. Nicholson). . . . Tested for turnery."

Litsaea chinensis Lamk.

Weight 45–48 lbs. (Gamble). India, Burma, Ceylon, Malaya, China, Australia.

VERN—*Maida lakri, meda lakri, gwá, rián, chandra, gar bijaur, singrauf*, Pb., N.W. Prov.—*Medh*, Oudh—*Churo, kathula*, Kumaon—*Katmara, shingran*, Garhwal—*Garoli*, Dotial—*Kukur chita*, Beng.—*Suppatnyok*, Lepcha—*Maida lakri*, Mar.—*Katakamma*, Reddi—*Narra alagi*, Tel.—*Elumpurukki*, Tam.—*Bomi, bombi*, Cingh—*Ôndôn*, Burm

Pearson and Brown, in *Commercial Timbers of India*, remark that *L. sebifera* Pers. is a synonym of the above species.

The colour of the wood is a light brick-red, with a close grain yielding a smooth surface from the tool, and not hard. Gamble reports it as durable and not attacked by insects, and Foxworthy as " nearly indestructible," a description which is not justified on examination of the specimen itself. It is not suitable for export.

The concentric layers of growth are marked by dark, obscure, irregular rings. The minute, plugged pores are rather scarce, and arranged in duplicate and in small irregular belts, with very fine medullary rays, hardly discernible under the lens.

Litsaea Gardneri Thw.

Ceylon.

A yellowish, straw-coloured, fairly hard wood with a straight grain. More information about this wood is required, as it should be useful for many purposes in its native country, although not of sufficient interest for export.

The pores are numerous, very small, mostly plugged. Medullary rays

obscure, very fine, crossed at right angles by tiny light lines making a network pattern.

Litsaea zeylanica C. & Fr. Nees.

Weight 54 lbs. Ceylon.

VERN—*Kanvel, chirchira,* Mar.—*Bodeda,* Saura—*Akupatrikam,* Tel—*Belori,* Badaga—*Vayana,* Mal—*Dawul-kurundu, kudu-dawula,* Cingh.

The wood has an agreeable silver-grey colour resembling that of harewood, with a close, firm grain, yielding a smooth surface from the tool. Being an attractive wood, it should meet with a ready demand if it could be supplied in market sizes free from defect; suitable for inlay, turnery, or any decorative woodwork of a superior character.

The concentric layers of growth are marked by dark rings; very numerous, minute pores, plugged. Medullary rays exceedingly fine, and not showing on the transverse section.

LOCUS WOOD.

See ANGELIQUE, *Dicorynia paraensis* Bth.

LOCUST WOOD.

See TEAK, SURINAM, *Hymenaea Courbaril.*

LOGWOOD. *Haematoxylon campechianum* Linn.

Weight 50–60 lbs. Central America.

VERN—*Logwood, campeachy* or *campechy wood, campetch, peach-wood, poach-wood, blackwood, blockwood,* Eng.—*Campecheholz, Campeschenholz, blauholz, blutholz, allerheiligenholz, blankholz,* Germ.—*Bois noir, bois bleu, bois de Campêche, bois de sang, bois sanglant, bois de la Jamaique, bois de Nicaragua, campêche, campêche carmen, campêche rouge, cœur rouge,* Fr.—*Campeggio, legno di campeggio, legno azzurro, legno nero,* Ital.—*Palo de Campeche, palo de sangre, palo azul, palo de tinta, tinto,* Span.—*Pao sanguinho,* Port.

Record reports it as a strong, rather brittle, highly durable wood, finishing smoothly and taking a high polish. It is better known in commerce as a dyewood and not useful as timber.

Longan-ch'ai. Source unknown.

China.

Professor Chung identifies this as *Euphoria longana.* The wood is extremely hard, close-grained, resembling apple, but darker in colour.

The pores are very small, generally open, a few plugged. The medullary rays are almost indistinguishable under the lens (+10).

LONG JACK. *Flindersia Oxyleyana.*
Weight 46 lbs. (Baker). N.S. Wales, Queensland.

Known as yellow-wood ash in Queensland. The grain is close, firm, and hard, with a good bottom, and the colour that of a West Indian satinwood, which wood it resembles, so that in finished work it might be mistaken for it, although a little duller in colour and less satiny. Layers of concentric growth are strongly marked on the transverse section. Baker calls it she-teak and refers to it as "being close in grain, somewhat similar to American Ash, tough or leathery to work, polishes well." A strange description, as the wood is quite unlike either teak or ash, either in colour, texture, or anything else.

Lophopetalum fimbriatum Wight.
Weight 34 lbs. (Pearson & Brown). India.

Pearson and Brown, in *Commercial Timbers of India*, state that the colour is "uniform pale yellow to light pinkish- or brownish-grey with a faint yellowish cast, with inconspicuous light brown streaks or mottled with light brown on the tangential surface . . . somewhat lustrous . . . straight-grained, medium- and even-textured. . . . Not durable in the open or in contact with the ground. Under cover it is durable and keeps its colour. . . . The Manager of the Radharani Saw Mills states that during the war he supplied this timber to be tested for aeroplane frames and that it was favourably reported on by the authorities. Not an ornamental timber, but a fine, clean board wood, suitable for all general carpentry purposes."

Lophopetalum Wightianum Arn.
Weight 28–29 lbs. (Gamble). India.
VERN—*Balpalé*, Kan.—*Vengalkattei*, Tam.—*Vengkotta, karuka*, Mal.—*Vengkadavan*, Trav. Hills.

The wood is of a pale straw colour, with a fine, close grain, similar to that of a hard Honduras mahogany. It is a valuable furniture wood, but without any particular characteristic; suitable for linings, backings, or other fine cabinet work where close-grained, reliable wood is needed.

The pores are very variable in size, open, irregular in position, giving an appearance of having been made by some insect. The medullary rays are of the finest possible character, very numerous and close, and crossed at right angles, at very irregular intervals, by fine chains of light, wavy bands.

LOSONIA. ? *Dysoxylum* sp.
Weight 40 lbs. India, Burma.

A shipment was made for the 1920 Holland Park Exhibition from Bengal under the name of losonia, which Mr. S. K. Dutton thinks is

Dysoxylum procerum or *D. binectariferum*. He gives the Nepali vernacular as " lahasune." Although there is some resemblance between the wood of losonia and aukchinza, the structure is different, and either Burma aukchinza or Bengal losonia is probably attributed to the wrong source. The wood closely resembles that of poon (*Calophyllum tomentosum*).

The colour of losonia is a dull lightish-red, with a nice grain which works well under the tool, stands well in all positions, and is a useful substitute for mahogany.

The concentric layers are marked by thin, dark lines at irregular intervals, the pores from small to medium size, scarce, joined by extremely fine white lines, making an attractive pattern. The very fine medullary rays are very close together and irregular.

LOURO.

See *Cordia* sp.

LOURO VERMELHO.

Brazil.

The colour of the wood is yellow with a tinge of green, much resembling the wood of louro, *Cordia frondeus* (*q.v.*), but with marked contrary layers of hard and soft grain. Record reports: " The commonest and most generally used ' louro ' seems to be the ' vermelho,' *Ocotea* sp., which is well suited for lumber. . . . The wood is easily worked, and although it is considerably heavier than the cedro (*Cedrela*), which it somewhat resembles, it is used for many of the same purposes as that wood and is much cheaper." Some confusion exists in this as in many other cases of South American woods.

The resemblance between the specimens marked louro vermelho and those marked louro and louro cheirozo is considerable, while at the same time the two latter are attributed to *Cordia*, and the former to *Ocotea*. The fragrant scent which is indispensable in nearly all the Cordias, and which is possessed by the two specimens of louro marked Cordia, is entirely absent in that marked louro vermelho.

The very scarce pores are irregular in position, rather large, sometimes plugged, with irregular but pronounced medullary rays.

LUMBAYAO. *Tarrietia javanica* Bl.

Weight 36 lbs. Java, Cochin-China, The Philippines.

This timber was imported into London and Liverpool in 1914 in sawn planks from 10 to 25 feet long, 8 to 14 inches wide, and 1 to 6 inches thick. It is of a light reddish-brown colour, with open pores showing the medullary rays on the surface, as in the plane tree: they are well-defined on the transverse grain. Otherwise the appearance and texture

is similar to that of East India cedar (*Cedrela*), but it is without any aromatic scent. It is straight-grained and easily worked, but it appears liable to warp and twist, and can only be used as a substitute for cheap mahogany or cedar.

The pores are not very numerous, very large, and open. Medullary rays hardly discernible under the lens, but showing on the radial section in tiny flecks.

Machilus Blumeai. Hay.

Weight 39 lbs. Formosa.

The wood is of a light brick-red colour, and in this, as well as in its grain and general character, it resembles the plainer and commoner descriptions of mahoganies from the southern districts of America. The grain is firm and straight, and a very smooth surface can be obtained, though the wood shows a liability to warp.

The concentric layers are clearly defined. The pores are exceedingly numerous, small, and even-sized. The medullary rays are very fine and sharp, and are parallel. They are joined at right angles by a great number of similar lines, which vary greatly in size and strength.

Machilus edulis King.

Weight 39–44 lbs. (Gamble). India, Himalaya.

VERN—*Dudri, lepchaphal, lepchakawala,* Nep —*Phani,* Lepcha

A very attractive wood with a silver-grey colour, similar to that of black chuglam, capable of a fairly smooth surface from the tool, but not silky ; it is likely to contain all kinds of figure as well as mottle. The attractive colour would lend itself admirably to any decorative woodwork. A specimen shipment was sent over for the 1920 Holland Park Exhibition, but no development has taken place since, and the wood has not been met with in ordinary commerce, although it has been used in India for planking, tea-boxes, etc.

The concentric layers are marked by dark rings ; the numerous pores are very small and mostly plugged, with extremely fine medullary rays, numerous, parallel, and generally equidistant.

Machilus Gammieana King.

Weight 35 lbs. (Pearson & Brown). India.

VERN—*Machilus—Lali, jagrikat,* Nepal—*Phamlet,* Lepcha

Pearson and Brown, in *Commercial Timbers of India,* report this wood as being " pale yellowish or roseate-grey when first exposed, ageing to light grey or pinkish-grey, passing over into pale red or pinkish-brown towards the centre of the tree, occasionally with darker streaks . . .

straight-grained, fine and even-textured. . . . Very durable. . . . A sound construction timber."

Machilus macrantha Nees.

Weight 36–37 lbs. Southern India, Ceylon.

VERN—*Kurma*, Kan —*Gulum*, Mar —*Kolla mávu*, Tam.—*Urávu*, Mal —*Ana kuru*, Trav. Hills—*Kromé*, Badaga—*Iruli*, Kader—*Ululu*, Cingh.

The colour is a light greyish-brown, with a slightly lustrous surface and a rather coarse, rough grain, yielding a rough surface from the tool. This wood was reported by Gamble as of an orange-brown colour, which does not agree with my authentic sample of *Machilus macrantha*. It is reported as being used for building and for boats, but if regular supplies could be provided it would meet with a welcome reception here as a fine panelling and cabinet wood.

The concentric layers of growth are marked by dull light lines. The rather small-sized pores, plugged, are arranged in wavy belts ; medullary rays faint and somewhat sparse, irregular in position, not showing on the radial section.

Machilus odoratissima Nees.

Weight 39–42 lbs. (Gamble). India, Himalayas, Burma.

VERN—*Dalchini, mith-patta, prora, badror, leddil*, Pb.—*Kawala*, Hind.—*Seiknangyi*, Burm

The wood is a brown-red colour, darkening on exposure, with a close grain, similar to that of Cuba mahogany, which timber it resembles in many respects. It is used in Burma for building, etc. The layers of growth are marked by rather wide, dark bands. The rather numerous pores, partly open and partly plugged, are formed in short belts or bands. Medullary rays are pronounced, irregular, and uneven in position.

MADRE CACAO. *Gliricidium sepium* Jacq.

Weight 77–79 lbs. The Philippines, Honduras, Central and Tropical America.

VERN—*Madrial, cacagua*

This is a very strong, hard, dense, heavy wood of a dark reddish-yellow colour, and a surface something like that of the palm caryota, but a different colour. It takes a high polish and is durable. Being subject to attacks by a boring worm (beetle), local discoloration occurs ; nevertheless it has valuable qualities and should be tried for works such as violin necks, bows, etc., or turnery.

In *Timbers of Tropical America* Record gives the vernacular *madre cacao* as produced by *Erythrina crista-galli* L., and describes the colour

as " yellowish-white ; subject to blue-stain," and mentions in connection with it the names " coral tree " and " red bean tree " in Jamaica. My specimen from Honduras somewhat resembles the Australian black bean, but of a very red colour.

In reply to a question, Professor Record says : " The name (madre cacao) is likely to be applied to any tree used for shade in cacao plantations, but in British Honduras, Guatemala, and the Republic of Honduras it generally refers to *Gliricidium sepium*. This is a low-branching leguminous tree, of about the shape of an apple tree. It loses its leaves during the winter and is then covered with a great mass of light pink flowers. The trees are frequently used for live fence-posts, and an avenue of them in blossom is a gorgeous sight. The greenish wood is hard, heavy, tough, strong, and durable, but available only in small sizes. . . . When I published *Timbers of Tropical America* in 1924, very little was known about the identities of Honduras trees and I have since then made a special effort to straighten them out."

The somewhat scarce, very small pores are arranged in belts, and plugged. The extremely fine medullary rays are parallel and nearly equidistant.

MADRONA. *Arbutus Menziesii* Pursh.
A. Xalapensis H. B. K.
A. arizonica Sarg.
North America.

The " strawberry tree " known in Great Britain is reputed to be *Arbutus unedo*. There does not appear to be any difference between the wood of the madronas and that of the strawberry tree ; it is probable that the different sorts have become confused.

For full description see *Arbutus unedo*.

MAGNOLIA. *Magnolia acuminata* Linn.
Weight 36 lbs. 6 oz. North America.

Very large supplies, in sawn lumber, boards, and planks, have been imported into the United Kingdom and found a ready market for many years past (1931).

The wood is of a light straw colour, often with dark, almost purple streaks or stains like American poplar (*Liriodendron tulipifera*), but harder and closer in the grain, which lends itself as a useful medium for sharp angles or for mouldings, etc. A very valuable and useful wood, requiring selection if uniformity in colour is requisite.

The tree, a native of America, was introduced into England in 1736 by Peter Collinson, an arboriculturist of Mill Hill.

W. G. Evans & Co. report that, having used magnolia for the internal

construction of a pianoforte, the top side was stained with a brown stain to match the walnut, and it was found that the colour penetrated through to the under side of a piece of wood one-quarter inch thick. Micro-photographs were taken revealing pores which penetrated through the tangential surface in a horizontal direction towards the growth of the tree, as well as in the perpendicular growth as usual. Similar experiments with Indian balsa, English ash, Honduras mahogany, silver walnut, and birch failed to show any similar pores.

The pores are very small and indistinct, the concentric layers clearly defined, and the fine medullary rays sharp and distinct.

Magnolia Campbellii Hook.

Weight 25 lbs. (Gamble). India, Himalaya.

VERN—*Lal champ*, Nep—*Sigumgrip, sagok, penré*, Lepcha—*Pendder, patagari*, Bhutia.

This wood has a firm, close and compact, lustrous grain, capable of a smooth surface from the tool. When first cut it is yellowish-white, but exposure to air turns it to a lustrous mole colour.

A beautiful wood for presenting a unique colour in panelling.

MAHOE, BLUE. *Hibiscus elatus* Sw.

Weight 48 lbs. Cuba, Central America.

VERN—*Blue mahoe, mountain mahoe, maltese wood, blue mahogany*, Trade—*Majagua, majagua común, majagua blanca, majagua azul, majagua de la maestra*, Cuba—*Emajagua, emajagua excelsa, majagua, mahagua*, P R.—*Tall hibiscus, grand mahot, bois de luege*, Barb—*Tulip tree*

This timber is imported in the form of logs, both hewn square and round, from 8 to 20 feet long, and about 10 to 20 inches square. The supply is small and intermittent. The wood is of a pronounced and pleasing grey-blue colour, sometimes having dark blue streaks, with a close texture and grain. It has an agreeable aromatic scent, and when worked the wood has a transparent, lustrous appearance. It is strong, flexible, and elastic, and "does not corrode nails" (Leman, *Hortus Jamaicensis*). Weisner says that it has all the character of the best European ash, but is more durable and longer in the fibre.

It is surprising that such a beautiful wood should never have been used for decorative work. It combines quality of surface with a very artistic colour, and a room decorated with it would have the same appearance in shade as genuine harewood (not the artificially coloured so-called harewood), and would be much more lasting and require less delicate treatment; also it might be used for inlay work, and would be excellent for billiard cues. This wood is very durable when exposed to weather,

or in contact with the ground, under both of which conditions it seems to harden and improve. Blue mahoe has also been used for fishing-rods, and there is reason to suppose that it has sometimes been passed off in veneers as " green ebony."

The pores are irregular and rather scarce, and are partially plugged with a bright-shining gum. The medullary rays are very clear and distinct, parallel, and nearly equidistant.

MAHOGANY. *Swietenia* spp.

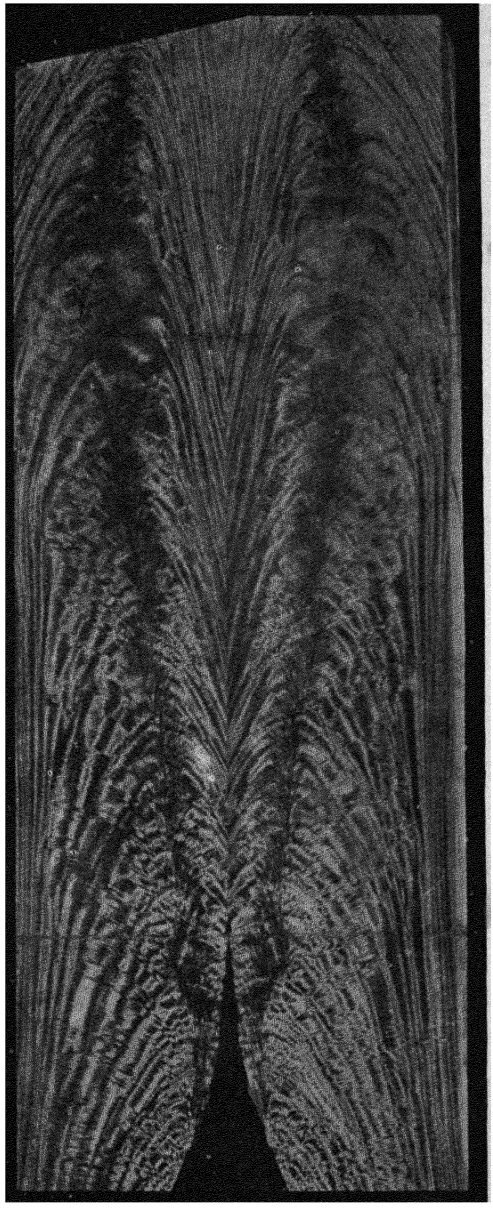
Central America, The West Indies, West Africa.

VERN—*Mahogany, Spanish mahogany, Cuban, St. Jago, Santo Domingo, Honduras, Tobasco, Nicaragua, Mexican,* etc., *mahogany,* Eng., Trade—*Caoba,* Span —*Acajou,* Fr.—*Mahoganiholz, acajouholz, echtes mahogani,* Germ —*Mogano, acagiu,* Ital.—*Mogno, acaju, anacardo da America,* Port —*Mahok,* Dutch—*Caoba monde, cedro carmesi, magnolia* ? Col.—*Caoba blanca, cedro cebello,* Pan.—*Yulu,* Nic.—*Caoba, cobano, flor de venadillo, gateado, palo zopilote, rosadillo, tzopilotl, venadillo, zopilote, z. colorado, z. negro, zopilotl, zopilocuahuitl, zopilo-zontecomacuahuitl* (*buzzard-head tree*), Mex.—*Madeira, madeira wood,* Fla , Bah —*Cedar, cedrela, redwood* (old names).

The name mahogany has been applied, properly and improperly, to many kinds of wood. In judging as to the legitimate use of the name it must be remembered that originally mahogany was obtained solely from the West Indies, and subsequently the mainland of America, and that it gained its unique reputation not only because of its decorative qualities, colour, figure, lustre, and capability of taking a high polish, but also because of its mechanical characteristics, which include relative hardness, remarkably slight shrinkage so that the wood stands well, and its considerable powers of repelling the attacks of beetles responsible for " worm-holes." Therefore, to give the name mahogany to other woods that are merely reminiscent of it, as regards colour and general appearance, is quite unjustifiable. Yet the name has been applied locally, or even more widely, to numbers of woods having little agreement with mahogany in appearance or properties : for instance, in Australia to the woods of several kinds of gum trees (*Eucalyptus*), including jarrah, and in the United States to even a common birch (*Betula lenta*).

The woods deserving the name of mahogany are now procured from Central America, the West Indies, and tropical West Africa. The American woods are said to be the products of a genus *Swietenia* which belongs to the family Meliaceae, which might be termed the mahogany family. The Swietenia trees themselves have leaves recalling ash or laburnum in design, though not in detail. The flowers, seed-cases, and seeds are also characteristic. The genuine African mahogany tree would be recognised as such by persons familiar with *Swietenia*, for in foliage,

flowers, seed-cases, and seeds, as well as in wood, they closely resemble the American trees. They belong to the same family, Meliaceae, and even to the same subdivision of that family, but to different genera, namely, in the main, *Khaya* and *Entandrophragma*. To distinguish between these genera and *Swietenia* requires the trained eye and experience of a botanist; indeed so close is the resemblance that the botanist first describing an African species of the *Entandrophragma* named it *Swietenia angolense*.

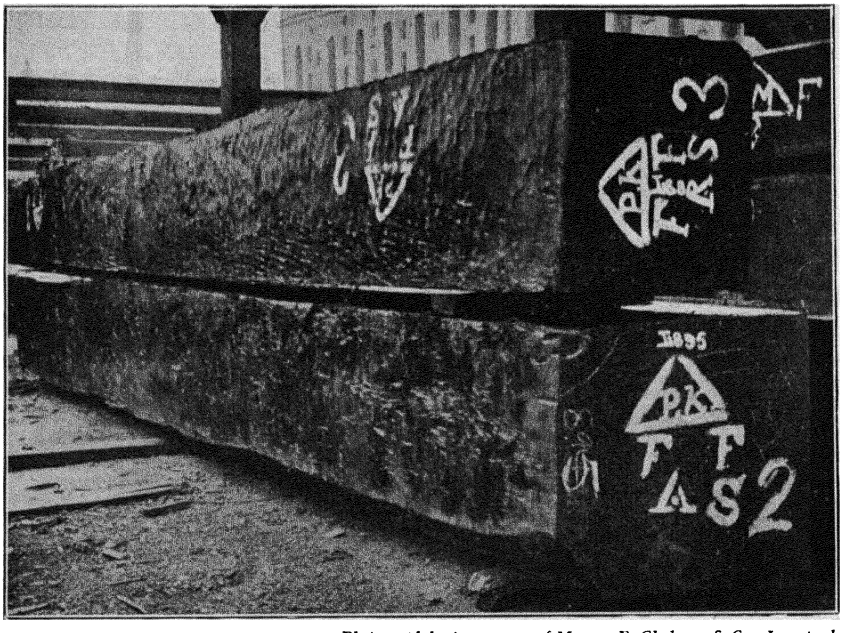


A VERY HANDSOME AFRICAN MAHOGANY CURL

The mahoganies of America differ among themselves, and from the African mahoganies, yet certain American and African kinds agree so closely that even experienced practical men find it difficult or impossible to distinguish between them. As a matter of fact, however, it is possible for the expert, especially when aided by a lens, to recognise the American or African source of any sample. So far, then, the woods of both continents are entitled to the name of mahogany.

Other genera of the same family, Meliaceae, provide woods more or less closely agreeing with mahogany, for instance: *Carapa* in Africa and America, *Dysoxylon Fraserianum*, the Australian mahogany or pencil cedar, *Soymida febrifuga*, the red-wood or mahogany of India. Other members

of the Meliaceae supply so-called mahoganies or cedar-wood: such are species of *Guarea* or *Pseudocedrela* in Africa (for instance, Sapeli mahogany is truly a scented cedar-wood derived from a *Pseudocedrela*).[1] The meliaceous *Cedrela* is the source of cedar-woods in tropical America and Asia, and in Australia. Farther removed from mahogany are still other woods yielded by members of the same family: namely, the Chittagong wood (*Chickrassia*) of India, and East Indian satinwood (*Chloroxylon*).



Photograph by permission of Messrs. E. Chaloner & Co., Liverpool

AFRICAN MAHOGANY. TWO FINE FIGURED LOGS

It is therefore evident that the woods of only certain members of the Meliaceae deserve the name mahogany.

MAHOGANY, AFRICAN.

Tropical Africa now supplies the greater part of the enormous quantity of mahogany which of late years has been imported into England. The wood was generally reported by the authorities to be produced by *Khaya Senegalensis* A. Juss., but Dr. J. Hutchinson of Kew, in *Tropical Woods*, No. 15, p. 24, says that this "is incorrect, as the timber of this species is not exported," the principal source being *Khaya ivorensis* A. Chev. It is a wood of such beautiful appearance and fine qualities that it has found a ready market, and has indeed been employed all over the civilised world. The total imports into Liverpool alone, during 1913, amounted to 64,579

[1] According to H. N. Thompson.

logs, out of which 33 million feet were sold in Liverpool; apart from this, 20,000-odd logs were transhipped. To this has to be added over 21,000 tons, approximately over 10 million feet, imported into London, making the total for London and Liverpool amount to over 43 million feet.

The increase to Liverpool is shown as follows:

	Million Feet		Million Feet
1894	9	1903	21
1897	13	1905	17
1900	18	1913	33

Of later years the export has very greatly diminished, partly due to direct shipments to U.S.A., but principally because of a great falling-off in supplies.

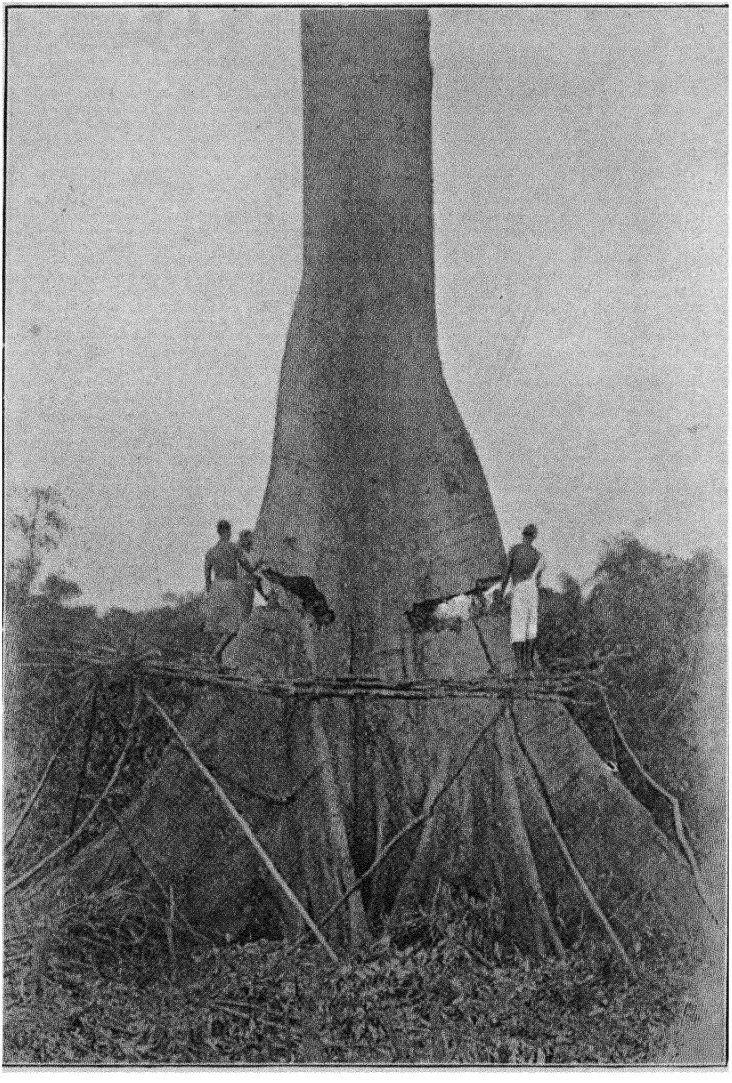
The figures for the last three years, to Liverpool and London, only amount to:

	Liverpool.		London
	Million Feet		Million Feet
1929	13	1929	4
1930	10	1930	4
1931	6	1931	2

Perhaps it is hardly realised from what a vast area these supplies are obtained. From Senegal to the present known limit in Angola, the timber is available throughout a country extending along a coast-line of approximately 5000 miles, and from nearly 10 degrees south of the equator to nearly 15 degrees north. Having this in mind, very much more emphasis should be laid upon the names of the districts whence the timber is obtained, and which to some extent indicate its character. No one would confuse, for instance, the produce of Honduras with that of Cuba. Yet in practice, in regard to African timber as far as the public is concerned, the supplies from this immense tract of country are grouped together under the one inclusive term of "African mahogany." In some specifications the terms "Lagos" or "Benin" are used, but in many more cases no such precise designation is found. Yet the distinction in character and quality is very great, and in tendering for a supply which merely stipulates "African mahogany," a wide field is open for conjecture as to what class, and how far down in the scale of quality, the buyer will accept.

One of the advantages of these African supplies is that they furnish an abundance of wood of greater length and width than any other kind of mahogany. The greatest fault is the prevalence of heart-shakes, cross-breaks, wind-shakes, thunder-shakes, which are the various names given to cross-fractures. These are liable to occur at intervals ranging from 6 inches apart to 10 feet, and extend across the longitudinal grain more or less extensively, so that actually in some cases the log has broken in half. In all cases these fractures mar the appearance and scope of the timber, and occasionally render it entirely valueless. Much speculation has arisen

as to the cause of this defect. Some have said that it is caused by lightning or thunder, hence one of the names ; but the general opinion is that it is caused by the swaying of the trees to and fro in the wind. I do not, how-



FELLING A LARGE BUTTRESSED MAHOGANY TREE IN WEST AFRICA

ever, agree with this theory, nor do I see how it can be sustained. In logs of close, firm texture from circumference to heart, the defect is little found, but in those trees where the heart-wood is soft and spongy, or, as it is termed in America, " punky," the cross-breaks abound. In these trees

the annual layers or rings are much closer and compact in later life, so that the portion of the tree which is likely to be cross-broken can often be very nearly estimated by the expert from the appearance of the butt, which will show approximately the point where the tree began to make slow growth. In such case the difference between the strength of the outer and inner layers must be very considerable. It seems, therefore, quite possible that in later life the inner portion dries up and shrinks, and, being bound in by the close, strong outer layers, a strain is caused which snaps the fibres of the soft and weaker parts. This theory is supported by an observation of other varieties, where the heart-wood is found to be more regular, and almost if not quite as strong and compact as the outer wood, and in which heart-breaks are rarely found. Whatever the reason may be, this fault has caused many a disappointment to the over-sanguine purchaser, who finds his £500 log stricken with this complaint. There is no doubt that the figured wood is more liable to this defect than the mild, straight-grained, plain logs.

The varieties known as "Sapeli" and "cherry" mahogany are not liable to soft hearts, as the character of the annual layers is uniform throughout the life of the tree, and in these kinds cross-breaks are rarely found.

It has now been seen that of the several varieties of mahoganies and other hardwoods shipped from the different ports on the West Coast, the larger proportion are offered and sold under the general term "African mahogany." Many of these are not true mahoganies, and others, though bearing some resemblance, yet vary to such an extent that the difference is easily recognisable. Those shipments which are recognised by the trade as being true mahogany are the varieties which are now to be described.

(The weights given are of my authentic specimens of dry wood.)

ASSINEE. Weight 28 lbs. 9 oz. Supplies of mahogany from Assinee are remarkable on account of the extraordinary number of finely figured trees which are obtained, many of which have realised almost fabulous prices. Except in this respect, the wood is not on the whole so satisfactory as the other kinds. In general character it is softer and lighter in weight, and the defect of cross-breaks is perhaps found in Assinee wood to the greatest extent of any, many large trees being entirely spoilt by this fault. There is a noticeable scarcity of mild, straight-grained wood, and a large proportion is of a poor colour.

The pores are less abundant and more scattered than in the Lagos wood, but in other respects it is similar.

AXIM. Weight 30 lbs. 1 oz.—This quality is rather mixed. A considerable proportion yields bright, excellently coloured wood of good texture, some of which is as fine as the best of any African mahogany,

while on the other hand there is a certain amount of defective, soft, punky wood containing cross-breaks. The logs suffer badly on account of the necessity of shipping them in the surf over a rocky coast, which rubs the sides so that they present a torn and bruised appearance, while the fact that they are usually shipped in short lengths is a further disadvantage.

The numerous pores vary largely both in size and position ; some are plugged. The medullary rays are fine but very distinct, showing in small flecks on the radial section.

BATHURST. Weight 48 lbs.—Between the years 1894 and 1897 some of the finest mahogany which has been seen from the West Coast of Africa arrived from this port. The shipments then suddenly ceased, and this class of mahogany has not since been seen. During the year 1913 a small shipment was sold in Liverpool which was catalogued as having been shipped from Bathurst, but the quality was not comparable with the original supply, or even at all similar to it. For firmness of grain and texture, richness of colour and depth of quality, even good specimens of Cuba and San Domingo would not surpass it. Slightly heavier than these in weight, it was of a rich reddish-brown colour, and a few logs were obtained large enough to yield 28 inches, or even a little more, cut clear of the heart, which contained the richest broken roe and mottle.

The pores are very large and are sparse. The medullary rays, which are exceptionally thick, are parallel and irregular.

BENIN. Weight 38 lbs. 9 oz.—This mahogany must now be considered the best obtainable from the coast. Benin, Grand Bassam, and Lagos wood most nearly resemble the supplies from Honduras. The colour is the true bright mahogany-red, though slightly browner than other varieties ; the wood works well under either hand or machine plane, for it possesses the quality which is termed " a good bottom." It stands well without shrinking, warping, or twisting, and the large sizes in which it can be obtained add to its value. It is especially good for panels, for which it is superior to most other mahoganies. The grain, although not liable to twist or buckle, is more tough and interwoven, which renders it less liable to split or fly in pinning. The more figured wood, which is unsuitable for panels, proves attractive for decorative work on account of its colour and the variety of the grain. The logs, which are of solid, firm growth, are generally free from cross-breaks, and yield a large percentage of clean, sound wood of a reliable character. There is little doubt but that this timber would yield as good material for aeroplane propellers as anything that could be obtained. Indeed, African mahogany of Benin quality was found to have been used in the propeller blades of the Zeppelins brought down in England during the war (1916).

The pores are rather small but exceedingly numerous, and many are plugged. The numerous, pronounced medullary rays are wavy and form a pretty ripple marking on the radial section. Rather indistinct concentric lines cross the rays at irregular intervals.

BONAMBA. Weight 35 lbs. 4 oz.—Of recent years a large quantity of timber has been imported almost entirely in round logs, but a few have arrived hewn square. The shippers have sent a miscellaneous collection of all kinds of timbers without discrimination. These are

AFRICAN MAHOGANY. A PATH THROUGH THE FOREST

found to consist of about eight widely different varieties, several of which in no way resemble mahogany. Great difficulty has been experienced in selecting the logs of true mahogany before the timber has been sawn, as it is all covered with discolouring matter. It is evident that all the trees of the forest have been cut without any selection; but the experiment must have been found very unprofitable, as the uncertainty regarding the nature of the wood has been reflected in the exceedingly low prices realised for the shipments.

The true mahogany which is included is of fine quality, colour, and

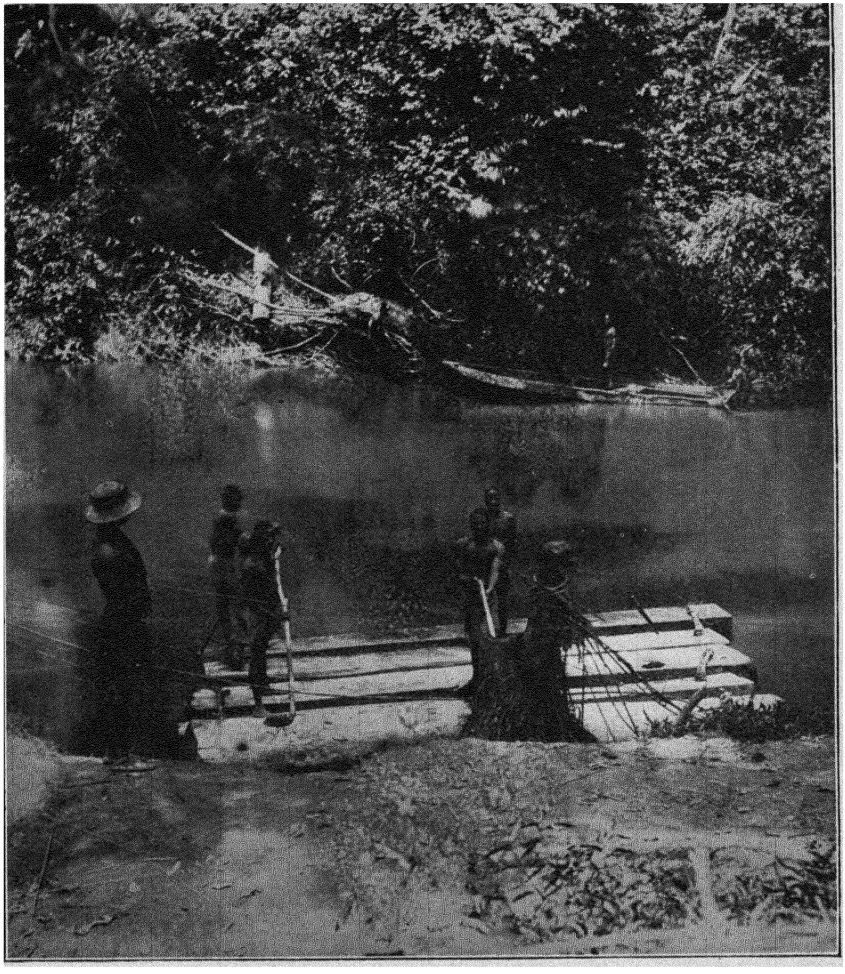
texture, generally straight-grained, mild, and suitable for panels. Among the unknown varieties of logs some develop a blue mould which clings to the outer skin on the circumference, and on the ends of the logs, and produces after sawing a white mould or fungus which fills all the pores, and the wood appears to possess no virtue or strength, and becomes quite valueless. Some of the logs are perforated with worm-holes. Another variety is similar to the description known as Sapeli, and is almost indistinguishable from it. Still another kind produces a wood of a dark dull-brown colour, with a closer texture and a harder grain ; this, though quite unlike mahogany, is useful, as it is suitable for many kinds of cabinet work, and especially for counter-tops.

The transverse grain of the true mahogany is generally similar to that of Benin, but has slightly larger pores ; the colour is a deeper red and the medullary rays are less distinct.

Mahogany is also shipped from the following ports : Coco Beach, Eclimda, Princes, Acquidad, Pontadoon, Dixcove, Forcados, Duala, Degama, Beniot, Fresco, Ovenda, Quillo, Boutry, Mundah River, Trepow, Beyin, Sinoe. These mahoganies are in general similar to the foregoing varieties.

CAPE LOPEZ. Weight 38 lbs. 9 oz.—Logs from this port consist of excellent wood, which is generally mild in quality and straight in grain ; it is of a bright colour and easy to work. This mahogany is one of the most valuable woods which come from the coast, and specially suitable for panels ; unfortunately the logs arrive badly star-shaken in the heart, or contain other shakes or splits, which would suggest that they are either felled carelessly, or suffer damage in transit. It is possible that this may be caused by the logs being hurled by the currents against the rocks in their passage down the rivers to the sea-coast. They are also more or less damaged by teredo worm-borings. Worm-holes either of large or small size, on the outside of logs from other ports, do not generally prove to be a serious matter, as they rarely penetrate far. In the Cape Lopez wood it is quite different, for the boring of the teredo worm is found to penetrate into the entire log, sometimes even reducing it to a mere honeycomb, so that it is of little value. It is not possible always to see the indications on the outside of the log, and even a careful search will fail to disclose the slightest sign of the damage, which is only discovered after the log is sawn up. On one occasion such a log was found to contain many hundreds of these teredo worms alive and hard at work. The sawyer obtained some alive and left them in the mill overnight, but by next morning they had been devoured by rats. He afterwards secured alive a worm measuring 22 inches in length, and upwards of $\frac{3}{4}$ inch in diameter, which is now preserved in spirits of wine. The piece of the log from which it was taken contains the end of the hole which has

been bored, and which measures exactly $\frac{7}{8}$ inch in the largest part. One board 6 feet long by 20 inches wide contained over seventy of these holes, many of which were more than $\frac{3}{4}$ inch in diameter. The worms work surrounded by a slimy solution which probably acts as a lubricant to the



AFRICAN MAHOGANY. A RAFT ON THE RIVER

teeth or jaw, which works like a tool commonly employed in a centre-bit. The hole made in this manner is at first bright and clean, as cut by an ordinary tool, but after the body of the worm, surrounded by solution, has passed through, it is left as though polished, with an almost black covering. The body of the teredo worm which was found was full of saw-dust. It is desirable that this damage should be stopped. Many people

would be glad to have an opportunity of using Cape Lopez wood, but are unable to do so on account of this fault. The quality of the timber is so good that it would well repay the extra price which would be obtained, whatever expenditure was necessary. A large quantity of Gaboon mahogany or "Okumé" (*Boswellia Klaineana*) has also been imported from Cape Lopez. Whether this timber comes from the same district as the ordinary Cape Lopez wood, or is transhipped from another port, is unknown, but it is certain that the wood is identical with that known as Gaboon. The general quality has been better than that shipped from Gaboon itself, and the logs have been more sound and serviceable, but the claim that it is different in character is incorrect. There is a slight

MAHOGANY. SHOWING WASTE IN SQUARING TIMBER

variation in both supplies, a proportion of the logs from both ports being of a slightly different character and quality, as well as of a superior texture. This, however, is only a variation without distinctive difference. For a fuller description reference should be made to the account of Gaboon mahogany.

The appearance of the tangential grain of regular Cape Lopez mahogany (not Okumé) resembles that of Grand Lahou, but the average weight is less. The pores are scattered and scanty. There is a light, ill-defined concentric ring, which may or may not mark the annual growth. The medullary rays are very fine and parallel; they are rather indistinct, and are joined at right angles by similar white lines of parenchyma: all these characteristics are very similar to the Grand Lahou wood.

CHERRY. Weight 40 lbs. 12 oz.—There is no distinctive name by which this variety can be recognised. The name "cherry" is one

given by Americans on account of its colour, which somewhat resembles that of the American cherry-wood. Although specimens have been found among the mahogany imports from nearly all the ports on the coast, the largest quantity has been imported from Lagos and Cape Lopez. The logs are of the usual dimensions of the African mahoganies, and range up to 6 feet in diameter in the round, and 50 to 56 inches in the hewn logs. The wood is hard, strong, comparatively heavy, has a close texture, and is liable to warp and twist if used in an unseasoned condition, though it stands well if properly seasoned. It varies considerably in colour, part being of a light mahogany red, while some is a very dull brown; the finest, a warm, bright red, closely resembles the matured colour which is assumed by the Cuban or Spanish woods. The logs are inclined to split on the ends and sides, and do not weather so well as the ordinary sorts. The splits also generally extend throughout the length of the whole piece, and recur at intervals of a few inches over the hewn or sawn surface of the outside of the log, in parallel lines. This wood, therefore, should be converted into planks, boards, scantlings, or veneers immediately on arrival. It is exceedingly difficult to cut with the saw on account of a kind of gum it contains, which clogs the saw and blunts the tool. An ordinary bandsaw such as that used in Europe will not, however ingeniously prepared, enter the wood beyond a few inches. The majority of the logs are also impossible to saw with either veneer or ground-off saws. A horizontal reciprocating saw specially set and prepared can be used successfully if a continuous stream of soapy water is poured on it as it is working. Without these preparations the saw will run and produce irregular thicknesses, or parts of the board will have the grain torn out, and the saw will generally be jammed, so that it is only extracted with the greatest difficulty. To the inexperienced eye this is the more surprising, as the appearance of the timber would give the impression that it is the easiest kind of African mahogany to saw. These disadvantages militate against its use, although when they are overcome it provides a valuable cabinet, furniture, and decorative wood, especially suited for counter-tops, hand-rails, and chair wood. Many of the logs are richly figured. Some of them retain their first brilliant appearance, and will provide panels quite equal in effect, if not occasionally superior, to that produced by the Cuban wood. Sometimes, however, the figure sinks or dulls somewhat after polishing, and does not show brilliantly except under particularly strong natural or artificial lighting. The surface is much spoilt by the french-polishing which is customary in England. The American and Continental custom of using a coachmaker's flat varnish is preferable. This variety of African mahogany was found in the propeller-blades of the destroyed Zeppelins. It was used in alternate layers with ordinary African mahogany, or Honduras, or Sapeli. The

Germans seemed to consider that it was immaterial which of the three was used, but evidently the cherry mahogany was purposely introduced on account of its strength and reliability.

The pores are small and are generally filled with a bright gum ; the medullary rays are fine and parallel, occasionally showing slightly on the radial section.

GRAND BASSAM. Weight 31 lbs. 15 oz.—Shipments from this port have very much increased during the last few years, and the quality has much improved. The average sizes are exceptionally large and long, ranging up to 30 feet in length, and often 4 feet square, while even larger sizes are sometimes obtained. A large proportion of the trees yields richly figured logs, and many fine specimens have been seen of recent years. Amongst these was a tree shipped to Mr. J. J. Richardson, of which three pieces were sold in Liverpool and one in London ; these four realised the record price of £4228. The butt cut of this tree contained about 5000 feet of measure, that is, 417 cubic feet, and weighed 9½ tons. It required two days for 300 men to haul this log to the river for shipment, and the one piece was sold for £2518.

The timber from Grand Bassam is generally shipped with a larger amount of wane on the sides than is the case with other African mahoganies. This is an economical way of manufacturing the timber, but causes a considerable loss here. Not only does the heavy wane reduce the width obtainable in conversion, but it is measured almost as if it were square, and the sawing bill has to be paid for the widest part of the log. An additional loss is also experienced, as the outside of the log generally carries about an inch of sap and has a large number of small worm-holes. This timber would probably yield a greater proportion suitable for use in propellers for aircraft, than anything else except Benin. In structure it resembles the Benin wood except that the pores are slightly larger.

GRAND LAHOU. Weight 30 lbs. 12 oz.—This timber is very similar to the Lagos, but the logs in general are not so sound or so good in quality. When carefully selected, this wood makes excellent panels. The ports of Twin Rivers, Benin River, and others yield similar supplies to the above, but are generally more varied in character and quality.

The medullary rays are rather indistinct and irregular ; the pores are scattered and irregular in size and position ; the concentric layers are indistinct.

JAMESON RIVER. Weight 40 lbs. 12 oz.—Most of the timber shipped from this source is of a lighter colour and closer grain than any of the other kinds. A larger proportion of the wood has a very pronounced cedar character, and some is scented. The logs are sound, and the wood is of a good, firm, useful texture.

A MAHOGANY CAMP IN SOUTHERN NIGERIA

LAGOS. Weight 31 lbs. 15 oz.—Of all mahogany from the West Coast, the timber shipped from this port held the first place for quality for a long time. From 1892, and after for several years, the shipments contained a large proportion of finely figured timber of a beautiful, bright, clean colour, which high standard has not been maintained. It is doubtful whether the supplies now occupy even a second place in value. The logs are well manufactured, but a large proportion now have soft hearts, often badly weathered, and with a greater prevalence of cross-breaks. This may be due to the timber being felled at the wrong season, as I understand that felling proceeds throughout the year. In colour and quality it is similar to the Honduras wood, and it is often difficult, if not impossible, to distinguish between them. A little more care would be required in selecting this timber for aircraft propellers, than would be the case with the Benin wood.

The medullary rays are even more pronounced than in Benin mahogany, and the pores are slightly larger and more open ; in all other respects it is similar.

OKOUMÉ. *Aucoumea Klaineana* Pierre. Weight 25 lbs.

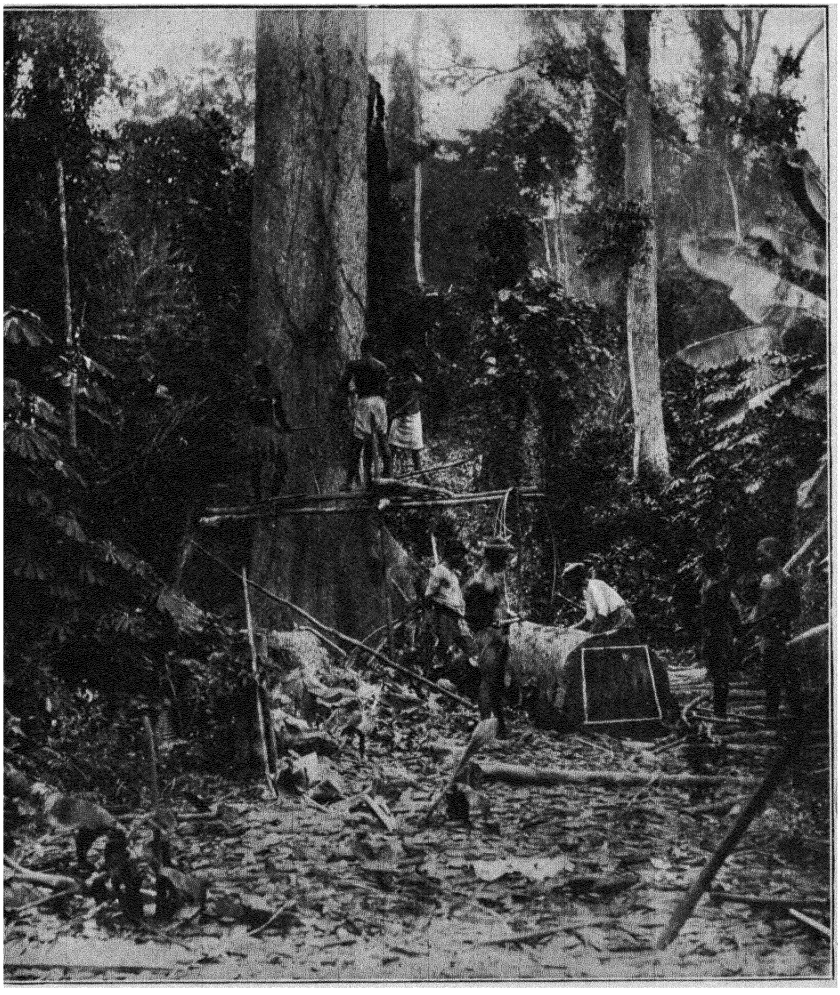
VERN—*Okoumé, Gaboon, Gaboon "mahogany,"* Trade—*Acoume, ojoume,* M'ponghoue, N'komi, Mitsogho, Baviya—*Angouma,* Pahouin, Bengouma, Bakalai—*Moukoumi,* Bapounou, Eschira, Bakaya—*Koumi,* Baloumbo—*N'koumi,* Bavili ba Loango.

This extremely useful wood, generally called "Gaboon" in England and Scotland, deserves a name of its own, since it certainly fills a place of importance which justifies a title which would give it individuality ; this fact is recognised on the Continent, where it is known by the name of Okoumé. Although used there, and here, for many of the purposes for which mahogany is required, it is certainly not considered a mahogany.

According to Jean Collardet, this timber was first brought to European attention in 1885. Subsequently the above-named botanist Pierre decided the source as being of a new genus, *Aucoumea,* which is closely related to *Boswellia Klaineana.* The record further states that three varieties are recognised : namely, *zouga,* a red timber ; *nyangala,* a rose-coloured variety ; and *combo-combo* or *cambogala,* which is pale rose in colour.

Pale in colour, soft, and light in weight, and yet strong, it meets the special requirements of many classes of work, and at the price at which it has been obtainable for a long period it probably provides the best value for money of any known timber. It has been claimed that it is a cedar, but there is no evidence to support this assumption, and the scent of cedar is entirely absent. For making cigar-boxes this wood should be equally suitable, so long as the cigar manufacturers continue to paste paper labels over the greater part of the boxes. It is largely used in automobile carriage construction both in England and abroad, and also

for ship's fittings, and on the Clyde and elsewhere it has superseded pine for this purpose. Its appearance is much improved by either a light carriage varnish or polish, without the use of stain ; french polish or stain generally causes a muddy, and therefore an unsatisfactory, surface. A



FELLING AND SQUARING AFRICAN MAHOGANY

handsome show-window in a large store in New York is furnished with finely figured wood of this species, which, besides looking very bright and showy, makes an excellent background for the display of wares of all sorts. It needs a good finish, when it will present a very fine appearance. " Gaboon " (*Okoumé*) has been tried for the purpose of making aeroplane propellers, but has been found to be entirely unsuitable.

Samuel J. Record, in a note in *Tropical Woods*, gives some interesting information : " Okoumé has become the most important timber exported from Africa, exceeding African mahogany, which is now becoming scarce. The exports of Okoumé logs from Gaboon, which amounted in 1913 to 134,000 tons, were discontinued during the war, beginning anew in 1920 with 33,000 tons. They have since progressively risen to 305,000 tons during 1927 and to about 400,000 tons in 1928. . . . Although commerce in Okoumé is almost entirely in French hands, Germany remains, as before the war, the principal consumer, taking about half of the production. French industry absorbs about a third. The remainder goes, in the order named, to Holland, Italy, Spain, Belgium, England, and Norway. Shipments to the United States are on the increase, but are still very small."

According to a Bulletin of the Imperial Institute, the geographical distribution " is comparatively restricted, the tree being found only in the Gaboon, in Spanish Guinea and in the western part of lower French Congo. . . . In spite of exploitation for some years past, the tree is still abundant and reproduces well."

When we consider the vast quantities of this timber which have been exported, it seems incredible that if the supply is only in a restricted area, there can be much reserve.

The transverse grain shows that it has great similarity to Honduras mahogany, although the marked appearance of the annual layers is absent, the pores are irregular, as in Honduras ; the medullary rays strongly marked, and are parallel but not equidistant.

SAPELI. *Entandrophragma utile* Sprague. Weight 44 lbs. 1 oz. Nigeria. —A very large quantity has been imported into London and Liverpool since the general introduction of West Coast wood. The logs are of unusually large size and length, even up to as much as 7 feet square. The principal deliveries have come from Lagos and Benin, but this variety is found in the supplies from all the ports, and especially in the so-called " Bonamba " mahogany imported from Duala. It has been customary to name this wood Sapeli mahogany when it was imported from Lagos and Benin, but if received from other ports it is described and sold as mahogany without special classification, excepting that occasionally the timber is called " scented." A few logs possess very strong characteristics of cedar, with its pungent aromatic scent ; others have only a faint scent and a corresponding absence of cedar texture, while a few have cedar characteristics and scent on one side of the tree, the other side being of the pure mahogany type, which is only occasionally devoid of any scent. The wood is generally heavier and harder than other African mahogany, and almost invariably contains a roey or contrary parallel grain, which is often broken in character, and interspersed with more or less strongly pronounced mottle. These logs produce very handsome figured and coloured

AFRICAN MAHOGANY. ADZING SQUARE

wood, which is used either in veneer, or solid for panels or other decorative work. A straight-grained log is very rare. The principal fault consists in its liability to splits, which are generally ring- or cup-shakes, following the line of the concentric layers. These show as actual splits on the butt end of the tree, but they are also liable to develop along a gum streak after the wood is sawn up, and, unlike the other kinds of African mahogany, generally extend throughout the length of the tree, occasionally repeating in circular layers at intervals of a few inches. Another of the disadvantages of this wood is that, after finishing and polishing, the soft grain will sink slightly and the hard grain will rise, showing rather an uneven surface. This difficulty can, however, be overcome by careful finishing. The wood is almost entirely free from the cross-breaks so prevalent in all other West Coast varieties. The general colour of the timber is much browner than the other mahoganies, and on this account the use of the ordinary wood has been condemned in America, where the practice of sawing up different logs and mixing the produce results in a variation of colour in individual boards ; also the finely figured logs are not liked for veneers, on account of their liability, due to the exceedingly hot, dry climate, to split badly after conversion. Before the war the principal demand was from Germany, where this wood seemed to be very favourably received, as it was well suited to the design of decorative cabinet work peculiar to that country. Sapeli mahogany was found in the propeller-blades of the destroyed Zeppelins, and is undoubtedly a very fine material for such work.

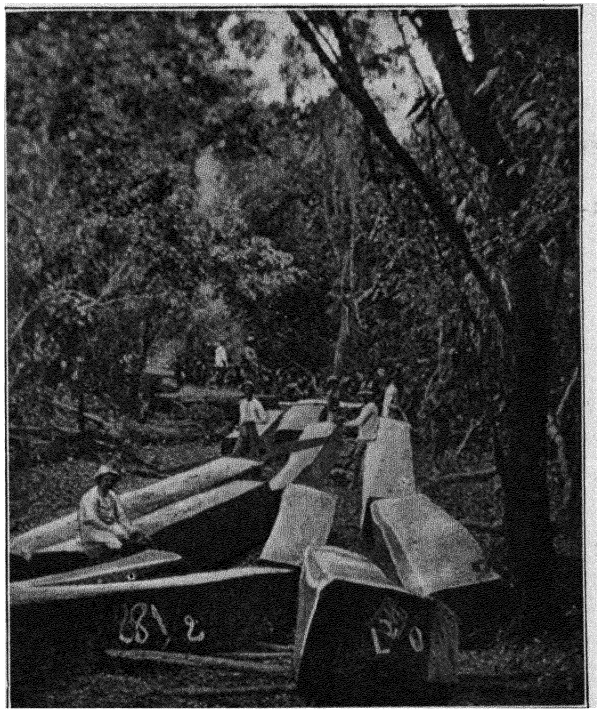
The pores are rather large and irregular, and are interspersed with bands of smaller pores which make a wavy pattern similar to elm. The medullary rays are strongly marked and are parallel ; they show on the radial grain as in maple.

SASSANDRA. *Entandrophragma* sp. Weight 27 lbs. 9 oz.—Supplies coming from the Ivory Coast of a form of African mahogany, differing from that which had previously been imported, resulted in the common name of " Sassandra " becoming general for commercial use. Later information shows that whereas all of the wood which bore this character was considered to be alike, there were two, or perhaps three, different sorts, viz. *Tiamo*, *Sipo*, a third being possibly *Aboudikro*, all species of *Entandrophragma*. From the timber point of view there is not sufficient difference to warrant separate names being given.

Record has pointed out that the bark of *Sipo de Sassandra* is thick and very deeply furrowed, whereas the bark of other species is smooth or scaly, flaking off in plates. According also to the same authority, the timber is cut in Sassandra, Lahou, and Tabou.

Sassandra wood is harder, closer in the grain, and of a darker colour than any other African mahogany except Bathurst. A certain number of logs coming from other districts, and especially from Axim, are of the same

variety as that generally known as Sassandra wood. Nearly all these logs contain dark gum veins which are more or less pronounced. The surface of the wood when planed is very smooth and lustrous, but it is liable to crack, and will sometimes split in parallel longitudinal lines. Some very finely figured logs have been seen which realised exceptionally high prices; one log sold for over 10s. per foot super of one inch, equal to £6 per cubic foot. As these figured logs are always required for veneers, and Sassandra wood has been found to crack when converted, it is not therefore



MAHOGANY. LOGS BEING PREPARED FOR HAULING AND SHIPPING

very favourably received. This variety was also found in the propeller-blades of the destroyed Zeppelins. It is probably the best kind of wood for this purpose, especially if used in alternate layers with cherry mahogany.

SECONDI. Weight 47 lbs. 13 oz.—This wood is generally harder and heavier than the other varieties. A proportion is sufficiently hard to be a good imitation of the Cuba wood, but there is an absence of the white chalk-marks in the grain. The logs are shipped well squared, but are liable to splits and to side- and end-shakes. The quality of the wood makes it more suitable for decorative work and furniture than for panels, especially as the rich red colour is very good. A large per-

centage, if not all, of this wood should be quite suitable for aircraft propeller-blades.

The annual layers of growth are well defined; the pores are decidedly less numerous, and the irregular and broken medullary rays are less distinct than in the Benin wood. The radial section shows bright shining gum in the small pores.

SIPO. The colour is similar to that of the African mahogany (*Khaya senegalensis*), but the grain is more silky, lustrous, and rather softer. The wood works and stands well and takes a good polish, the figured wood being very attractive. For many years past individual logs of this timber have been disposed of in the London and Liverpool markets, unidentified and merely described as West African mahogany. It is only just of late (1932) that "Sipo" wood, the wood construction of which is quite different from that of mahogany, has been separately classified, the first change probably having been started in France.

The concentric layers of growth are clearly marked by fine, dark lines. The numerous pores are very small, surrounded by fine lines of light-coloured tissue. The fine medullary rays follow wavy lines, and are crossed at irregular intervals by very fine lines of light tissue, the whole revealing a very different structure from that of African mahogany.

WARRI. Weight 38 lbs. 9 oz.—This is a very hard timber, with a grain which is often very much interwoven and of a roey character. The colour is a light reddish-yellow which darkens slightly on exposure to the air. The logs are liable to star-shake in the heart, and generally show a good deal of fault on conversion. It is a useful timber for decorative fittings, and if properly finished (not french-polished) the appearance is pleasing and unusual. It would undoubtedly be suitable for use for aeroplane propellers.

The pores are very regular in size, and are often filled with gum. The medullary rays are strong, irregular, and not equidistant; they are joined at right angles with similar white lines. The tangential grain shows bright spots and streaks of shining gum, and there is a slight, pleasantly aromatic scent, somewhat resembling that of African cedar.

MAHOGANY, BURMA. *Pentace burmanica* Kurz.

Weight 42 lbs. (Gamble). Burma.

VERN—*Thitka, kashit, kathitka,* Burm.

Thitka, which has been given the name of Burma mahogany, is of a light brownish-yellow colour, similar to that of Cuba mahogany when first cut, and possessing as great transverse and tensile strength. It has a close, fine, hard grain; stands well under all conditions, and takes a very fine surface from the moulding machine or the machine plane; so much so, that a wood-worker reported that he had used all kinds of mahogany

for fifty years, and preferred the Burma to all other sorts. It would hardly be amiss to call this wood the " Swietenia " of Burma.

The occasional shipments which found their way into London and Liverpool prior to the war received little recognition. After the 1920 Empire Timber Exhibition at Holland Park, a slight improvement took place, especially after the name thitka was changed to that of " Burma mahogany," when quite considerable shipments were freely exported. In the United Kingdom and on the Continent the wood has now become popular, and its demand is likely to continue. The efforts to introduce it into America would seem to have failed. The timber does not conform to the requirements laid down throughout the American markets. At the British Empire Exhibition at Wembley, a ladies' boudoir furnished in French style was exhibited, and was greatly admired by everyone, especially by H.M. the then Queen of Roumania. The room was subsequently re-erected at the *Daily Mail* Ideal Home Exhibition.

Burma mahogany is also a splendid wood for chairs, decorative woodwork, ships' furniture generally, mainly on account of its exceptional strength. It has been well received also for railway carriage work.

MAHOGANY, COLOMBIAN. *Cariniana pyriformis* Miers.

Weight 42 lbs. Colombia (South America).

The name mahogany is incorrectly applied to this wood, for it does not belong to the mahogany family. The timber, however, is so similar that commercially the name will probably continue on account of its suitability.

The supplies are shipped from Cartagena, a port on the Atlantic coast of the State of Colombia. Formerly they were only sent to Havre, but latterly London and Liverpool have received supplies. The logs are received mostly in the round, but occasionally are hewn with waney edges, in large squares ranging from 18 inches to 48 inches. The wood is always very much split and damaged, which is possibly due to the logs being dashed with some force against either rocks or other obstacles in their journey down the rivers to the coast, for they are usually cut from one to two hundred miles inland. As previously said, the timber greatly resembles mahogany in colour and is often beautifully figured. It works well, takes polish readily, and when well seasoned neither shrinks, warps, nor cracks.

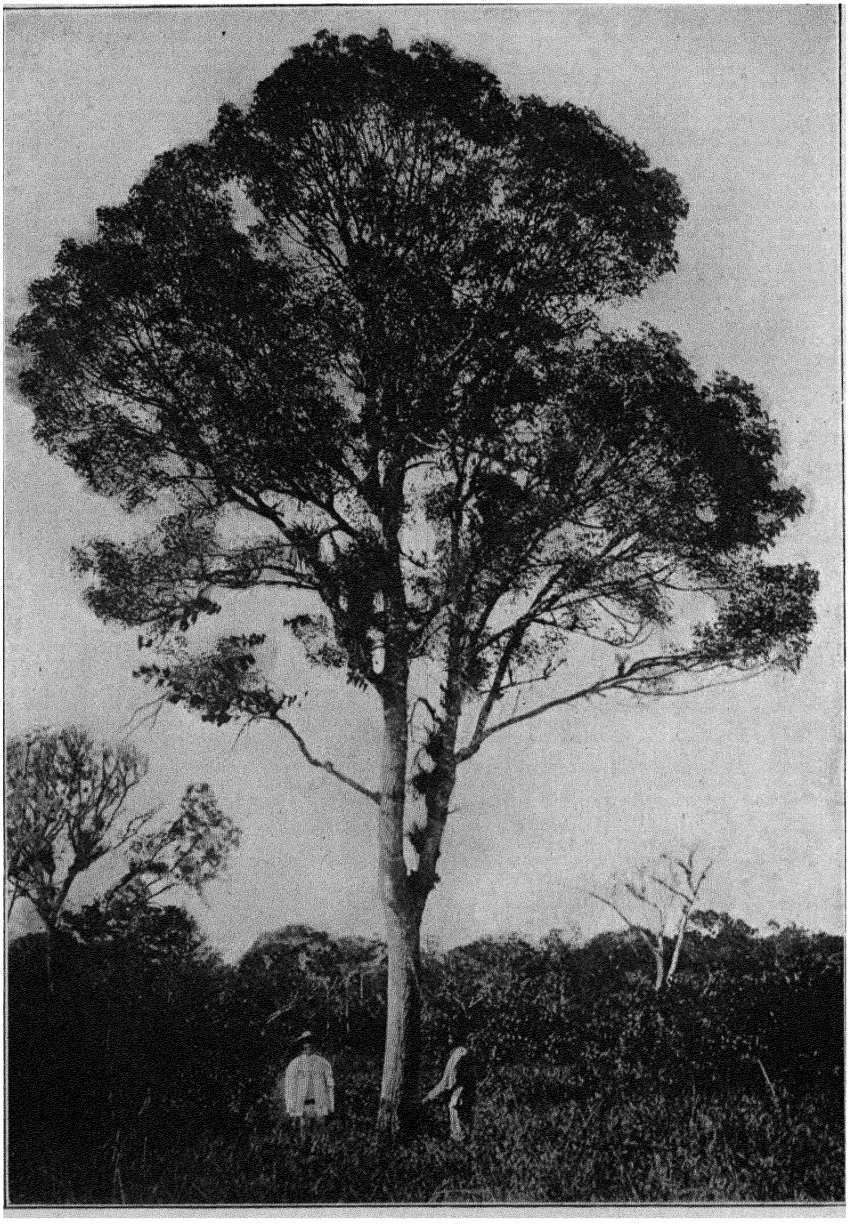
The wood can be distinguished from genuine mahogany by the numerous thin, light lines joining the rays at right angles, and thus forming a close network with rectangular meshes.

MAHOGANY, COSTA RICA.

Weight 42 lbs. 15 oz.

The timber from this zone is imported in straight, hewn square logs of

about 8 to 20 feet and over; they are generally short in length and are



A MAHOGANY TREE, CUBA

10 to 30 inches square. It is of a bright-red colour, has a firm texture, and is hard and close-grained; the pores are often filled with a white

chalky substance. In character it is like the Cuban wood, but is generally more straight-grained, and used for the same purposes. The logs are very liable to heart-shakes and galls, while rotten and defective places, in which burrowing worms are found, are prevalent.

MAHOGANY, CUBA.

Weight 39 lbs. 11 oz.

This is imported in round logs with the bark on, also in hewn square logs which are mostly straight, though some are bent and crooked, and in sawn boards and planks. The logs are from 8 to 36 inches square, and from 6 to 30 feet in length, though some are considerably larger. The imported sawn timber is of small size and indifferent quality.

The wood is generally of a hard, close texture, and is heavier than any other mahogany except some of the Spanish wood. When first cut it is of a light-red colour, but on exposure it rapidly darkens to a rich deep red, which, with its glossy, transparent, and satiny surface, has a most handsome appearance. A small proportion of the trees contains black, gummy veins which, although not injurious to the wood, yet appear unsightly. Others again, develop white chalky marks in the pores like the San Domingo wood.

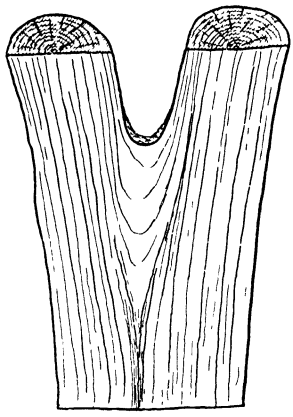
Many of the logs are beautifully figured or marked with wavy and curly grain, which is variously termed splash mottle, roe and mottle, fiddle-back, plum, snail, blister, and cross-bar.

Good well-figured logs command very high prices for veneers, the record during the last twenty-five years being one which realised £13 · 10s. per foot cube. Probably the finest log imported during this period was one sold at Liverpool in 1901 by Messrs. Farnworth & Jardine for £750.

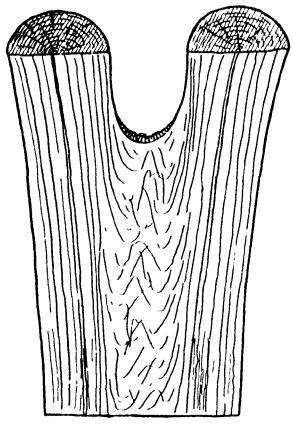
The wood from Cuba has largely taken the place of the old supplies from San Domingo. It is of the same character, though occasionally it surpasses it, for while the colour darkens with age, the Cuban wood better retains its brightness and transparency. It shrinks very little in seasoning, does not warp or twist, and is very durable.

The colour of Cuban mahogany when first worked is very light, even lighter than some of the other sorts, but an impression prevails that it should be as dark as the old work which has matured with age. In order to comply with the somewhat unreasonable demand for this darker wood, it is customary to stain the new to the shade of the old. This is an unfortunate practice, as it entirely spoils the transparency and beauty of the wood. Originally all the polishing was done by hand, without the use of polish; this produces the best results. Staining and heavy french-polishing ruin the colour, which otherwise would continue to improve with

the lapse of time. Very beautifully marked wood is obtained by cutting through the fork of the main trunk, or of two large limbs, thus :



SINGLE HEART



DOUBLE HEART, SHOWING CURL

Sometimes the main trunk itself consists of twin trees which have grown together. This peculiarity occurs more often in Cuba mahogany than in any other. When this growth has taken place without the formation of any bark, the wood presents a rich and agreeable appearance. These pieces when converted are known in the United Kingdom by the term " curls " and in America as " crotches." They are used extensively for panels and other decorative work.

The pores are irregular in position and size, and are more or less plugged with gum (?). The medullary rays are rough and irregular, showing rather obscurely in small flecks on the radial section, joined at right angles by rough similar light-coloured lines at irregular intervals.

MAHOGANY, GUATEMALAN.

Weight 38 lbs. 9 oz. Central America (Guatemala).

This mahogany is of a brighter red colour than Honduras, and in character and texture more resembles Cuban, and is indeed, often indistinguishable from it. It finishes with an exceedingly smooth surface from the tool, and stands very well. It is obtainable in large to very large squares, ranging even up to 4 feet, but it is generally exported in rather short lengths, rarely over 14 feet long, the average being not more than 11 to 12 feet. The logs are somewhat faulty, often much shaken, and liable to wormy and decayed centres. Occasionally very sound fine trees are found, and a few are beautifully figured. The white chalky grain which is a feature of Cuban and San Domingo mahogany is very prevalent in Guatemalan, and it is largely used as a substitute for these varieties.

The concentric layers are sharp and defined to the naked eye; the medullary rays are distinct, regular, and nearly parallel; the pores are irregular in size and position.

MAHOGANY, HONDURAS. *Swietenia* sp.

Weight 29 lbs. 12 oz. Central America (Honduras).

Large quantities of mahogany have for many years been imported from Honduras; probably the best in quality is that which has been shipped from Belize. It is received in hewn square logs and in the round, and also, of later years, in square sawn boards and planks. This, however, has been exported first from Honduras to North America, where it was sawn and thence re-exported in the various grades and qualities of the National Hardwood Lumber Association.

The wood is similar to the other mahoganies of Central America, though for a great many purposes it is superior to all. It is lighter in weight and milder in texture than the Spanish or Cuban. The dimensions in which it has been produced are larger than any other kind obtainable from Central America. In common with all other mahoganies, the forests yield a small proportion of highly figured pieces which are in great demand. Unlike the Spanish or Cuban wood, which darkens with exposure, that from Honduras bleaches, and when exposed to exceptionally strong rays from the sun, the colour inclines to a beautiful golden brown or even greyish shade. Although very occasionally a tree will be found to possess the white, chalky substance so common in the Spanish wood, yet it is unusual, and Honduras mahogany generally has a more or less black marking in the pores, some trees containing both the black marking and the white.

This timber has at times been called "baywood" (*q.v.*), the term referring to the Bay of Honduras, from which the wood was obtained.

The pores are irregular both in size and position, and are not very numerous. The pronounced medullary rays are parallel but irregular; they are crossed at intervals by similar lines. The rays show very strongly on the radial section as in sycamore.

MAHOGANY, MEXICAN and TOBASCAN.

Weight 30–33 lbs.

The mahogany which has been exported from Mexico has varied so much in quality that it is difficult to give a clear account under one heading. Those shipments described as *Tobascan* mahogany have been regularly of a high-class character, and the wood compares favourably with Cuban supplies. Many shipments of *Mexican* mahogany have reached the markets in America and Europe, comparable in quality with that from Honduras, Nicaragua, Panama, and Costa Rica, but always

having a percentage of inferior, soft, and unsatisfactory wood. As a result it has been customary to class that which can claim the name of *Tobascan*, by itself, and to use the name of *Mexican* for the remainder.

No doubt the best trees have long since been used up, and what is left consists of a larger percentage of logs hewn straight but with wandering hearts, showing that crooked-grown trees are more abundant than straight.

MAHOGANY, NICARAGUA.

For a description of this wood see HONDURAS MAHOGANY. The slight differences are not of sufficient importance to warrant any attempt at differentiation.

MAHOGANY, PANAMA.

Weight 35 lbs. 9 oz. Central America.

Mr. Bradley says that there are two varieties of true mahogany in Panama, the light and the dark. The dark is, with some variations, similar to the mahogany of Central America, and bears a conical-shaped pod. The light variety is of the same family, but differs in leaf, seed, bark, grain, and colour, the seed being nearly round. The light mahogany grows on the wet land near the creeks in an accessible position. The timber of these two varieties may be classed together. The quality and colour are good, and resemble that of Honduras, so that this wood often passes for it. It has been imported in the round, and in hewn square logs of small and large sizes. The majority have arrived in such a split condition that the wood has not been favourably received, and until some means can be found to bring the logs in a more sound condition, little commercial development will ensue. Its uses have been the same as those for Honduras mahogany.

A cargo of so-called Panama mahogany was despatched to New York in 1910, which proved to consist of ESPAVÉ (*q.v.*).

In the true Panama mahogany the concentric layers show sharply defined to the naked eye. The pores are open and irregular ; the medullary rays are clear and regular, and are in all respects similar to Honduras mahogany.

MAHOGANY, SPANISH. *Swietenia Mahogani* Linn.

Weight 48 lbs. San Domingo, etc.

The name " Spanish " mahogany has been applied to the wood which from earliest times came from the Spanish West Indies, and not, as some have erroneously thought, from Spain. It is interesting to notice that the origin of what subsequently developed into an active trade in a most fashionable wood was the bringing to England of a few planks and butts

of mahogany as ballast by the captains of English vessels voyaging to the West Indies. Spanish mahogany, probably first heard of in 1597, only came to England in marketable quantities towards the end of the seventeenth century. In 1724 a few planks were sent home by a West India captain to a Dr. Gibbons, who was erecting a house in King Street, Covent Garden. The workmen rejected them as being too hard, but the doctor's cabinet-maker, Woolaston, made a candle-box from them. Notwithstanding his bitter complaints about the hardness of the wood, when the box was finished it outshone in beauty all the doctor's other furniture, and so Spanish mahogany, being admired by the Duchess of Buckingham, became fashionable. Nearly all the beautiful and highly figured pieces of Chippendale furniture produced about 1750 were made of this wood. Its unusually attractive qualities then gave it the premier position, which it retains to-day. The importation has always been of a desultory character, those trees growing within easy access of any seaport being cleared rapidly, after which difficulties of transport precluded removal of anything over a small size or weight. The export of mahogany, at first from Porto Rico, and afterwards from San Domingo, where the country is rugged and mountainous with no suitable transport other than oxen and mules, was carried on under great difficulties. Towards the end of the eighteenth century a considerable demand arose for that form of timber known in England as "curls," and in America as "crotches." These pieces are obtained from that portion of the tree which contains a fork, either of the main trunk or secondary branches (see MAHOGANY, CUBA). To meet this demand great numbers of trees were felled, and all the forks from about 9 inches in length and 5 inches in thickness were carefully hewn out. These pieces, in oblong hewn slabs, ranged up to about 3 feet long and 2 feet wide, or as large as it was possible for the oxen or mules to carry, were packed on their backs and brought down to the sea-coast for export. Meanwhile the main trunks, too heavy to remove, were left lying on the ground, where many remained for over half a century. The trade in the curls received a considerable impetus from the publications and influence of Mr. Edward Chaloner, who published a useful pamphlet on the subject in 1800, and whose firm still occupies a leading position in Liverpool. At a later date an enterprising engineer, M. Juan Baptista Nunez, a native of San Domingo, having studied engineering in America, was engaged in carrying a railway system through San Domingo. He rapidly realised the advantage of collecting those large trunks of trees, felled so many years before, and which, through the advent of the railway, could now be transported. For many years Mr. Nunez shipped to New York, Liverpool, and London a number of these trunks, hewn into squares, many of which were of magnificent colour, texture, and figure, although often the outsides of the logs were decayed from exposure to tropical

weather. Such deterioration destroyed even as much as 3 inches of the outside wood, but after this was removed, the colour and quality of the remainder were found to be as sound and satisfactory as could be desired. San Domingo mahogany, or " City wood " as it was called, had in the past, and still has, a peculiar attraction for many, and a few such have been found so extreme in their admiration that they might justly be titled " mahogany misers." One cabinet-maker in the Midlands refused to use or part with several fine logs which he kept in his warehouse, which had one cut through the log, and were planed, showing the figure. He kept these logs for over half a century, dusting them with a silk handkerchief at least once a week. They all contained very fine figure and quality. Some very thick planks of very rich wood were discovered lying in a cellar in the West End of London, where they had been at least for fifty years, and when found were dirty and thick with dust. Upon discovery it was impossible at first to identify the wood. A portion of these planks were subsequently used and can be seen in the panelling of the Wigmore Hall, London, and display a quality and figure no longer procurable. It is distressing to find it recorded by a late publication (1931) by Mr. Tom Gill, *Tropical Forests of the Caribbean*, that practically all the valuable timber trees of Porto Rico, Haiti, and San Domingo have now disappeared. The irregularity in the supply of San Domingo encouraged a larger import from Cuba, from whence large quantities of fine texture and quality have been imported, such wood enjoying the title of Spanish mahogany. The quality of individual trees from Cuba has equalled, if not indeed surpassed, that from San Domingo, but while as a rule the Cuban wood is less faulty in the heart, and yields larger sizes and longer lengths, the intrinsic quality of the wood as a whole is not so good. San Domingo and Cuba mahogany when first cut are, as a rule, light in colour, but with exposure turn to a deep rich colour, generally darkening with exposure to sunlight, while individual specimens occasionally are bleached by the same agency.

Two large trees of *Swietenia mahogani*, growing in the Botanical Gardens in Calcutta, were felled in the winter of 1922–23 and subsequently transported to England, where, after being sawn into boards, they were shown at the Exhibition at Wembley. The butt of the larger, which had lost its crown some years before, weighed over 10 tons, and measured over 6 feet in diameter, containing over 4000 feet super as 1-inch board measure of timber. Although no certain information is available, as nearly as it is possible to estimate, the age of the tree was about 129 years. The smaller one weighed just over 4 tons, and contained about 1600 feet super as 1-inch board measure, and it is probable this tree was 82 years old. The quality of the wood in both cases is as good as that which has been grown in San Domingo, thus contradicting the impression, which prevailed in the Indian Forest Service, that the quality of mahogany grown in India

is inferior. The general uses to which Spanish mahogany is put are so well known that comment is unnecessary.

The pores are very irregular in size and position, while the white chalky substance with which they are often plugged is peculiarly characteristic of the wood. The medullary rays are rather coarse ; they are parallel and uneven, and are joined at irregular intervals by similar light-coloured lines.

MAHOGANY, VENEZUELAN. *Swietenia Candollei* Pittier.
Weight 45 lbs. South America.

The wood is of a true mahogany quality and character, colour, and grain. The quality resembles that of the old-fashioned Spanish wood, possessing figure varying from plain stripes of harder and softer layers to broken layers constituting what is known as " broken roe," and often with some mottle. There is also a preponderance of the characteristic white chalk in the pores.

The pores are very scarce, irregular, rather large, with fine medullary rays crossed at right angles by tiny similar light marks, making a pattern of a square.

MAHWA.
See *Bassia latifolia.*

MAIDEN'S BLUSH. *Echinocarpus australis* Benth.
Sloanea australis Swain.
New South Wales, Queensland.

This timber is known as " maiden's blush " in New South Wales and " blush Carrobean " in Queensland. Swain describes it as " the palest of uniform pinks . . . lit by a silken sheen." The romantic Australian who named this timber must have been influenced at the time by some passing fancy, and it would be desirable that a name should be found that would be more descriptive of an ordinary and somewhat uninteresting timber. When exposed to the air, the wood is a normal brown without any distinctive feature and a grain mid-way between a softwood and a hardwood. It is described as being used in Australia for various building purposes, carpentry, and turnery.

MAIRE, BLACK. *Olea Cunninghamii* Hook.
Weight 72 lbs. (Baterden). New Zealand.

Of this wood the New Zealand Board of Agriculture says: " Deep brown in colour, often streaked with black and highly ornamental, durable, even in grain, and takes a good polish. Procurable up to 20 feet in length and 12 inches in width. Used for framing for machinery, millwrights' work, and oranmental cabinet work of all descriptions." Baterden says that

the timber makes good durable sleepers, piles, and fence-posts, and it is said to make capital wood for large engraving blocks if properly seasoned, as it does not wear and bears high pressure. He adds that it takes a long time to season.

MALLETWOOD, BROWN. *Rhodamnia argentea*
R. trinervia.
Weight 50–56 lbs. (Swain). Queensland.

Also known as white myrtle, blackeye, or brush turpentine. " It is of the Boxwood type, tough to cut . . . has considerable strength and durability. . . . Baker recommends its use for carriage, waggon, and wheelwrights' work " (Swain).

The principal uses are for mallets, heads of mauls, etc. It is Indian pink in colour, and fine in texture.

Mallotus Philippensis Muell.
Weight 43–51 lbs. (Gamble). India, Burma, The Andaman Islands, Ceylon.

Gamble mentions this as one of the most universally distributed and most common of Indian forest trees. The vernacular names by which it is known are so numerous that, on account of its unimportance, they are not included.

The colour is a greyish-brown, similar to a plain Ancona walnut, with a fine, close grain capable of a smooth surface from the tool. No opportunity has been given to ascertain whether the wood stands well, but if it should do so, it might be a substitute for grey French walnut. A small experimental shipment was made for the 1920 Exhibition, but no development has occurred since, and the expectation of its being met with regularly in commerce is unlikely.

There are concentric layers marked by dark lines at varying intervals. The pores are very regular both in size and position, small, and open. The very numerous medullary rays are hardly discernible under the lens, but show in the tiniest possible flecks on the transverse section.

MAMEE APPLE. *Calocarpum mammosum* (L.) Pierre.
Weight 43–44 lbs. British Honduras, West Indies, Central and Northern South America.

VERN—*Sapote, mamee-sapote, marmalade fruit, marmalade tree,* B.W.I.—*Mamey, mamey colorado, mamey zapote,* Cuba—*Sapote, zapotte, gross zapotte, zapotte à crême, sapotille mamey, marmalade naturelle,* Fr. W I —*Bartaballi, balataballi,* B.G.—*Zapote mamey,* Col.—*Mamey colorado,* Col., Venez., Ec.—*Zapote,* C.A., Mex.—*Zapote*

colorado, zapote mamey, mamey colorado, tezonzapote, tzapotl, tsapas sabani, haaz, chacal haaz, Mex.—*Sal-tul, tul-ul, chul, chul-ul,* Guat.—*Ingerto, zapote ingerto,* Salv.—*Beko, kurók, kóm-kra, fiú,* C.R.—*Oa-bo,* Pan.—*Sapoteassú, palata, urique,* Braz.

A light grey-coloured wood, with a very hard surface, mid-way between a mahogany density and that of the ordinary plane, and taking a smooth surface from the tool. It is not likely to become a commercial wood, as the supply is limited and uncertain, since the tree is protected by natives on account of the fruit.

The concentric layers are clearly marked by dark lines, and very scarce, small pores, forming a kind of irregular pattern, at right angles to the concentric layers. The very numerous and exceedingly minute medullary rays are hardly discernible under the lens.

MANGEAO. *Litsea calicaris* Benth. & Hook.
Weight 38–48 lbs. New Zealand.

" White, firm, strong, and of great elasticity, and is suitable for a great variety of purposes requiring strength, toughness, and elasticity with light weight. Procurable in lengths up to 25 feet and up to 18 inches wide. Used for ships' blocks, coopers' ware, wheelwrights' bent stuff " (Board of Agriculture, New Zealand).

Mangifera indica Linn.
Weight 42 lbs. (Gamble). British India, Burma, Ceylon, Malaya.

VERN—*Am,* Hind —*Ghari am,* Ass.—*Jegachu, bocho,* Gáro—*Marka,* Gondi—*Uli,* Kól—*Ama,* Baigas—*Ul,* Sonthal—*Maha,* Khond—*Ambo,* Uriya—*Tsaratpang,* Magh—*Ambe,* Kurku—*Amba,* Mar —*Maá, mangas,* Tam.—*Mamadi, mamid,* Tel.—*Mavena, mávu, marveen,* Kan —*Mávu,* Mal —*Thayet, mango,* Burm.—*Sepam,* Malay.

This is a dirty-coloured, brown wood, with a fine, close grain, yielding a smooth surface from the tool. Gamble reports it as being grown principally for the sake of its fruit, and that it is used for planking, doors, window-frames, packing-cases, canoes, and tea-boxes. It is not suitable for export.

The minute pores are not discernible under the lens. Medullary rays numerous and very fine.

MANGROVE. *Rhizophora Mangle* L.
Weight 69 lbs. Brazil, Tropical America, India, Africa, and the Tropics generally.

VERN—*Mangrove, red mangrove,* Eng.—*Manglé, m. colorado,* Sp. Am., gen.—*Manglé rouge,* Guad.—*Manglier,* Mart.—*Manglier rouge,*

Trin.—*Mangue vermelho, mepareyba, apareiba, guapariba,* Braz.—*Paletuvier rouge,* Fr. G.—*Duizenbeenboom,* Sur.—*Manglé salado,* Pan.—*Manglé gateador,* C.R.—*Candelón, manglé dulce, m. tinto, tab-ché, tap-ché,* Mex.

The mangrove formations of the world are to be found in two broad but well-defined areas—an Eastern area embracing East Africa, Asia, and the Polynesian Islands down to Australia, and a Western area comprising the coasts of America and West Africa. There are two botanical names noted by Colonel Gamble for this wood, and also two specimens in the collection, one marked " Mangue, Rhizophora Mangle," and the other " Mangue vermelha." Both these are of a brown colour, streaked with a darkish shade, and bear a superficial resemblance in the grain, but the structure as seen on the transverse section does not correspond.

It is stated that " Mangue vermelha " forms what are called " manguesaes," when the seeds shoot before they are detached from the tree and the shoots descend until they strike into the ground, thus forming a thick forest from one tree. Under the roots a crab is found which is considered to be poisonous because of the herbs on which it feeds. The people at St. Joan da Barra, notwithstanding this opinion, used to eat the crabs they found among the mangue.

Record refers to " 15 genera and about 50 species." It is probable that only a few of them produce timber of any size and utility. Colonel Gamble in his notes says that his collected specimen is of either *Avicennia tomentosa* or *Laguncularia racemosa*, but I think there can be no question that it is *Rhizophora mangle.*

J. S. Gamble, in his *Manual of Indian Timbers*, mentions the following, *Rhizophora conjugata, R. Candelaria,* and *R. mucronata* Lamk., as occurring throughout India, Burma, and Ceylon. The woods of these vary considerably, from the wood mentioned above, in colour and grain ; the colour of these is a light salmon pink, with a hard, close grain, containing the same kind of figure-marking as that found in mahogany. The transverse grain shows the cleanest-cut pattern, with fine, sparse pores, heavily plugged, and very pronounced. Medullary rays are single, duplicated, and triplicated, and in spite of their prominence, hardly show on the radial section.

With the American produce the pores are exceedingly numerous and often subdivided ; they show in bands alternately scarce and numerous, so that a section of the wood shows alternately light and dark. The numerous medullary rays are very strongly defined, and show a pretty, though minute, silver grain on the radial section.

Mangue vermelha.—The pores are exceedingly numerous and often subdivided, in alternate bands of few and many pores, so that a section of the wood is alternately light and dark. The numerous medullary rays are strongly defined, and show a minute silver grain on the radial section.

Rhizophora mangle (South American).—The pores are very minute and very numerous, plugged, with lightly defined medullary rays. With the Indian *Rhizophora* the pattern is similar to the latter, but on a larger and more pronounced scale, with the finest clean-cut section possible, and the rays strongly marked.

MANUKA. *Leptospermum ericoides* A. Rich.

New Zealand.

This timber, the produce of the tea tree, according to the Board of Agriculture, New Zealand, is red in colour, dense, straight-grained, and elastic. It is only procurable in short lengths which are small in size. It is used for wheelwrights' work and for inlaying.

MAPLE. *Acer saccharinum* Wang.
A. saccharum Marsh.
A. macrophyllum, etc.
Weight 37 lbs. 2 oz. Canada, United States.

This exceedingly important timber is drawn from a very wide expanse of country, and is obtained from many species. It has, therefore, an extensive range of quality, from the best, hard, tough-grained white maple, through many stages to a soft, often bluish or reddish medium-textured wood. The best is always asked for, and sometimes obtained; it is termed in specifications "hard, white, rock maple." A considerable quantity is found with a curly, twisted grain, and is known as "curly" or "bird's-eye" maple. This variety is much in demand for decorative work, and is generally used in the form of veneers. The whiter the wood in which this description is found, the more highly it is valued. It is used for trimmings of buildings, cabinet work, furniture, and general decorative purposes, especially in the saloons and state-rooms of yachts and steamers, and for railway coaches.

A particular variety of wavy, curly grain without bird's-eye marking has been called "Papapsco wood" (*q.v.*). Other uses for maple are very varied, and include rollers for several kinds of machines, agricultural implements, presses for heavy machinery, and for general furniture. A finely carved German coffer of maple, dating from the fourteenth century, can be seen at the Victoria and Albert Museum, South Kensington.

It has also been used for the backs of violins. The violin of the musician in Longfellow's "Wayside Inn" was

> Fashioned of maple and of pine,
> That in Tyrolean forests vast
> Had rocked and wrestled with the blast

The texture being of a tough, substantial nature, without long or fibrous grain, the wood is suitable for floorings where hard wear and rough

usage are required, as the surface does not become torn or flaked, and the continual dragging of heavy articles or the shuffling of feet does not wear the surface. For this purpose it is extensively used throughout Canada and America, and in this country also, but the timber being particularly susceptible to damp, the greatest possible care is required in laying a floor to prevent shrinkage or swelling.

The pores are exceedingly small and very regular. The medullary rays are very strong and parallel, showing very distinctly, though finely, on the radial section.

MAPLE, JAPANESE. *Acer palmatum* Thunb. and others.
Japan.

It is impossible to say of what species the commercial supplies of Japanese maple consist, nor is it probable that at present it could be ascertained. Goto names *A. palmatum* as being " abundant in Hokkaido and the northern part of the main island." It is therefore likely that this species predominates in supplies. Fifteen different species are named by this authority. The character, general quality, and size of the shipments which have already arrived in England, give the impression that the wood is all of one species. The colour is white, and the texture and grain of the wood are very good indeed, and compare to advantage with the best Canadian. For all purposes for which hard rock maple excels (see MAPLE), the Japanese is equally good, if not more satisfactory.

MAPLE SILKWOOD. *Flindersia Brayleyana* F. v. M.
syn. *F. Chatawaina* and *F. Pimenteliana* F. v. M.
Weight 35–40 lbs. (Swain). Queensland, New South Wales.

Known also as Queensland maple. The wood is a light red mahogany colour, with a hard, close grain, resembling the plainer kinds of American mahoganies, although harder. It is difficult to know why it has been called " maple," as it does not in any way resemble maple (*Acer*). A fair quantity has found its way into the European markets, and its usefulness has been recognised as a good substitute for mahogany. Swain reports it as " one of the prime cabinet woods of the world, ranking with Cedar, Mahogany, and Walnut."

Maple silkwood is moderately elastic, and the grain often wavy and curly ; it veneers and plies perfectly, taking stain readily, seasoning well, and is said to be disliked by borers. It is not durable in the ground or in damp situations, but is useful for inside purposes and in shipbuilding.

The pores are very small and rather scarce, but of moderate size, with a rather coarse, ill-defined medullary ray ; the transverse section grain showing very similar to that of African mahogany (*Khaya Senegalensis*).

MAPLE, VINE or **DWARF.** *Acer circinatum* Pursh.
A. glabrum Torr.
British Columbia, N.W. United States.

The colour is light brown, sometimes almost white. A hard, heavy, and close-grained wood, not strong. Used for tool handles and fuel.

MARBLEWOOD. *Olea paniculata* R. Br.
Weight 59 lbs. (Baker). New South Wales, Queensland.

Known also as "clove berry," and should not be confused with marblewood, Andamans, *Diospyros oocarpa* (*q.v.*).

The colour is yellow, with darker streaks. Baker likens it to the Australian black plum, *Cadellia monostylis* Benth. It has a tough, hard grain and is reported as being difficult to work.

MARBLEWOOD, ANDAMANS. *Diospyros oocarpa* Thw.
Weight 45 lbs. (Gamble). India, The Andaman Islands, The Nicobars, Coco Islands, Ceylon.

VERN—*Vellei-karunkali*, Tam.—*Kalu-kadumbériya*, Cingh.

The name is well chosen, as it would be difficult to find in nature anything more resembling marble. An alternative name is "zebra-wood."

The wood is of a dense, ebony black, with stripes of golden yellow and whitish-yellow; it has a very close, hard, firm texture which is rather cold to the touch, and is capable of a very smooth surface. Experience of its use in various kinds of woodwork had disclosed that the wood does not stand well, and is not comparable with the ebonies, or so-called coromandel woods from other sources. When used either in solid or veneer work in furniture, it is very liable to split. In such work as small ornamental boxes, razor-cases, etc., where thicknesses from $\frac{1}{8}$ inch to $\frac{1}{4}$ inch are employed, it has also been found to be too brittle for continual use, and the wood throws off the glue, causing the box to fall to pieces. As walking-sticks it is not found to possess the necessary strength to resist ordinary wear and tear. The supply of even reasonably sound trees seems to be practically exhausted, those logs which have been shipped during the last ten years having been so inferior in size and condition, and so defective, that it has been impossible to convert even small sizes for any purpose.

The scanty pores are exceedingly small and plugged. Medullary rays confused, very fine, and hardly discernible under the lens.

MARIA PRETA. *Melanoxylon Brauna* Schott.

Weight 69 lbs. Brazil.

VERN—*Brauna, barauna, grauna preta, grauna parda, garauna, maria preta, perovauna,* Braz.

My specimen displays a small portion of dark wood, almost black, with a much larger proportion of yellow-brown. Whether the light-coloured portion is the sap-wood of the tree it is impossible to judge, the indications inclining rather against this view.

It is a hard, cross-grained wood, but my specimen is riddled with worm-holes, and otherwise defective. There is nothing to show that it would be useful for any ordinary purpose.

The pores are rather small and infrequent; they are joined by continuous wavy bands of loose tissue. The medullary rays are fine, numerous, and undulating.

MASSARANDUBA or **MESSARANDUBA.** *Leucuma procera* Mart.
Mimusops elata Fr. Allem.
Mimusops sp.

Weight 71 lbs. 9 oz. Brazil.

VERN—*Bullet wood, bully tree, balata tree, beefwood, horseflesh, red lancewood, baruch, buruea,* B.G —*Bolletrie, bolletrieboom, balataboom, bloedbalata, pardeflesh, pardenvleesh, roode balata,* Sur —*Balata, balata franc, balata rouge, bois rouge, bois de natte, sapotillier marron, manil-kara, l'abeille, hymarikushi, mora-balli, assapookoo, morakokuru, mamushi,* Fr. G —*Acana, ausubo, balata, mameyuelo, sapote, sapote de costa, zipote,* P.R —*Jaimiqui,* Cuba—*Wild dilly,* U S., Bah —*Balata, purgo,* Venez —*Nispero,* C A —*Massaranduba, massaranduba amarella, m de leite, m. vermelha, maçeranduba, maparajuba, aparahiú, apraiú, apraua, balata, chauá, muirapiranga,* Braz.—*Pferdefleischholz,* Germ.

It is not clear from which of the above species this wood is produced, or whether all are included under one name. *Brazilian Woods* gives the same Brazilian name to them, and mentions that in the State of Bahia they are called " apraiú."

Record reports two kinds of massaranduba; *Mimusops amazonca* Huber and *Mimusops* aff. *elata* Fr. Allem., while Pereira names three species, *i.e.* the yellow, red, and milk massaranduba. The last name doubtless originated from the fact that the bark of the tree secretes an abundance of fluid which can be used as milk, hence its alternative names of milk tree and cow tree. This fluid is common to all three species. The available supply is limited.

Colonel Gamble's specimen is bright brick-red in colour, and has an exceedingly close, firm, hard texture, yielding a very smooth surface from the tool, with a bright metallic lustre. It is mentioned in *Brazilian Woods* as an excellent wood for piles and submerged work, as well as for hydraulic

work. It is well suited to heavy, durable outside constructions and railway ties, and would be useful for chair and table legs, or any decorative furniture work where a very hard, smooth, durable wood is required, though it would perhaps be found too hard and heavy for ordinary cabinet work.

The pores are very scarce, and are generally arranged in short wavy bands or groups; in some cases they are plugged. The medullary rays are exceedingly numerous, clearly defined and parallel, but irregular. At intervals they are crossed at right angles by similar light wavy bands, presenting a very pretty pattern.

Mastixia Thwaitesii.

Ceylon.

A pale yellowish-white timber with a soft, rather rough grain, not of much value. Liable to attack by a small boring insect, which stains the wood black.

The excessively small and numerous pores make a pretty pattern on the transverse section. The medullary rays are wavy and very fine, showing on the radial section in minute silver flecks.

MATAI. *Podocarpus spicata* R. Br.
Weight 40 lbs. New Zealand.

This wood, alternatively known as black pine, has been imported into London this year (1930), especially as a flooring wood in narrow widths. The colour varies from light straw to yellow of a deeper shade. It has a smooth even grain like that of kauri pine. It is a good, useful wood, but does not possess sufficient attraction to warrant the costs of transport from New Zealand. It is used for general building purposes, especially flooring and weather-boarding, joinery, and cabinet-making. Obtainable in long lengths and up to 24 inches in width.

Faint lines mark the concentric lines, but in rather an obscure manner. The medullary rays are numerous and fine, showing in extremely small flecks on the radial section.

MATAMATA. *Eschweilera* sp.
Weight 68 lbs. 6 oz. Brazil.

This wood is of a dull nut-brown colour, and is capable of a smooth surface from the tool. It is, however, inclined to warp and twist in a more than ordinary degree, and also to split longitudinally with the growth, in numbers of straight, small lines. It could only be used, therefore, in small sections, and for a limited number of purposes.

Record, quoting Huber, says: "The 'matamata' of the Amazon region supplies a timber in demand for hydraulic works, particularly for the

supports of bridges and warehouses, because of its great resistance to the attacks of the teredo. There are two species, namely, *Eschweilera coriacea* Mart. and *Eschweilera Matamata* Huber."

The pores are very regular and uniform, and are rendered apparent by a whitish halo. The medullary rays are very fine and clear, and show a stronger wavy mark at right angles, the whole making a beautiful pattern on the transverse section.

MAYFLOWER. *Tecoma pentaphylla* A. Juss.

Weight 36 lbs. British Honduras, Mexico, Panama.

VERN—*Roble*, Sp. Am. gen.—*Roble blanco*, P R.—*Palo blanco, roble blanco, roble de yugo*, Cuba—*Apamáte, roble colorado*, Venez.—*Ocobo*, Col —*Roble de savana*, Pan.—*Mano de león, matilisquate*, Guat, Hond.—*Cortes, macuelizo*, Hond.—*Amapa*, Mex.—and others.

Record says that " the vernacular name ' roble ' is applied to a number of different trees, but to none more commonly than to *Tecoma pentaphylla*, the wood of which has a superficial resemblance to oak, though it does not have prominent rays." It is a beautiful grey-brown wood, with a grain more like mahogany than oak. When first cut it shows a light straw colour, but on exposure to air turns a silver-grey brown. The colour is so attractive that, if supplies are forthcoming, it will be in demand.

The pores are regular and very numerous; the concentric layers marked by dark lines; the medullary rays are exceedingly fine, hardly discernible under the lens, with a very marked ripple ray on all sections.

MEDANG or **MENDONG.**

Malay Peninsula.

Foxworthy reports that this wood is produced by a great number of different genera and species, and that there are over a hundred names for it, mostly known as medang with some qualifying term. The wood is a light yellow straw colour, with a smooth, close, lustrous grain, suitable for light decorative woodwork purposes or laminated woodwork. Foxworthy says the medang produced by the Cinnamomum genus has an aromatic odour. All of these woods unduly expand and contract, and are very liable to warp and twist.

The pores are very small, parallel, plugged, with numerous medullary rays which are obscure and difficult to detect under the lens.

Melaleuca leucadendron Linn.

British India, Malaya, Tropical Australia.

VERN—*Milkwood, white* or *swamp tea-tree, atchoourgo*, Aborig.—*Kayu puti*, Malay.

The Cajeput tree. The colour of the wood is reddish-brown, with a hard, close grain, reported as durable underground.

Gamble says " the leaves give the Cajeput oil used in rheumatism." Not met with in commerce.

Melanorrhoea spp., *Gluta* spp., etc.

India, Burma, Malay Peninsula, Borneo, Sumatra.

VERN—*Kheu*, Manipur—*Thitsi*, Burm—*Soothan*, Taleing—*Kiahong*, Karen—*Borneo rosewood*, *black varnish tree*, *rengas* or *ringas*, Malay.

The wood was first introduced commercially into London at the Holland Park Exhibition, 1920, under the name of " red zebra wood,"

MELANORRHOEA USITATA, UPPER BURMA

The colour is a rich deep red, with darker and lighter streaks. It has a dense, hard grain which yields a smooth surface under the tool. Several handsome pieces of furniture, including a copy of an early Jacobean cabinet in the possession of the late Percy Macquoid, were shown at this Exhibition, where the wood was much admired. It was also used as lining and banding in tables and sideboards. In the East it is reported as used for building bridges, and smaller work, such as tool handles.

Dr. Foxworthy, in *Malayan Forest Records*, No. 3, 1927, says: " Ridley . . . gives *Melanorrhoea Maingayi* Hook. f. as the principal source of the timber known as Rengas. It now seems that Rengas is produced

by quite a number of species belonging to the genera *Gluta, Melanorrhoea, Melanochyla, Parishia,* and *Swintonia.* The group is not well understood and no attempt is made to define the different species." Speaking of the danger of poisoning, he says: "The wood contains some of the poison, which is most active when the wood is fresh, but which is capable of causing poisoning many years after the wood is first cut." It may be that, as in such woods as koko, Knysna boxwood, balsa, and greenheart, there is a particular property, affecting individual shipments, which may contain some slightly poisonous qualities producing feverish attacks, swollen glands, or even a septic condition; but ten years of its use in England has not confirmed his statement, and to my knowledge no complaints have been made. At the same time, a continued warning such as that afforded by Dr. Foxworthy's last publication, and coming from such an authority, must not be ignored.

The pores are numerous, uneven, irregular in position and size, generally small and plugged. Medullary rays numerous, irregular, close and fine, with thicker wavy lines, crossed at right angles by similar lines, making a pretty pattern on the transverse section.

Melia Azedarach Linn.

Weight 38–40 lbs. (Gamble). India, Burma, Ceylon.

VERN—*Darachk,* Kuram Valley—*Chein, kachein,* Sutlej—*Drek, bakáin, bakáyan, betain, deikna, bakarja,* Hind—*Deknoi,* Jaunsar—*Bitan,* Kumaon—*Denkan,* Garhwal—*Bitrayan,* Dotial—*Maha limbo, malla nim, muhli,* C.P.—*Bakainú,* Nep.—*Pejri, padrai,* Mar.—*Mallay vembu,* Tam.—*Taraka vepa, makánim,* Tel.—*Bévu, chik bévu, heb-bévu,* Kan.—*Thamaga, tamaga,* Burm.

This is known as the "Persian lilac." The colour is mahogany red, and while attractive, the wood is rather soft, but valuable for decorative cabinet purposes.

Swain mentions an Australian variety, *M. Azedarach* var. *australasica,* or *M. composita,* generally called "tulip cedar," and "known to bushmen as 'white cedar,' although the wood is not white but is variegated like streaky bacon."

The pores are fairly large, mostly plugged; strong medullary rays showing prominently on the radial section.

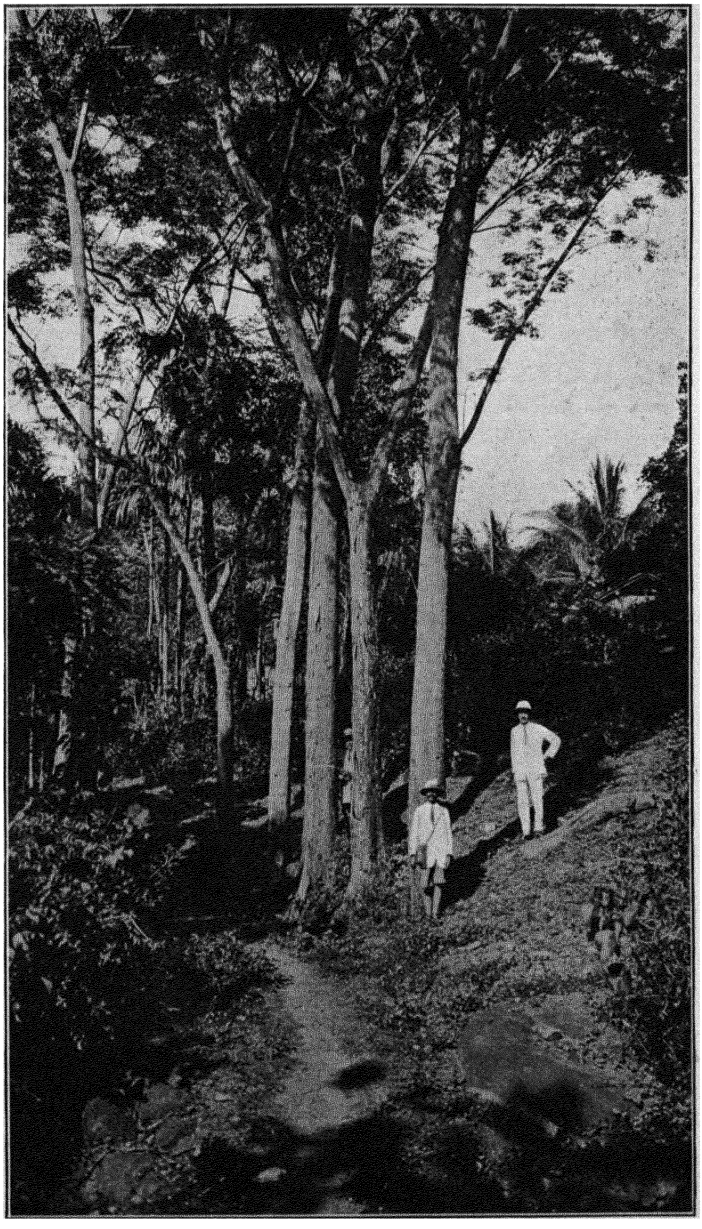
Melia composita Willd., ***M. dubia*** Hiern.

Weight 26–33 lbs. (Gamble). India, Ceylon, Africa, Australia, Tropical Asia.

VERN—*Eisúr, limbarra, nimbarra,* Bombay—*Dingkurlong,* Khasia—*Mallay vembu,* Tam.—*Bévu, betta bévu, kád bévu,* Kan.—*Lunumidella,* Cingh.

The wood of the two different species, for commercial purposes, may be treated as the same. It is reddish-white in colour, yielding a smooth

surface from the tool. Gamble says: "The structure resembles that of



MELIA COMPOSITA TREES

toon (*Cedrela Toona*), but all the pores are of the same size, and the wood is softer. . . . In Ceylon the outriggers of native boats are made of this

wood, which is highly esteemed also for various other purposes." The failure in discovering the value of Indian timbers is again illustrated by the use of such a valuable wood for the outriggers of native boats.

This wood has the unique grain of kiri, *Paulownia* sp., varying only in the colour. In Japan the wood of *Paulownia* is highly valued, and it has been used greatly to the advantage of the producer.

The concentric layers are marked by pronounced, thin, dark-coloured lines, with open pores of small to large size, other pores open and plugged, very small to medium-sized. The medullary rays are rather coarse, at very irregular intervals, wavy, showing on the radial section as in cedars (*Cedrela* spp.).

Melia indica Brandis. ***M. Azadirachta*** Linn.
Azadirachta indica Juss.

Weight 45–52 lbs. (Gamble). India, Burma, Ceylon.

VERN—*Azad-darakht, neb,* Pers.—*Nim,* Hind.—*Betain,* Kumaon—*Agas,* Palamow—*Limbo,* C P.—*Kohumba,* Guz —*Nimuri,* Sindi—*Vepa, vempu,* Tam.—*Yapa, yepa, taruka, vempa,* Tel.—*Limb, nimbav,* Mar.—*Bevina, bévu, heb-bévu, kirri bévu,* Kan.—*Kohomba,* Cingh —*Tamaka, thinbaw-tamaka,* Burm.

This is known as the " neem " tree, which is prominent in Northern or Western India, and may be seen growing in avenues in Calcutta and other places in Burma. Gamble quotes Oliver, who states : " It is wild and cultivated in Upper Burma." The tree is reported as being very productive, almost every part of it, the bark, wood, leaves, seeds, oil, and gum, all being utilised for medicine, food, or otherwise. Moreover, it provides most excellent shade when other trees are bare.

The wood resembles that of high-class quality mahogany (*Swietenia mahogani*), so that even an expert might be deceived. Gamble says that the authorities report the wood as warping and splitting, but experiments show that, properly handled, there is no danger in this respect.

The concentric layers of growth are marked by thin white lines, the pores generally in groups, rather small, plugged ; the medullary rays parallel but not straight, well-defined, crossed at wide and irregular intervals by stronger light patterns.

Memecylon capitellatum Linn.

Weight 58–60 lbs. (Gamble). Ceylon, Burma, The Deccan.

VERN—*Nirasa,* Uriya—*Alli,* Tel.—*Arjun, arjuni, kurpa,* Bombay—*Udatalli,* Kan.—*Kaya, kassau,* Tam.—*Kora-kaha, weli-kaha, dodan-kaha,* Cingh.

The wood is a rather bright yellow colour, with a close, compact grain, yielding a very smooth surface from the tool. Gamble states that it is a small tree useful for fuel and making charcoal ; in the Deccan it is used

for house-posts. The quality of the wood is far too good to be used for such purposes; it would be an excellent medium for all descriptions of decorative woodwork, although not of sufficient character to warrant export.

The pores are very scarce and small, plugged. Medullary rays rather coarse, irregular, uneven, and unequal, showing on the radial section in tiny flecks.

MEMPENING. *Pasania* spp.
Quercus spp.

Malay Peninsula.

VERN—*Berangan babi.*

The colour of the wood is a pinkish-brown, duller but somewhat like that of *Quercus rubra*, with a rather soft, smooth grain, yielding a smooth surface from the tool. This product of an evergreen oak is milder and lighter in weight, softer in grain than in any other evergreen oak yet recorded. If supplies were available in commercial sizes it would meet a good demand. Foxworthy reports the wood as suitable for some classes of furniture when carefully seasoned, which is placing the value of the timber on a higher rating than it deserves.

The rather scarce pores vary from small to fairly large, ranged in streaky bands between the usual wide, pronounced medullary rays of the evergreen oak, which, as usual, show on the quartered section in dark reddish-coloured flakes.

MENGKULANG. *Tarrietia* spp.

Malaya.

VERN—*Balong ayam*, Kedah—*Mekeliang, melima, mengkeluang, merbaju, siku keluang, teraling.*

The colour of the wood is brick-red, with light, lustrous narrow streaks and a firm, strong grain, requiring a sharp tool to secure a smooth surface because of the narrow ridges of contrary harder and lighter layers. A very attractive, decorative furniture wood which Foxworthy reports as formerly used for cart-wheels in Malacca, it works readily, takes a fine polish, and is very suitable for furniture, with which opinion I entirely agree. According to the same authority, the most common form is *T. simplicifolia.*

The large open pores are scarce and widely distributed, with sparse, dark-coloured medullary rays, irregular and obscure.

MERANTI.

See SERAYA and LAUAN.

MERAWAN. *Hopea* spp.

Malay Peninsula.

VERN—*Chengal pasir, damar mata kuching, damar siput, jangkang, men garawan, merawan jangkang, pengarawan, pengarawan penak.*

Foxworthy, in *Malayan Forest Records*, No. 3, states that the timber is credited with being the produce of a number of *Hopea* species, widely distributed in the Peninsula, and rather abundant.

The wood is pale yellow when first cut, darkening after exposure to air, soft to hard, light to moderately heavy, with a variable grain which is in some cases smooth and capable of a good finish, and in other cases rough and difficult to work.

Mesua ferrea Linn.

Weight 70 lbs. (Troup). India, Burma, Ceylon, Andaman Islands, Malay Peninsula.

VERN—*Nagesar*, Beng.—*Nahor*, Ass.—*Nagesshvoro*, Uriya—*Nangal, mallay nangal, nángu, naka*, Tam.—*Naga kesara*, Tel.—*Nang*, Tinnevelly—*Nagchampa*, Mar.—*Nagasampigi, kesara*, Kan.—*Péri*, Trav. Hills—*Atha*, Coorg—*Surli*, Kader—*Behetta champagam*, Mal.—*Ná*, Cingh.—*Kaing-go*, Magh —*Naksher*, Mechi—*Gangaw*, Burm.—*Penaga, lenggapus, matopus*, Malay.

The native Burmese name by which it is sometimes known in Europe is "gangaw" ; in India it is called " Indian rose-chestnut," and sometimes " ironwood." This wood is of bright rose-red colour, which darkens on exposure, with a rather coarse, open grain ; nevertheless it is decorative in colour and general appearance. It requires to be thoroughly seasoned, when it stands well. Gamble says : " The timber is very strong, hard and heavy, and it is just its weight and hardness, and the difficulty of extracting it from the forest and converting it, that leads to its comparatively slight use. It gives good sleepers, as good as those of pyinkado, but the cost of extraction, conversion and freight is so great as to make its extended use unlikely. . . . In the Andamans . . . it is used for building, for bridges, gunstocks and tool handles."

This timber was first imported commercially into Europe in 1920, but is not yet much in demand, as its merits are not recognised by timber users. Being a valuable and important timber, efforts should be made to find those requirements for which its remarkable strength, hardness, and durability so greatly recommend it. The Superintendent (1921) of the cellular gaol at Port Blair (Andamans) prefers it for many purposes to any timber the Andamans can yield. He specially commends it for mallet heads.

The pores are not very numerous ; they are sometimes in single formation, but more generally in short radial lines of five or six joined

pores. The medullary rays are fine though distinct, and parallel; they are crossed in a peculiarly irregular manner by small, white wavy lines, the whole giving an effect as of a badly damaged spider's web. The transverse section shows concentric belts of light- and dark-coloured wood.

Michelia excelsa and *M. Kisopa*

See CHAMP.

Michelia nilagirica Zenk.

Ceylon, Southern India.

VERN—*Pila champa*, Hind., Mar.—*Shembugha*, Tam.—*Wal-sapu*, Cingh.

The colour of this wood is a light yellowish-white, with a very close grain, and yielding a smooth surface, especially for such a light wood. Trimen reports that it was used for sleepers on the Nanu-oya Railway, and Gamble that it is used for house-building; this last authority quotes the weight at 38 lbs. per foot cube, but the specimen provided to me by the Forest Authorities, Ceylon, is much lighter, namely, 25–27 lbs. It seems impossible that this wood can be useful for either sleepers or house-building, but it would prove an excellent substitute for balsa wood, or in place of *Paulownia* for the linings of small cabinets.

The pores are very scarce, irregular in size and position; medullary rays strongly marked, very numerous, and showing in an unusually pronounced manner on the radial section.

MILHO COZIDO. *Licania incana* Aubl.

Weight 59 lbs. Brazil.

This wood is of a light nut-brown colour, yielding a smooth straight surface from the plane. It has a close texture comparable to that of Spanish mahogany, and it shows minute flecks on the radial section. Pereira says it is a scarce timber, of secondary quality, used for interior works.

The pores are rather scarce and are variable in size; they include a proportion which are wider and more open than is usual in Brazilian timbers. There are wavy bands of light tissue following the line of the concentric layer. The very numerous medullary rays are exceedingly fine, forming, with the wavy bands which cross them at right angles, a fine lace-like network.

Miliusa velutina Hook.

Weight 48–53 lbs. (Gamble). India, Burma.

VERN—*Dom-sál*, Hind.—*Daulo*, Kumaon—*Gausal*, Garhwal—*Kari*, C.P. —*Kharrei, kajrauta*, Oudh—*Karikaput*, Koderma—*Peddachilka dúdúga, nalla dúdúga*, Tel.—*Thabutkyi*, Burm.

A light brownish-green coloured wood with a fine, close-grained texture. Not likely to be of any commercial importance, but apparently of some use in its native country.

Pores are scarce ; medullary rays coarse but well-defined.

Millettia pendula Bth.

Weight 66 lbs. India, Burma.

VERN—*Thinwin*, Burm.

This is a very beautiful wood possessing a rare figure, and it would be much sought for if a regular supply were established. It is of a dark chocolate colour, with black and reddish streaks, and somewhat resembles a rich dark partridge wood. It is capable of a smooth surface, but requires a sharp tool, and finishes with a bright metallic lustre. It would be valuable for cabinet work and inlay, also for walking-sticks and turned articles of a decorative nature.

The pores are scarce, and generally plugged with gum. The medullary rays are very fine indeed, although clear-cut ; they are parallel and exceedingly numerous, and crossed by pretty wavy lines of light ripples following the concentric layers.

Mimusops Elengi Linn.

Weight 54–57 lbs. (Gamble). India, Burma, The Andamans.

VERN—*Bukal, bohl*, Beng., Mar.—*Mulsári, maulser*, Hind.—*Khiri, kirakuli*, Uriya—*Pál*, Palkonda—*Magadam, mahila, makil, mukalai, vilva-pattiri*, Tam.—*Pogada*, Tel.—*Bokal, boklu, mugali, bokli, renje, bagalamara*, Kan.—*Barsoli*, Meywar—*Vavoli, ovalli, owli*, Mar —*Elengi*, Mal —*Kaya, chaya*, Burm.—*Munamal*, Cingh.

Pearson and Brown, in *Commercial Timbers of India*, give the name " bullet-wood " to this timber.

The colour of the wood is bright plum-red, with a very hard, close, compact grain, the pores on the tangential grain shining brightly in tiny specks. It resembles very much the European plum, but is much harder and heavier.

" Pores small, in short lines, which are generally radial but often irregular and oblique. Medullary rays very fine, very numerous, uniform and equidistant. Many parallel, wavy, concentric bands, narrow but conspicuous " (Gamble).

Mimusops hexandra Roxb.

Weight 72 lbs. (Gamble). India, Ceylon.

VERN—*Khír, khirni*, Hind.—*Rain*, Meywar—*Khiri, kirakuli*, Uriya—*Ranjana, raini, khirni*, Mar.—*Raini*, Gondi—*Pála, palle panlo, palla pandu*, Tel.—*Palla, kanun palle, palai*, Tam.—*Pal*, Palkonda—*Palu*, Cingh.

This very valuable wood is known in Ceylon as "palu," and in the Andamans as "bullet-wood." Pearson and Brown, in *Commercial Timbers of India*, attach the name to *M. Elengi* and *M. littoralis*, and do not mention it as produced by *M. hexandra*, quoting the latter as a synonym of *M. indica*. The wood is purplish-red in colour, with a very close, firm, hard texture. Occasional logs have found their way into London from Ceylon and the Andamans, but while it is a valuable wood in its native place, it cannot compete in Europe with the South American beefwood (*Mimusops globosa*), which it resembles. It is capable of a very smooth surface from the tool, and is excellent for turnery. Gamble reports it as used for sugar-mill beams, oil-presses, house-posts, tool handles, and turnery. He adds: "The great weight and hardness hamper its extended use as timber," failing to recognise that these are the qualities which make its exceptional value, and that as the world's supplies of such timbers are rapidly diminishing, its uses should be confined to those purposes for which it is suitable, which do not include house-building or furniture. Trimen reports its use for railway sleepers—a most unreasonable waste of a valuable wood. Pearson and Brown report it as very durable, quoting the same kind of uses as above, but showing that it is suitable for articles where toughness and hardness are of importance, yet still failing to realise the value of a rare wood which should not be used for common purposes.

The very numerous, tiny pores are in belts or bands, and plugged. The medullary rays are numerous, very fine, and difficult to distinguish under the lens.

Mimusops littoralis Kurz.

Weight 66 lbs. The Andaman Islands.

VERN—*Mohwa, pinlè-mohwa, katpali*, Burm.—*Dogola, mowha*, And.

This is a handsome wood, sometimes known as "bullet-wood" and resembling *M. Elengi* but of a lighter red, and a more wavy grain. It is smooth, and takes a good polish. Gamble says that it is apt to split. "The timber is extracted in squares up to 50 feet long with a siding of 2 feet. It is difficult to cut and saw or to drive nails into. . . .

"Pores very small, elongated, subdivided, in radial or oblique lines. Medullary rays very fine, very numerous, uniform, and equidistant."

MINGRIS. *Koompassia Beccariana* Taub.
Weight 52 lbs. 14 oz. Borneo.

This timber is hard, and is of a dull, brick-red colour. In Borneo it is not considered durable, and seems liable to twist and warp. It very much resembles the somewhat inferior varieties of *Dipterocarpus*.

The numerous open pores are filled with gum. The very fine medullary rays are parallel, but not quite equidistant.

MIRABOW, MIRABOO, or MERBAU. *Intsia Bakeri* Prain.
Afzelia palembanica Baker, and possibly
Intzia (*Afzelia*) *bijuga* Colebr.
Weight 60 lbs. 10 oz. Malay Peninsula, Borneo, India, The Philippines.

VERN—*Ipil*, Malay.

Intsia Bakeri occurs in the Malay Peninsula, Borneo, and Sumatra; no such narrow limits mark the coastal species, *I. bijuga*, which is widely distributed over the tropics of the Old World from Madagascar and the Seychelles to India, Malaya, and across the Pacific Ocean as far as the Sandwich Isles. According to Foxworthy the woods of the two species are named respectively "miraboo" and "ipil" or "miraboo laut," but are so similar in appearance that he could detect no structural difference between them. It is possible that the wood of commerce may be derived from both species. It has been imported in sawn planks and boards of various sizes.

The timber is so hard and heavy that it is sometimes numbered among the "ironwoods." It is of a warm, brown colour that darkens almost to blackness with age and exposure. The Borneo wood is one of the most valuable in that island, and has been imported into England under the name of "Borneo teak" or "Borneo No. 1 teak," but it has none of the qualities of teak, and on account of its heaviness did not find favour as a substitute for that wood. The wood from New Guinea (probably *I. bijuga*) imported into Germany was also recommended as a substitute for teak. Mirabow takes a good polish and has been extensively used in the Far East in the manufacture of furniture; one fine piece possessed by Dr. Hose in Borneo formed the circular top of a dining-table (8½ feet in diameter and 2½ inches in thickness) and had been hewn from the trunk, moulded, and completely finished by natives solely with the aid of axes. Being very resistant to decay, and to the attacks of insects (including "worms"), the timber has been successfully used in Borneo, etc., for bridges, houses, posts, and other constructional purposes; but it is said to corrode steel.

Experiments have been made in America which serve to show that this wood is but little affected by acid, and consequently makes a good

wood for accumulator boxes ; but according to an American Professor it contains too much colouring matter, which might discolour the solution.

In transverse section the wood shows many thin, sharp, light concentric lines, dividing it into concentric zones which are of very uneven widths. The same section also reveals numerous light dots, evenly scattered ; each dot has a light-coloured fringe and includes one or more pores, which are mostly visible to the naked eye. The coarse vessels (pores) contain a substance which is sulphur-yellow or glistening red to reddish-black. The light-coloured medullary rays are fine and numerous.

MIRO. *Podocarpus ferruginea* Dow.
Weight 46 lbs. (Baterden). New Zealand.

The wood varies from light to dark brown in colour, is close in grain, moderately hard and heavy, planes up well, and takes a good polish. Some logs are nicely figured ; it is, therefore, very suitable for cabinet-makers' work. It would also be useful for the turner, and for any ornamental work. As it yields timber 10 to 18 inches square, and 20 to 30 feet in length, it would no doubt be fit for civil architecture.

Mischodon zeylanicus Thw.
Weight 69 lbs. Ceylon, Southern India.
VERN—*Tampanai*, Tam.—*Tammanua*, Cingh.

The colour is a dull nut-brown, with a reddish shade, the texture very close and compact, yielding a very smooth surface from the tool. Gamble reports it as " used for building, and durable under water." Its qualities, however, render it unsuitable for building purposes, as it is very hard and would be expensive to work ; but it is very suitable for decorative woodwork and turnery.

The concentric layers of growth are marked by light lines. The pores are very small, numerous, and plugged. Medullary rays very numerous, exceedingly fine, parallel, uniform and regular.

M'KUNGUNI. *Commifera* sp. Troup.
Weight 42 lbs. East Africa.

The colour when first cut is a bright golden green with very fine, purple veins, but with exposure it changes to an attractive olive brown with still a touch of green in it. The grain is very close, compact, hard, yielding a very smooth surface from the tool. Suitable for furniture, panelling, and good class decorative woodwork.

According to a letter from the Conservator of Forests, Tanganyika, the trees are widely scattered and there is a lack of transport. He adds: " The trees as a rule would square from 18" to 24", and they would have

to be carried by natives, which limits them to 10 cubic feet, consequently only small sizes could be transported."

The concentric layers are marked by dark and light lines at varying intervals, and more or less pronounced, with numberless very small pores, plugged, and generally surrounded by belts of light tissue, crossed at right angles by strong, fine, pronounced medullary rays.

MOERI. Possibly *Brabejum stellatifolium* L.

South Africa.

This is the well-known " red stinkwood " or " wild almond " of South Africa. The colour is a dull brick-red, and the wood has a close, hard grain. In quality, grain, hardness, and weight it resembles Muer (*Pygeum africanum*), although there is a noticeable difference in the structure, that of moeri having the pores regular in both position and size, often seen in twin and triple formation ; medullary rays are parallel, often exceedingly close together, and comparatively strong ; while my specimen of muer shows the concentric layers clearly marked, the pores less numerous and plugged, and very fine, close medullary rays.

MOHO. (*Narrow Leaf*) *Bellotia Campbellii* Sprague.

This wood seems to be identically the same as the well-known balsa wood, *Ochroma* species. For description, therefore, see BALSA WOOD, *Ochroma* spp.

Record does not mention *Bellotia Campbellii*, which name is attributed to the balsa wood in British Honduras.

MOIRA-TINGA.

See KING TREE.

MOLAVE. *Vitex littoralis*, Dene.

The Philippines.

This wood is yellowish or straw-coloured, hard, heavy, strong, and close in the grain ; it possesses a figure or waviness that somewhat resembles satinwood, hence it may be found useful not only in building but for cabinet purposes. Molave timber appears to be of good quality, and has the property of seasoning without much shrinkage or splitting ; it also stands long exposure to the weather without showing any signs of deterioration. In the Philippines it is considered very durable.

Foxworthy states that for many purposes it seems to be fully the equal of teak. Amongst its many uses he mentions house- and ship-building, cabinet-making, doors, flooring, sleepers, and paving-blocks.

MONCA BRANCA. Source unknown.
Weight 44 lbs. Brazil.

This brown-coloured wood with its smooth, tight grain, somewhat resembles the silky oak (*Grevillea robusta*) of Australia in texture and appearance. The flecks which show on the radial section are of a darker colour than the groundwork.

The small pores are uniform in size and position. In between are the large, strongly marked medullary rays, which radiate from the centre in curves.

MORA. *Dimorphandra Mora* Benth. & Hook.
D. excelsa Baill., or *Mora excelsa* Baill.
Weight 76 lbs. 14 oz. (fresh cut). British and Dutch Guiana.
VERN—*Mora*, B. G.—*Peto, mora, roode mora, witte mora, palakoea*, Sur.—*Mahot rouge*, Fr. G.—*Belarbe*, Mart.—*Mora, muro*, Trin.—*Moraholz*, Germ.

In 1875 Laslett published a good report of this wood, from which time until just lately (1930) little, if any, efforts have been made to popularise it. Fourteen logs hewn square, straight-grained and of good quality, came to London from Surinam during the war, the cargo having been diverted from Havre.

Stone and Freeman give a very complete account in which they say that it is more durable than teak. They mention three varieties: the red, the white, and mora-bucquia; this last, however, is not considered to be durable. Record refers to this as "morabucquia" and says that it resembles the true mora, and is confused with it on the market. "Mora can be met with in logs 18 to 35 feet in length, 12 to 20 inches square"; these are the same sizes reported by Laslett.

The wood is a yellowish-brown colour, and contains an oily and glutinous substance in its pores, probably conducive to its durability. It is of close texture, and has occasionally a twist or waviness in the fibre, which imparts to the logs possessing it a figured appearance.

The Panama species is *Dimorphandra oleifera* (Triana). Miles Haman reports that the wood springs in sawing, but does not splinter readily, and planes well. It resists decay but is susceptible to attack by teredo and other marine borers. The worst defect is water-cracks in the heart. It is excellent for shipbuilding, railway ties, house frames, etc.; 150 sleepers have lately been sent to the London Midland & Scottish Railway to be laid and tested.

The pores of *Dimorphandra Mora* are conspicuous and numerous, and are generally in duplicate or triplicate, more or less filled with gum. The medullary rays are strongly defined, irregular, frequent, scarcely parallel, and show clearly on the tangential section.

MORRELL. *Eucalyptus longicornis* F. v. M.
Weight 64 lbs. Western Australia.

" It is a strong, dense, hard wood, and has an interlocked grain. It is of a dark brown colour and is used for wheelwrights' work, tool handles, etc. It is also used for mining timber. . . . Transverse strength 16,900 lbs. per square inch. Tensile strength 18,000 lbs. per square inch " (Lane-Poole).

Morus indica Linn.
Weight 37–47 lbs. (Gamble).

M. laevigata Wall.
Weight 45 lbs. India, Burma.

VERN—*Túl*, Pb.—*Tútri*, Hind —*Tút*, Kashmir—*Siahtút*, Kumaon—*Tút*, Beng.—*Chota kimbu*, Nep.—*Mekrap*, Lepcha—*Nuni*, *meshkuri*, Ass.—*Tút*, *ambat*, Mar.—*Poza*, Burm.

The mulberry tree in India is cultivated more for the leaves required for feeding silkworms than for its wood, but the latter is of such a fine quality that it would prove to be of very considerable value if properly handled; and there are so many useful purposes to which this wood could be put, that the order might well be reversed. It was never met with in ordinary commerce until some experimental logs were sent over for the 1920 Holland Park Exhibition, when the outstanding qualities of the wood were recognised. It is of a golden-brown colour, darkening on exposure, slightly less yellow than the European mulberry, with a nice firm texture, capable of a smooth surface under the tool, good tangential strength, and excellent standing qualities. Small shipments were received from both India and Burma, and although they were both good, the latter proved to be the better. This tree might well be cultivated for future development.

The growth is rapid, and concentric layers wide, and very strongly marked by light-coloured rings, which contain large open pores in a narrow belt in the wood growth.

The pores are exceedingly small, fairly numerous, but irregularly placed. The medullary rays are very strong, parallel, but at uneven distances, and show in a marked manner on the radial section.

M. laevigata.

VERN—*Tút*, Hind.—*Kimbu*, Nep.—*Nambyong*, Lepcha—*Singtok*, *senta*, Bhutia—*Bola*, Ass.—*Malaing*, *tawpwèsa*, *tawposa*, *posa*, Burm.

This wood is similar in many respects to *M. indica*, except that in the Eastern Himalayas it often grows to a height of 100 feet, with a girth of 15 feet, and is of slower growth. It is of unusual and unique qualities, being suitable for panelling, carving, and turnery, as it bends easily and

stands well under great strain ; it is particularly suitable for tennis racquets. A canoe was constructed for the Wembley Exhibition, and this wood was used for the timbers, stem, sculls, etc.

The pores are very scarce, rather small, often subdivided, and slightly plugged. The medullary rays are rather coarse, irregular, and uneven, showing on the radial section as prominent, but small, silver grain ; they are crossed at right angles by white lines, which probably mark the layers of concentric growth.

MOVINGUI. *Distemonanthus Benthamianus* Baill.
Weight 39 lbs. West Africa (Cameroons, Gaboon).

The colour is like satinwood, darkening on exposure, and the wood similar in grain, but more open, and showing the pores more clearly. Certain logs yield a fine figure or broken roe, which is much in demand, and the wood has been used effectively in panelling at various exhibitions, also on cross-Channel steamers.

The concentric layers are marked by lighter and darker coloured rings. The numerous pores varying greatly in size, are in short wavy belts, generally plugged, with fine, well-defined medullary rays, regular and crossed at right angles by similar light lines forming a network pattern.

MUER. *Pygeum africanum.*
Weight 51 lbs. East Africa.

The colour is a dull brick-red, with a very close, compact grain, showing on the tangential section innumerable tiny specks of sparkling gum. The wood possesses all the qualities of a good Spanish mahogany, for which it would pass in any finished work.

The concentric layers are clearly marked. The pores are fairly numerous and plugged, with very fine and close medullary rays.

MUGAITA. *Rapanea rhododendroides.*
Weight 45–46 lbs. East Africa.

The colour of this wood is a rather dull yellowish-red, with a hard, tough grain ; it requires a sharp tool to saw and plane, and does not take a very smooth surface. Has not been seen in European markets. It is reported as being used for cabinet and furniture work locally, but care in seasoning is required, as the wood is very liable to warp and twist.

The minute pores, plugged, are ranged between very pronounced, exceedingly thick medullary rays, which show on the radial section.

MUHUGU. *Brachylaena Hutchinsii.*
Weight 58–60 lbs. East Africa.

The colour is an olive-green brown, with a very close, compact grain giving a fairly smooth surface from the tool. The wood has not been seen

in commerce, but is reported as very durable and immune from the attack of insects, and used in its native country for furniture, bridge decking, and fuel.

The innumerable tiny pores, plugged, are regularly distributed, with very fine medullary rays, confused and hardly discernible under the lens.

MUIRAPIRANGA. *Brosimum paraense* Huber.

Weight 70–71 lbs. The Amazon region.

VERN—*Satiné, satiné rubanné, satiné rubané, satiné gris, bois de féroles, bois de lettre rouge, bois de Cayenne, bois baroit, bois marbre* ? Fr. G. —*Satiné rubanné, ajeersi, oolemeriballi, warimiballi, sokonéballi addà*, Sur.—*Muirapiranga, meurapiranga, moira-piranga, condurú, condurú de sangue, cundurú, gondurú*, Braz—*Palo de sangre*, Peru—*Cacique*, Pan.—*Brazil redwood, cardinal wood*, Misc.

Record says: "The 'muirapiranga' of the Amazon region, *Brosimum paraense* Huber, is distinguished from the others (*Brosimum* species) by having a large core of beautiful red heart-wood." The colour is a rich purple red, with a very close, straight grain, with alternate lines reminiscent of the French satiné, although darker in colour. Record calls attention to the similarity of structure with letterwood (*Piratinera guianensis*).

A very fine decorative wood, suitable for high-class cabinet work.

The medium-sized pores, all plugged, are irregularly placed, subdivided, with very uneven medullary rays in irregular size and position, wavy.

MUIROSI. *Maba abysainica.*

Weight 47 lbs. East Africa.

A hard, close-grained wood, so closely resembling West African boxwood that even the expert might be deceived.

The exceedingly numerous tiny pores, all plugged, are evenly scattered over the surface. Medullary rays hardly discernible under the lens.

MULBERRY. *Morus nigra* Linn.

Weight 40 lbs. Europe, Great Britain.

The black mulberry has been cultivated in Southern Europe from a very early period, and according to Elwes was probably planted in England about the sixteenth century; there still remain many very old and decayed examples in various parts of the country. The colour when first cut is a brilliant gamboge yellow, on exposure becoming a rich golden brown, with a firm grain. The wood is strong, and if sufficient size and length is procurable it provides a first-class chair wood. A very old tree in Lord Hewart's garden at Totteridge, which was blown down during the winter of 1929–30, provided some handsome burrs and some sound wood, from which several small occasional tables were made for Lady Hewart.

When finished the wood gives a rich and attractive appearance, equal if not superior to anything which could be provided from very much more expensive woods, which are ordinarily procured from abroad at considerable cost.

The concentric layers are clearly defined by pronounced rings of pores which are large and open, in distinct lines, with secondary pores in the later growth crossed at right angles by very wide, strong medullary rays, at parallel but very irregular intervals, showing on the radial section and making a pretty pattern.

MULGA. *Acacia Aneura* F. v. M.
Weight 68 lbs. Southern Australia.

A reddish-brown timber with a very bright yellow sap-wood, resembling English plum. A useful decorative wood for inlays and bandings.

Hard, close-grained, and heavy. Concentric layers of growth marked by light bands; exceedingly numerous and very minute pores, with the finest of all fine medullary rays, hardly discernible under the lens.

MULTA. Source unknown.
Weight 55 lbs. Brazil.

This wood has a pleasing greyish-brown colour, and the specimen shows a faint mackerel ripple. The small specimen, only 2 inches by 4 inches, contains the heart and the pith, so that probably the tree is only a small one. The texture is very hard, firm, and close, and the wood should form a good medium for inlay veneer work.

The pores, which are very small, are all linked up with lines of light-coloured tissue, which follow the growth of the concentric layers. The exceedingly fine medullary rays are very numerous, but can only be discerned under the lens (+10).

MUNGUBA. Source unknown.
Weight 33 lbs. Brazil.

This is a dirty, greyish-coloured wood; it is of a coarse, soft grain, and is of little consequence.

The transverse grain is so soft that it is impossible to plane the wood and to examine the structure.

MUSENGERA or **MUSANGIRA.** *Podocarpus milanjianus*
P. gracilior.
Weight 28–30 lbs. East Africa.

The local name for this wood is podo. It is of a bright yellow straw colour, with a firm grain, capable of a smooth surface from the tool, very like kauri pine. It is reported as being obtainable in lengths up to 25

feet, and to square up to 24 inches. The woods produced by the *Podocarpus* species, while attractive in appearance and easy to work, are unfortunately all liable to warp and twist in a degree beyond most woods of this character. Musengera is reported as being used locally for building works and for plain furniture.

The suggestion that it would be a good substitute for pine and deal is mistaken, as it is neither sufficiently reliable nor can it be provided on an equally economical basis.

The similarity between the two sorts named above is so great that it is difficult to differentiate between them.

MUSHAMI. *Allophylus abyssinicus.*
Weight 36 lbs. East Africa.

The wood is of a dirty white colour when first cut, darkening to brown on exposure. It is moderately hard, shrinks in seasoning, requires to be bored for nails to be driven into it, and is reported as subject to attack of insects.

The pores, mostly subdivided, are small, evenly placed, and generally open ; medullary rays hardly discernible under the lens.

MUSKWOOD. *Olearia argophylla* F. v. M.
Weight 29–30 lbs. South-east Australia, Tasmania.

The colour is a golden brown, with a close grain like olive wood, but not so hard, taking a smooth surface from the tool. The tree apparently is subject to burr growth, yielding valuable burr wood and figure of a high-class character.

MUTARI. *Panax* sp.
Weight 28–30 lbs. East Africa.

The colour is a yellowish-white, showing innumerable specks of sparkling gum and a soft but compact grain, like Indian balsa but harder and heavier. This wood has never been seen on the European markets and there is little information concerning its uses, but it would be an admirable substitute for works where balsa woods are required, if a little heavier weight would not be detrimental.

The very sparse pores, very small to fairly large, are mostly plugged with faint, irregular, rough-edged medullary rays which show on the radial section as in Indian balsa, but smaller.

The botanical equivalent *Panax* sp. is tentatively given by Troup. The description given of another East African wood named mutati (*Heptapleurum* sp.), which was shown at the Holland Park Exhibition in 1920, is exactly similar to that given above, and, failing any more information on the subject, it seems probable that the mutati and mutari are the same timber.

MUZAITA.

See *Ocotea usambarensis.*

MYALL. *Acacia pendula* A. Cunn.

Weight 76 lbs. Queensland, New South Wales, Victoria.

The colour of the wood is a rich, warm brown with darker and lighter streaks. It has a very hard, smooth, close grain, and possesses a highly aromatic scent, but not the same as that of *Acacia acuminata* (*q.v.*), for which wood it has sometimes been mistaken. Baker says it is " close in texture, not too distinctly figured, polishes well, and should be very suitable for turnery, as it makes splendid handles of all kinds for bowls, mauls, etc."

MY LADY. *Aspidosperma megalocarpon* Miell.

Weight 59–60 lbs. British Honduras.

An uninteresting reddish-yellow wood, which evidently casts and warps unduly.

The transverse section shows a multitude of extremely fine, small, plugged pores, with also a multitude of very fine, well-defined rays, parallel and close together. Transverse section similar to that in the case of Billy Webb, but everything in identification is of a smaller nature.

Myoporum serratum R. Br.

Weight 41 lbs. Australia.

Known as native juniper, blueberry, native currant, cockatoo bush, native myrtle.

The colour of the wood is whitish-yellow, with a hard, strong grain, like birch requiring a very sharp tool to produce a smooth surface ; a useful furniture wood.

The concentric layers are marked by bands of very fine pores, plugged with numerous strong medullary rays, varying in size. The very numerous tiny pores are of two sorts, some quite open, others arranged in wavy belts, plugged, with exceedingly numerous, very fine medullary rays hardly discernible under the lens, which are crossed by still fainter light-coloured lines forming a rather rough network pattern.

Myristica Irya Gaertn.

Weight 52 lbs. (Gamble).

Burma, Andaman Islands, Ceylon, Malacca, Malay.

VERN—*Mutwindâ, chuglam,* And.—*Iriya,* Cingh.—*Maloh,* Burm.

Although this wood bears the vernacular name of " chuglam," it must not be confused with the well-known " chuglam " of the Andaman Islands,

which is the produce of *Terminalia* sp. The colour is a light brick-red, with darker-coloured thin veins, somewhat like poon. The grain is close, and yields a fairly smooth surface from the tool. A useful wood for common purposes, but although Gamble reports it as seasoning well and taking a good polish, his expression " a handsome wood, worthy of attention " cannot be confirmed.

The small pores are very scarce, uniform in position and size, and generally surrounded with a pale tissue. The numerous medullary rays are irregular, uneven, and crossed at right angles by fine light lines making a network pattern. Medullary rays numerous, very fine, wavy, showing on the radial section in tiny flecks.

Myristica laurifolia Hk.

Weight 32–33 lbs. Ceylon, Southern India.

VERN—*Malam padavu, palmanikam,* Tam.—*Patthapanu,* Kader—*Malaboda,* Cingh.

A soft, light straw-coloured wood with thin reddish streaks, and some irregular discoloration of a brownish hue. The timber is not likely to be useful except for common purposes, such as tea-boxes.

The scarce pores are grouped in an irregular manner in single, double, and triple formation. The close, numerous medullary rays are fine and prominent, crossed at irregular intervals by similar very fine light lines.

MYRTLE. *Fagus Cunninghamii.*

Weight 57–58 lbs. Tasmania, Australia.

Known also as " Tasmanian beech."

During the last few years (1930) fairly considerable quantities of myrtle have been imported into the United Kingdom.

The wood is of a salmon-pink colour, with a close, compact grain, yielding a very smooth surface under the tool, but somewhat hard to work. It is a rather attractive wood, but hardly possesses sufficient characteristics to make it worth the heavy cost of freightage and working, and up to the present it has not always stood well in the places where it has been used. Attempts have been made, but not always successfully, to utilise this wood for Post Office instruments.

A specimen of British-grown myrtle, *Nothofagus Cunninghamii,* is in my collection, the colour of which is light grey, lighter than, but otherwise similar in appearance and grain, to the well-known olive-wood. It takes an exceedingly smooth surface from the tool, and is very close-grained. If sound pieces could be secured of reasonable width, it would be a useful wood for purposes where hard, smooth surfaces are required.

In *Fagus Cunninghamii* the concentric layers are marked by darker and lighter wide lines. Pores exceedingly numerous, plugged, and very

small. The well-defined medullary rays are very fine, close, and parallel, making a pretty pattern on the radial section.

Nan-ch'ai. Source unknown.

China.

A nice yellow, canary-coloured wood, with a close grain, somewhat like Mexican prima vera, but not such a good wood.

The concentric layers are marked by thin dark lines. The pores are regular in size and position, and largely plugged. The medullary rays are very fine, equidistant, and parallel.

Nan-mu-hua.

China.

Professor Record has identified this as *Phoebe* sp. The wood has the grain and appearance of the real camphor, slightly darker, but without any scent. It has an attractive, fine, close, golden grain, highly figured, but displaying small in-barks which would militate against its use. Professor Chung says it is very costly.

The pores are very numerous, small, and mostly plugged. The medullary rays are very numerous, equidistant, parallel, and extremely fine, but clear.

NARGUSTA. *Terminalia obovata* R. & P. Eichl.
Weights, Honduras specimen 34 lbs.,
Cuba specimen 42 lbs. 12 oz. British Honduras.

In common with all of the South American timbers a definite description and statement of source seems impossible in the face of the confusion which exists, because of the duplication of names and the incomplete botanical decisions. In attributing the source of nargusta to *Terminalia obovata* I am accepting Professor Record's latest publication in *Tropical Woods*, No. 10, coupled with an authentic specimen sent to me this year (1932) by the Chief Conservator of Forests, British Honduras. At the same time, I have three other specimens, two of which were supposed to be authentic, and one, a specimen cut from a log belonging to a shipment from Cuba put upon the London market in the year 1900, and called Cuba almond-wood.

In colour and grain, as well as in wood construction, the three last specimens referred to, two from Honduras and one from Cuba, resemble each other very closely indeed, so that when the first Honduras specimen arrived in 1930 I was able immediately to identify it as the same as the shipment from Cuba in 1900. The latest specimens from the Chief Conservator at Honduras, while bearing a fairly close resemblance, present sufficient variation to make any decision still doubtful.

Tropical Woods, No. 10, gives the names as "guayabo" and "almendro" and describes the wood as "light to dark olive, often streaked, feather-grained, tough and strong, not easy to work, takes a high polish, is durable." A small pamphlet issued from British Honduras gives the description as "greenish-yellow with decorative pink lines; used locally for boards indoor and outdoor and for planks on bridges. . . . Used to decorate the interior of the Council Chamber of the new Public Buildings in Belize."

Tropical Woods, No. 24, attributes nargusta to *Terminalia Hayesii* Pittier.

Accepting all four specimens as the product of the same species, with certain variation, Record's description is sustained, excepting that he fails to remark upon the exquisite figuring, which consists of reddish-brown streaks and every description of splendid figure, including broken roe and mottle, splash mottle, plum and snail, and all those descriptions of figuring which are met with in well-known mahoganies, together with a more or less brilliant lustre. The one weakness which the wood displays is the variation of colour, which sometimes necessitates staining to give a completely good appearance. The specimens from Honduras in quality and grain are strangely Cuba-like, while in texture and surface the Cuban specimen is more reminiscent of the Honduras mahogany.

The shipment of the year 1900 sold on the London market as Cuba almond-wood consisted of a large number of large-sized hewn square logs from about 18 inches to over 36 inches. All the logs contained figure of good character, including many of the finest figured logs it would be possible to imagine. High prices were realised, and very fine decorative results secured from the veneers which were produced. The greater part of the cargo found its way to America. Since the arrival of this shipment no further supplies have been forthcoming.

Among other important works, some handsome Pullman cars, which can still be seen working on the Southern Railways, are trimmed with Cuba almond-wood.

The numerous small pores are of moderate size, partially plugged, with very numerous, very strongly defined, fine medullary rays crossed at right angles by wide and irregular similar light-coloured lines.

NARRA. *Pterocarpus indicus* Willd., syn. *P. pallidus* Blanco.
The Philippines, Malay Peninsula.

Known as sena or angsana in the Malay Peninsula. Narra is indigenous to the Malay Peninsula and Archipelago, and produces wood greatly varying in colour; said to be the most popular of the cabinet wood-producing trees in the Philippines, and sometimes called the "National Tree of the Philippines."

The colour varies from pale yellow to brown, light salmon, dark or brilliant red, often with streaks of light or dark red, the bright-red variety being the most valuable.

Foxworthy reports that the wood has "a slightly aromatic odour, durable, not attacked by termites, easily worked and polished."

According to *Tropical Woods* it is moderately hard and heavy, not very strong but fairly durable, does not split or open, is fairly easy to work, and takes a good polish. The dark wood, being stronger than the light-coloured, is considered to be the best. It is one of the most popular furniture woods of the country, often having a pretty figure.

"Has distinct ripple marks on the tangential surface" (*Malay Forest Records*).

NATIVE CHERRY. *Exocarpus Cupressiformis* Labill.
Weight 52 lbs. Australia.

The colour is yellow-red, with a close, hard texture, capable of a very smooth surface from the tool.

Baker reports it as a good cabinet and carving timber, also used for wood-turning and marquetry. It has been tried for golf clubs, but possesses no characteristic quality to recommend it for use outside its native country.

The pores are very numerous, tiny, mostly plugged, with somewhat fine, confused medullary rays which show faintly on the radial section.

NEDUN. *Pericopsis Mooniana* Thw.
Weight 45–56 lbs. (Gamble). Ceylon.
VERN—*Nédun*, Cingh.

The limitation of this tree to Ceylon is one of those strange fancies of nature which surprises the student of forestry. Many trees found in Southern India are common to Ceylon, Burma, and throughout Siam, and it seems strange that others of Southern India are not represented in the Andamans or Burma. Again, certain trees in Ceylon are non-existent in Southern India, the Andamans, or Burma. The Dutchman, with his keen discernment, recognised the valuable qualities of nedun in Ceylon, and used up the supplies rapidly, so that it is now very rare.

The visitor will find furniture, fittings, and decorative woodwork of all kinds made in this handsome wood, and it is rightly regarded throughout the island as the finest furniture wood obtainable.

It has an attractive, deep, warm brown colour, similar to dark-coloured walnut, but brighter, with a close, firm, hard grain, showing a metallic lustre like a darker edition of the black bean of Australia. It stands exceedingly well in the trying climate of Ceylon, and, unlike most timbers in India, improves in quality and appearance.

This wood and that of ormosia both belong to the *Sophoreae* family, and the wood of *Castanospermum Australe* from Australia closely resembles that of the Ceylon *Pericopsis Mooniana*, although the former is much lighter in colour.

The pores are in groups, almost entirely plugged, with exceedingly fine, close-grained medullary rays, rather regular, the whole making a very pretty pattern on the transverse section.

NEEDLEWOOD. *Hakea leucoptera* R. Br.
Weight 55 lbs. Australia.

The colour is a rich, warm reddish-brown ; the wood is close-grained, hard, and tough, somewhat resembling beefwood (*Stenocarpus salignus*) ; it is an attractive cabinet wood, and takes a good polish. Baker reports it as having been tried for tobacco pipes, but found unsatisfactory.

The pores are very scarce, almost indiscernible under the lens, with large, wide, strong medullary rays, uneven, irregular, taking a wavy line of direction.

NEGRITO. *Simaruba glauca* DC.
Weight 25–26 lbs. British Honduras, South Florida, Brazil.

Record says this is one of the most ornamental of all tropical trees in Florida. The wood is of a whitish-straw colour, with a soft close grain, but taking a very smooth surface from the tool. It is reported as not being very durable.

The sparse, open pores are rather above ordinary size, and are mostly plugged, showing rather a pithy growth. The medullary rays are neither well-defined nor definite ; crossed at irregular intervals by the very fine similar white lines, they do not show on the radial section.

NETTLE TREE. *Laportea urtica.*
New South Wales.

The colour of the wood is a rather dirty grey, with a soft, somewhat spongy grain, but it is capable of a smooth surface from the tool, showing a certain lustre when planed. The wood is very light, comparable in weight and texture to that of Indian white mahogany, and relatively strong for its weight. There is a considerable resemblance between the wood of the Australian nettle tree and that of the North American hackberry (*q.v.*).

NIRI. *Xylocarpus borneensis* Becc.
Weight 40 lbs. 4 oz. Borneo, The Philippines.

This is a hard timber, close and fine-grained, and of a dull, coffee-coloured or reddish-tinted brown, with darker brown gum-streaks. It is

rather liable to warp, but will take a fine smooth surface from the tool. Foxworthy mentions that a similar product from East Africa and the Fiji Islands, which is used for fine furniture, sandals, piling, etc., is obtained from *X. obovatus* A. Juss and *X. granatum.*

The annual rings are slightly apparent. The pores are numerous, evenly distributed, and generally filled with gum or resin. The medullary rays are fine, close, and parallel.

NUTWOOD.

See ANGELIQUE, *Dicorynia paraensis* Benth.

OAK. *Quercus* spp.

There are many different species of oaks, all belonging to the genus *Quercus*, and confined to the northern hemisphere : but the " she-oaks " of Australia, " African oak," and others from the southern hemisphere are not oaks, nor even allied to them.

In Great Britain there are two native species and their hybrids, and both of these are deciduous, that is to say, they annually shed all their foliage in autumn. These extend widely over Europe, through France, Germany, Austria, and Russia, and supply us with British, Austrian, and Russian oak. Going southwards to the Mediterranean region the deciduous species are more numerous, and are reinforced by evergreen oaks (holm oak, cork oak) which are never leafless. Passing on to India, the number of kinds, both deciduous and evergreen, is still greater, but not one of them yields timber that is exported to any extent. Again, in Japan there are quite a number of various kinds of oak, and among them are two deciduous species that supply to England and Europe generally the well-known Japanese oak. Crossing the Pacific to Canada, other species of deciduous oaks are encountered, and again on going south to the United States they are increased in numbers, and supplemented by evergreen species ; from this wealth of species are derived the medley of timbers known as American oak and (from evergreen species) " live oak."

The commercial oaks may be ranged under three main headings :

1. **EUROPEAN** : (*a*) British ; (*b*) Russian ; (*c*) Austrian ; all, or nearly all, derived from two closely allied species.

2. **AMERICAN** : (*a*) deciduous, derived from a mixture of species ; (*b*) " live oak," derived from one or more evergreen species.

3. **JAPANESE** : derived from two closely allied species.

For decorative purposes, commercial oak is supplied in the form of boards and so forth of two kinds : *wainscot* or quartered oak, and *plain* or bastard sawn oak. As plain oak is sometimes supplied in fulfilling contracts demanding wainscot oak, it is necessary to have a clear knowledge of the meaning of the latter description. This can be acquired by a con-

sideration of the history of its manufacture and the origin of the term " wainscot."

Oak and other straight-grained European timbers cleave most readily along the grain in the direction of the medullary rays, and this is particularly true when these are broad and deep. In such a case the splitting takes place along the deep rays which are thus exposed, and produces the " silver grain " common to the oak. When oak is thus split into thin boards they are wedge-shaped (being thinner towards the centre), and are termed "clap-boards," being still so called in the United States. Their shape particularly adapted them for use as shingles for roofs. The word " clap-board " itself denotes the mode of preparation, as it means a board produced by cleavage (*cf.* German word *klaffen*, to split asunder). For panelling, such boards were worked on the face side, so that ancient oak panelling shows the clash or silver grain broadly spread over the surface to an extent unobtainable by means of the saw, except in isolated cases. Wainscot boards thus prepared by cleavage were imported into England at a very early date.

According to Professor Joseph Wright, the word " wainscot " is of Dutch origin. The early Dutch form of the word is *waeghe-schot*, in which *weaghe* (old English, *waeg* ; German, *Wege*) means a wave, and *schot*, a partition, a closure of boards. Thus, according to Professor Wright, the " wave " refers to the wavy pattern on the wood (the silver grain caused by the medullary rays). " Schot " may refer to the mode of preparation, by which the wood was cleft or partitioned into boards, or to the purposes fulfilled by these in the construction of partitions in a house. Professor Wright states that in the seventeenth century, or possibly earlier, *waeghe-schot* became *wagenschot*, as the first element of the word was popularly associated with " wagen " (a wagon, a wain). Professor Skeat, another authority, says that the word is a corruption of the old Dutch *waeghe-schot*, wall-hoarding, from the old Dutch *waeg*, a wall, and *schot*, a partition. Again, it has also been said that it is derived from the old Dutch " wagen " (wagon) or " wen," and " schot " (partition), which might refer to the sides of a wagon or to a division within it. In former days wagons when journeying long distances had divisions for sleeping accommodation. This kind of partition was introduced into the house, the rooms of which were " wagen-schotted," wainscoted. Much of the panelling of early date was carried out in so-called deal, the product of *Pinus sylvestris*, but wealthier people were able to gratify their taste by using oak. As at that time saws were not used, the only possible method of conversion was that of splitting, and as oak splits on the medullary rays, the whole of the wood used showed a maximum display of " clash " or " figure."

It will thus be seen that whichever of the theories of the origin of the

term be accepted as the most probable, there is no question that for a room to be trimmed in wainscot oak the wood must show figure or clash on the face, and that the term " wainscot " used in connection with oak means figured oak.

To sum up : (1) It shows that the word " wainscot " was applied to a wood showing silver grain, the oak, and that this was necessarily divided along the medullary rays. (2) It denotes that the application of the word " wainscot " to any kind of wood not cut on the quarter is inadmissible.

While the meaning of the term wainscot as applied to oak wood is beyond doubt, the architectural meaning of the term has wandered from the original so far that it denotes a wooden boarding, sometimes panelling of the walls of a room. The consequence is that there might be ambiguity in a specification demanding that a room shall be wainscoted with oak panelling, but there should be no misunderstanding when the demand is that a room shall be panelled with wainscot oak. Yet to avoid all possibility of litigation it would be well to use the term " quartered " when wainscot oak is wanted, and possibly even supplement this term by " (well, boldly, best) figured."

Boards obtained by cleavage are necessarily wedge-shaped. With the advent of the saw it was possible to rapidly cut flat boards, but obviously if such boards were sawn exactly along the medullary rays the waste of material would be very great. It was therefore necessary to adopt some practicable and economic approximation to the results obtained by cleavage.

The following are among such methods of sawing :

The trunk is sawn down the middle (Fig. 1) ; the marginal pieces of the two halves are sawn off and there result two billets, termed wainscot billets. If these are cut in the manner shown in Fig. 2, that is, at right angles to the broad flat sides, the cut *a-b* is parallel to the medullary rays and the board yielded will be the most highly figured. A cut along *c-d* or *e-f* will traverse the medullary rays most obliquely and therefore show some figure, but the silver grain will be smaller and less marked. In fact, the nearer the board is to *a-b* the larger and bolder will be the figure ; the nearer to *c-d* or *e-f* the smaller and less bold will it be.

Yet when wainscot billets are cut sufficiently narrow (Fig. 3) all the boards show sufficient figure to be termed wainscot oak. If the billets, however, are cut wider (Fig. 4), it is evident that the boards cut from the outside will actually be plain oak, or approximate to it, so that a board *g-h* will actually be plain oak. Hence if the wainscot billets be too wide not every board cut is wainscot oak.

This mode of producing wainscot billets has been adopted during late years with oak from Riga, Libau, and to a limited extent from Japan.

Another method of sawing which is possible if the trunks are of considerable diameter, is pursued in the case of Austrian (Hungarian) oak. The butts are sawn as shown in Figs. 5 and 6. Each butt yields two wainscot billets, *A* and *B*, and two wainscot planks, *C* and *D*, 3 to 8 inches in thickness. The centre and the remaining marginal pieces, *E*, *F*, *G*, *H*,

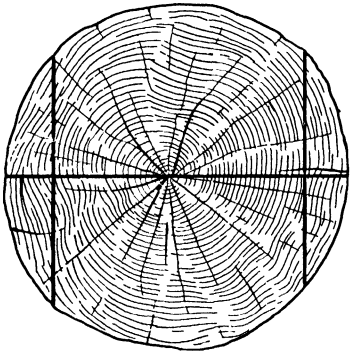


FIG. 1

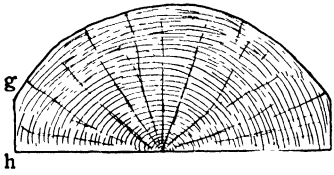


FIG. 4

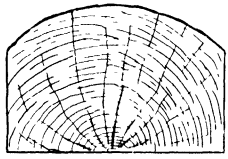


FIG. 5

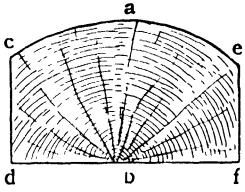


FIG. 2

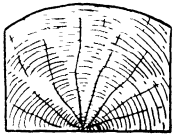


FIG. 3

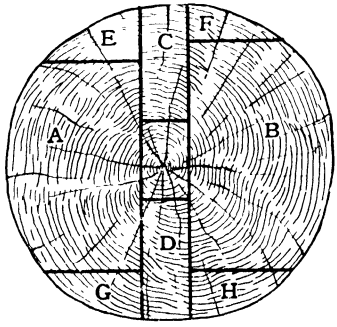


FIG. 6

are not used to produce wainscot oak. The two billets (as in Fig. 6) are subsequently cut in the manner already described.

These considerations of the mode of cutting lead to the conclusion that not every board cut from a wainscot log or wainscot billet is necessarily wainscot oak, for the marginal boards will be plain oak if the billet or log be too wide in relation to the original thickness of the butt.

So far the matter has been discussed solely from the point of view of history and decorative effect, but there is another important aspect of the question. Shrinking and warping during drying are very much less along

the medullary rays than in a direction at right angles to these. The result is that true wainscot panels will shrink, warp, or crack less than plain oak panels under the same conditions. Hence, even should oak possess little silver grain, true wainscot panels (cut on the quarter) would be more valuable than plain panels.

From all points of view then, it must be rigidly insisted that wainscot is that cut on the quarter, and showing very considerable silver grain in the form of transverse bands. It will be seen, therefore, that the original panelling in oak, or as it was termed, "wainscoting," consisted necessarily (since the whole of the wood was reft or split) of highly figured timber showing the "clash" or "flower" to the greatest extent, but that at a later date, with the advent of the use of the saw, a change gradually took place. According to an account of "W. S." published by the *Timber Trades Journal*, 7th August 1915, "The wainscot oak in the old houses in the country was mostly English oak; there was not much Dutch or Riga wainscot before the reign of William the Third (1689–1702). I think Sir Christopher Wren introduced a great deal of it into this country; he was building for a Dutch king, therefore it was natural that he should use it." John Armstrong (1835) says: "Most of the timber cut by windmills at Westzaam and Zaandam and others near Rotterdam, and shipped either from Ostend or the Holland ports." He also reports that George the Fourth (1820–30) sent his representative over to Holland to purchase wainscot oak for Gothic fittings in Windsor Castle, but although he obtained the wood he does not seem to have been very pleased with the quality, partly because he could not select billets for figure, but had to accept them as they came. George the Fourth has not been the only disappointed man. Complaints and disputes leading to law-suits and arbitrations have been continually recurring. It would therefore be desirable that, to prevent further disappointments and disputes, there should be a general agreement that where work is specified to be executed in wainscot oak, it should be understood that the wood must show a preponderance of good figure or clash, and especially so in the panels. At the same time, having regard to the altered conditions since the age when "split" wood was used, reasonable regard should be paid to the economical conversion of the material. For instance, the appearance of the finished work would not suffer if a reasonably wide latitude were allowed in the use of plain wood in mouldings, styles, and rails. A brief consideration of the foregoing remarks on conversion will conclusively show the loss or waste in attempting to produce all the timber dead on the quarter, as it appears when split.

The important position which oak occupied in the United Kingdom consumption is realised probably by only a few, and the following figures will therefore be informative:

TOTAL IMPORTS OF OAK INTO UNITED KINGDOM FROM ALL SOURCES

	Loads.	£		Loads.	£
1913 . .	254,386	1,736,061	1922 . .	108,093	1,430,184
1914 . .	180,607	1,246,220	1923 . .	164,481	2,236,660
1915 . .	123,587	956,036	1924 . .	201,246	2,716,140
1916 . .	48,221	511,368	1925 . .	203,997	2,600,756
1917 . .	7,075	163,158	1926 . .	196,694	2,453,041
1918 . .	12,679	382,563	1927 . .	254,698	3,009,587
1919 . .	137,173	2,848,016	1928 . .	263,251	3,116,591
1920 . .	85,271	2,504,200	1929 . .	261,817	3,164,021
1921 . .	59,930	1,430,184	1930 . .	280,938	3,179,263

The extraordinary totals reached in the years 1928 and 1929 of over three million pounds for the import of oak alone, suggest an inquiry which might be termed National. The following is an analysis of the figures:

	1928	1929.
U.S.A	£2,226,091	£2,215,920
Russia, Latvia, Poland, Austria, Czecho-slovakia, Yugo-slavia	508,577	572,544
Japan	214,592	242,671
*Italy	126,878	76,812
Canada and other British Possessions . . .	10,608	6,761
Irish Free State	7,422	21,512

* It is to be presumed that the imports from Italy should now include some of those previously from Austria, and might be added to the figures of the other European countries

—with others of lesser amounts.

It will thus be seen that the United States exported to the United Kingdom in 1928 and 1929 respectively a quantity almost as large as the entire annual imports of oak into the United Kingdom until 1923. The total amounts of the post-war years 1919 and 1920 are, of course, abnormal.

OAK, AFRICAN. *Lophira alata* Banks.
Weight 70 lbs.

The produce of this timber is not often seen in our markets, although J. M. Hillier, in the *Kew Bulletin*, No. 2, 1913, mentions that some was brought to Liverpool from the Gold Coast, where it is known as karkoo. He adds that "it is the favourite wood for railway sleepers and heavy constructional work generally . . . (and) owing to its great weight and the difficulties of shipment it has not yet received the notice which its merits deserve." In a list of forest trees of the West Coast of Africa, prepared by Sir Walter Egerton, it is stated that this timber is known in Yoruba as "Ponhon" and in Benin as "Ugbeberi." I have seen at least five different hardwoods from the coast all of which have been termed "African

oak," and which, although all possessing qualities of heaviness and hardness, differed materially in all other respects; it seems impossible to be sure of the identity of the different varieties.

OAK, AFRICAN. *Oldfieldia africana.*

Ivory Coast.

VERN—*Angouran, esson, fu, fou, esùi, étu.* (From the Bulletin of the Agent-General for the Colonies.)

A very hard, strong, tough wood, known by the name of African oak, and sometimes African teak, the product of *Oldfieldia africana*, was well known to the British Navy about 150 years ago. Evidence exists showing that it was commonly used in England for other purposes as well, and in France for the French Navy.

As far as we know, the first reference to its use was by Laslett in 1875. He says: "The African Oak tree, the African teak or Mahogany timber of commerce, for it is known under a variety of names, is probably the *Swietenia Senegalensis* or *S. Khaya* from Sierra Leone, and appears to form a link between the Oak of Europe and America and the Teak of India." Laslett was rarely wrong, but the African oak of which he was speaking was undoubtedly *Oldfieldia africana*, and had no relation to either of the two woods he named (and which are not now classified as *Swietenia*), nor had it any likeness to the oak of Europe or America, nor the teak of India.

Chevalier reports it as being found in Malamalasso, common in Sanwi, Sassandra, and Cavally, but it has not been seen in the markets of the United Kingdom for the last thirty years. Several different kinds of timber from time to time have been imported and called African oak, but the wood was quite different from that of *Oldfieldia*. One of these has been traced to *Lophira alata* Banks. The spirally carved pillars in the state-room of the *Foudroyant*, a ship taken by Nelson from the French, and subsequently used as his flagship, were of this wood, but whether the pillars were in the ship when it was built, or introduced at a later date, is not known. It is noticed that the native name of the tree is *fou*, and the name of the French battleship "*Fou*" *droyant*, either a curious coincidence, or having some relation to the name of the wood. A considerable volume of constructional timber work in this wood was established throughout England at about this date, including complete staircases, in more than one historical building.

In the Bulletin of the Agent-General for the Colonies (Ivory Coast), it is stated that the wood is little exploited on account of the difficulties of transport. It is recommended as a substitute for box, lignum-vitae, or service tree; and has been used for making tools, planes, blocks, jointing planes, etc.; but as it does not possess the special qualities of either box or lignum-vitae, and is unlike service tree, it would not be suitable in

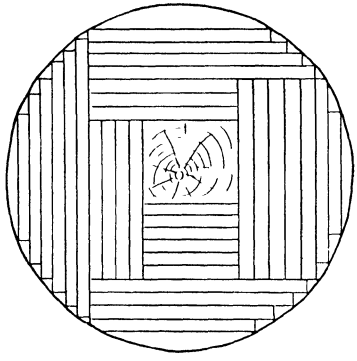
England for the articles mentioned ; its real value consists in its immense strength and durability, when for such purposes the heavy cost incurred for transport can be afforded.

OAK, AMERICAN. *Quercus alba* Linn. and other *Quercus* spp.
Weight 41 lbs. 14 oz. North America.

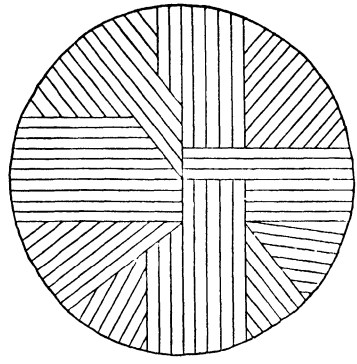
The very important part which this wood plays in the timber supply of this country is shown by the immense quantity imported every year. The value in money has approximated to a million pounds yearly, ranging from £675,000 during 1909 to over a million in 1913. Its use far exceeds that of any other oak, and constitutes more than five-eighths of the whole supply from abroad. This remarkable result is not due to its superiority over other supplies so much as to the enterprise and energy of the American merchant, in providing it in a suitable manner and at a moderate price, while its transport is facilitated by advantageous railway and steamer freights. The timber so provided is the produce of a great many species mixed indiscriminately. The sources of supply have been continually extended as the available forests disappeared under the woodman's axe, and the once famous Indiana white oak is now no longer obtainable, at least for export. The result, so far as that part of the shipments which is used for constructional work is concerned, is not of consequence, as the present supplies are suitable, but for cabinet and decorative work the mixture of the variety of grain and colour is disadvantageous. The colour varies from a pale yellow brown through various shades to a light brick-red. The wood of *Q. alba* " is of a pale reddish-brown colour, straight-grained, moderately hard and compact, tough, strong, and of fair durability. Being remarkable for its elasticity, planks cut from it may, when steamed, be bent into almost any form or curve, no matter how difficult, without danger of breaking or splintering them. This characteristic renders it especially valuable for shipbuilding purposes. The wood opens very sound ; and as it shrinks but little, and almost without splitting, during the process of seasoning, there is nothing to prevent its extensive use in railway carriage-building, civil architecture, and generally in the domestic arts. . . . In the experiments that were made, it was found White Oak compared very favourably with all the foreign Oaks, but proved to be slightly inferior in strength to the English Oak." So wrote Laslett in 1875, and it would be impossible to give a better description.

Of late years the logs have occupied a very important place, as they yield strong timber of long length up to over 60 feet, and large squares, up to 2 feet 6 inches, perhaps more, of clean, straight grain and good quality. This, however, is neither of the same character nor of so high a standard as the old shipments. It is used mostly in railway carriage and waggon building. The timber is not very durable and should not be used in

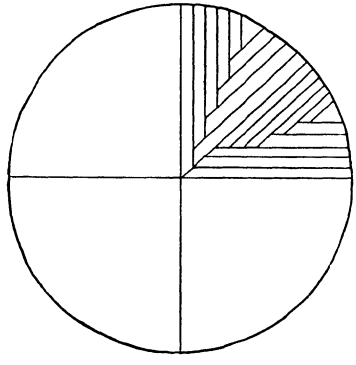
England in those places where it is required to remain sound for a great number of years, although much can be done to increase its durability by a wise system of ventilation around those parts which are built into walls. Unfortunate results with American oak beams were experienced in its use for the roof and other places in the museum at Barnard Castle. The especial qualities of toughness and elasticity, together with a plentiful supply of long lengths of straight grain which can be easily obtained free



A. Plain sawn.



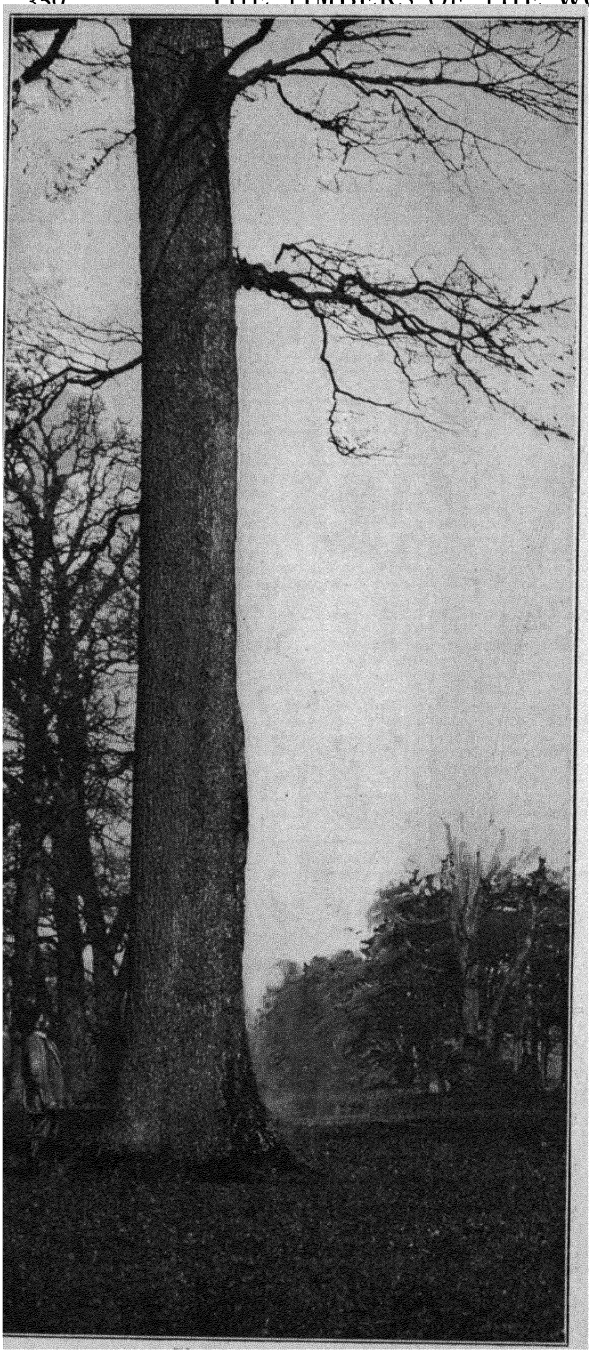
B. Quarter sawn.



C. Quarter sawn.

from knots, give the planks and waggon scantlings a very justifiable popularity. An enormous quantity has been used for sills for windows, this being principally due to the low price at which it has been provided, as for such purpose it is doubtful if it is sufficiently durable. Planks and boards for decorative work are obtainable in what is termed " plain " or " quarter sawn." The plain boards are then sawn so that the surface shows the tangential section, while the quarter sawn displays the radial. A boxed heart square is generally taken from the heart.

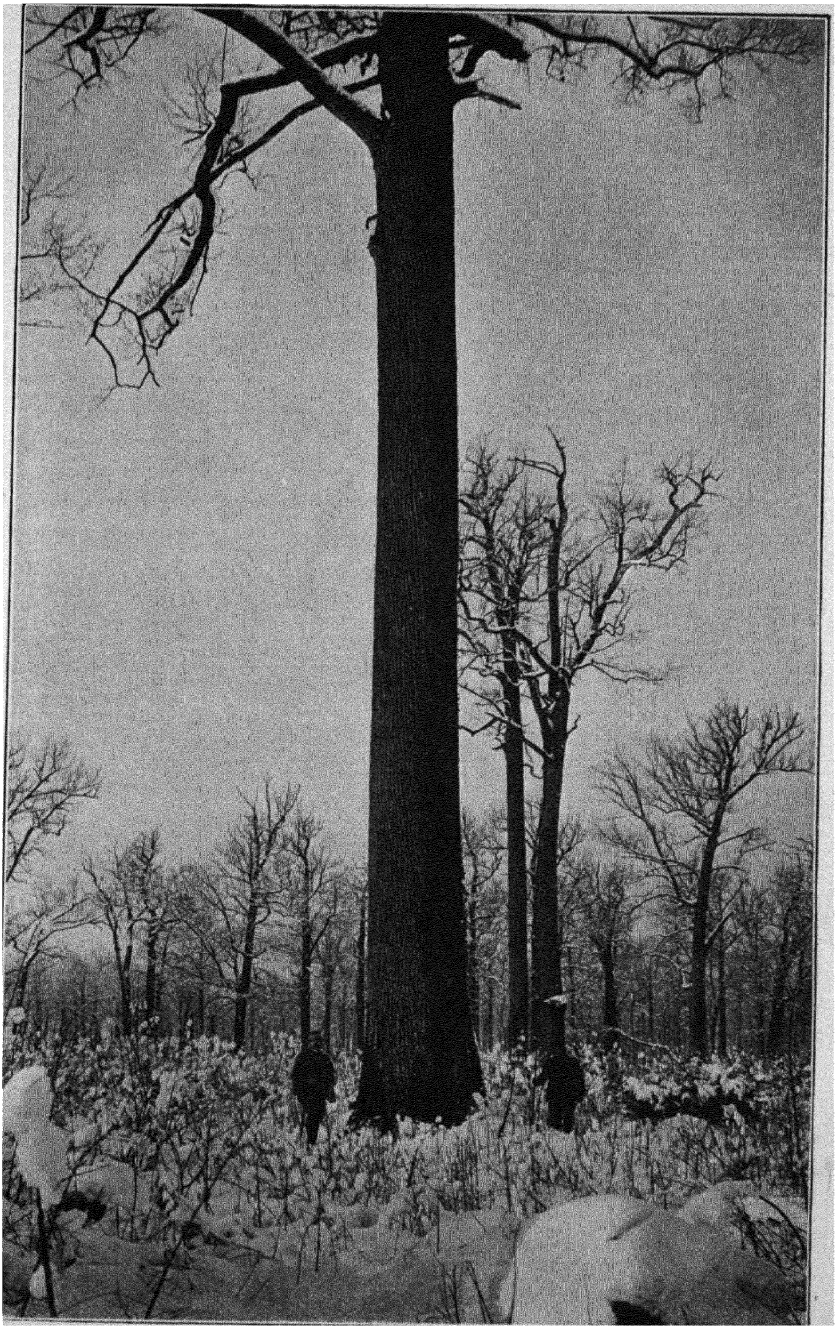
It will be seen that quarter sawing entails greater cost and more waste,



Photograph by kind permission of H. J. Elwes, Esq.

OAK IN KYRE PARK, WORCESTERSHIRE

which consequently makes it more expensive. Immense quantities of these descriptions have been used in every kind of cabinet, building, and decorative work. The product of the log is handled as it comes from the saw and is selected into grades according to an inspection regulation decided by the National Hardwood Lumber Association. This authority regulates the different qualities by rule, the product being divided into what are called firsts and seconds, "No. 1 common," "No. 2 common," and "culls." A very large quantity of floorings is imported ready prepared. All flooring strips in America are of a much narrower width than that which has been commonly adopted in the United Kingdom; the usual widths of imported American floorings are nominal 3 and 3½ inches. The wood is always plain sawn, quarter sawn floorings being unknown. It is tongued and grooved, and



B.—OAK TREE OF THE SOCNA FOREST, SLAVONIA

generally bored for secret nailing ; the ends also are tongued and grooved so that they can be joined without cross-cutting to fit the joists. The lengths are much shorter than those commonly used in English prepared floorings, ranging as the wood falls from the saw, from 18 inches to 16 feet, the average being about 8 feet. A very excellent plan of hollowing the under side is adopted in order to provide for a free current of air, and the consequent ventilation of the floor to prevent the attack of dry rot.

According to the *Pioneer Western Lumberman,* San Francisco, 1st November 1915, the largest oak tree in the world is to be found in San Benito. " This lordly tree measures thirty-seven feet six inches in circumference. The natives, who declare that it produces a ton of acorns every year, take great pride in it." The note remarks that this tree surpasses that which previously was supposed to be the largest, and which was known as the famous Hooker oak of Chico, California, named in 1872, which rises to a height of 105 feet, but is only 21 feet 8 inches in circumference.

The pores in the spring wood are large and regular. The medullary rays, which are larger and bolder than in any other oak, are very numerous and continue, more so than in other varieties, in a direct line from the heart to the circumference. The converted wood displays, therefore, when quarter sawn, a larger and bolder figure or clash than it is possible to produce from any other variety of oak.

OAK, AUSTRIAN. *Quercus pedunculata* Ehrh.
Q. sessiliflora Sm.

Croatia and Slavonia (Jugo-Slavia).

Austrian oak is mainly yielded by the forests of Slavonia and Croatia, the best quality being the Slavonian. It is shipped from Susak and other ports of the Adriatic, and also overland.

The term " Austrian " is still used (1932), although, in view of the changes which have recently occurred, it would be more correct to call the timber Slavonian oak and Croatian oak.

Trees of large dimensions, straight and clean in growth, and possessing lofty branchless boles, are obtained from the forests. A number of the latter, whether owned by the State, by public bodies, or private persons, are administered by the State, which ensures proper management, including regulation of the felling and due regeneration of the stock. The result of this enlightened system, which is followed by a number of Continental countries, but not here unhappily, is that there will be a considerable maintenance of the supply of Hungarian oak. Trees of large size will decrease in number in the future, and are not expected to be available many years hence. The cause of the depletion of these large trees is twofold. On the one hand, such trees are of great age, and therefore

cannot be replaced by others in a few years. On the other hand, the modern German method of forestry determines that the trees shall be felled at the moment when they represent the maximum profit (as measured by interest on capital and condition of the remaining forest); and this moment is reached in all European timber trees long before they have obtained impressive dimensions. Yet at present very large oak trees are still found in Slavonian forests, which also include a wealth of fine old ash, elm, lime, and hornbeam trees, and are so old as to have some claims to be regarded as truly primeval.

Trees with such outstanding features as height, girth, and cleanness of stem, are not confined to the Slavonian forests. Yet with that curious attitude in which the average Englishman ignores the value of the products of his own country and utilises instead those of foreign lands, such trees as these become well known, whilst others in England, of equal quality and dimensions, remain unnoticed.

For instance, in Kyre Park, Worcestershire, the property of Mrs. Baldwin Childe, is an oak grove containing over one hundred trees, whose clean, straight stems are of a wonderful height. H. J. Elwes, writing of them, says: " . . . they are not so remarkable for their girth as for the way in which they run up with clear stems to a great height. The two tallest are certainly over 130 feet by my own measurements in 1907. . . . The largest . . . has a stem 83 feet long by 17 feet 8 inches in girth at 5 feet, and contains 1031 cubic feet of timber. Fourteen of them contain over 600 feet, and the smallest tree in the grove has 97 feet, which is considered a big oak in many districts. . . . There is an oak of remarkable size in another part of the Kyre estate. . . . It is 113 feet in total height, with a trunk nearly straight to about 90 feet high, where the head begins, and 15 feet 10 inches in girth " (see illustrations).

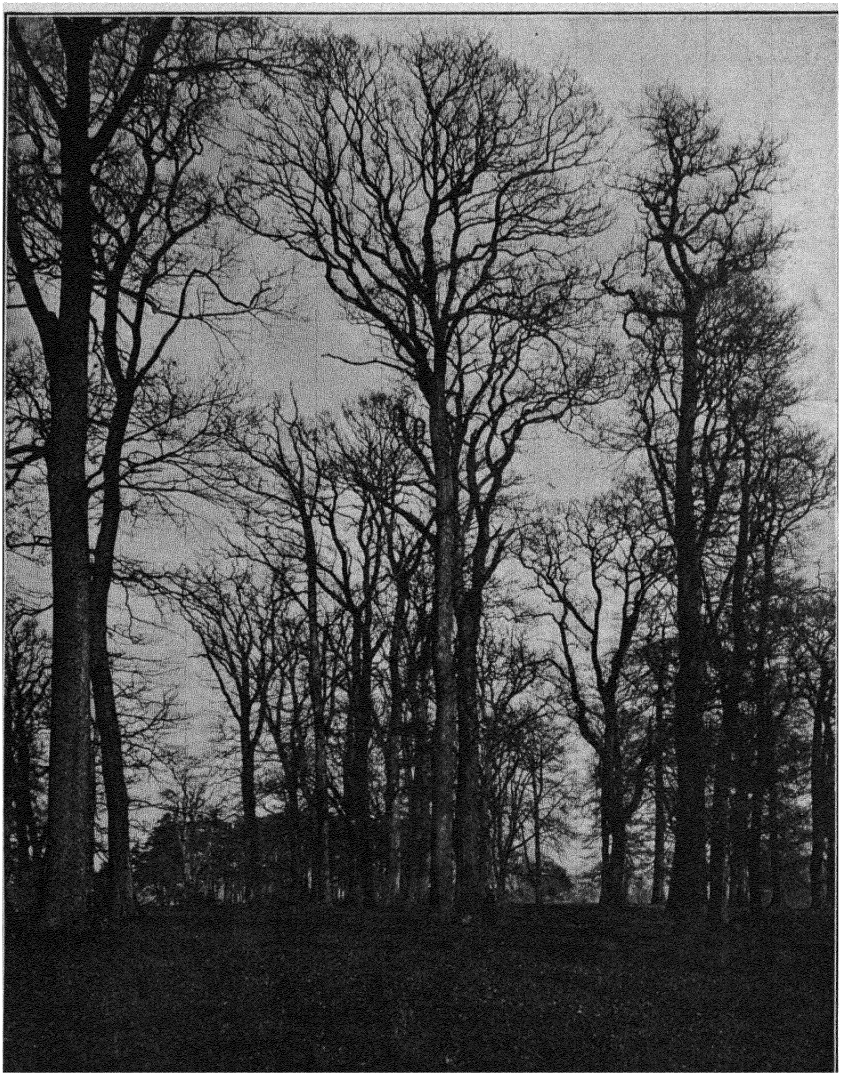
Two oak trees which grew in the Socna forest in Slavonia are also illustrated.[1] The following were the dimensions of the two main trunks:

	Tree A.	Tree B
Complete height	130 feet (*circa*)	130 feet (*circa*)
Height to lowest branch . . .	42 feet 3 inches	35 feet 9 inches
Diameter at height of 5 feet . .	4 feet 2 inches	4 feet 6 inches
Diameter at height of 22 feet 9 inches .	3 feet 6 inches	
Diameter at height of 35 feet 9 inches .		Over 4 feet

Thus it will be seen that, as against a diameter of 4 feet 2 inches and 4 feet 6 inches in the case of the two exceptional trees in Slavonia, among sixteen trees at Kyre Park, the four largest have perhaps a larger diameter, while the height of the lowest branch exceeds that of the Slavonian.

[1] For these photographs and the accompanying information I am indebted to the Photographic Studio " Etienne."

The value of the British-grown tree exceeds that of the Continental, yet in the spring of 1914 princely oaks were sold within fifty miles of London

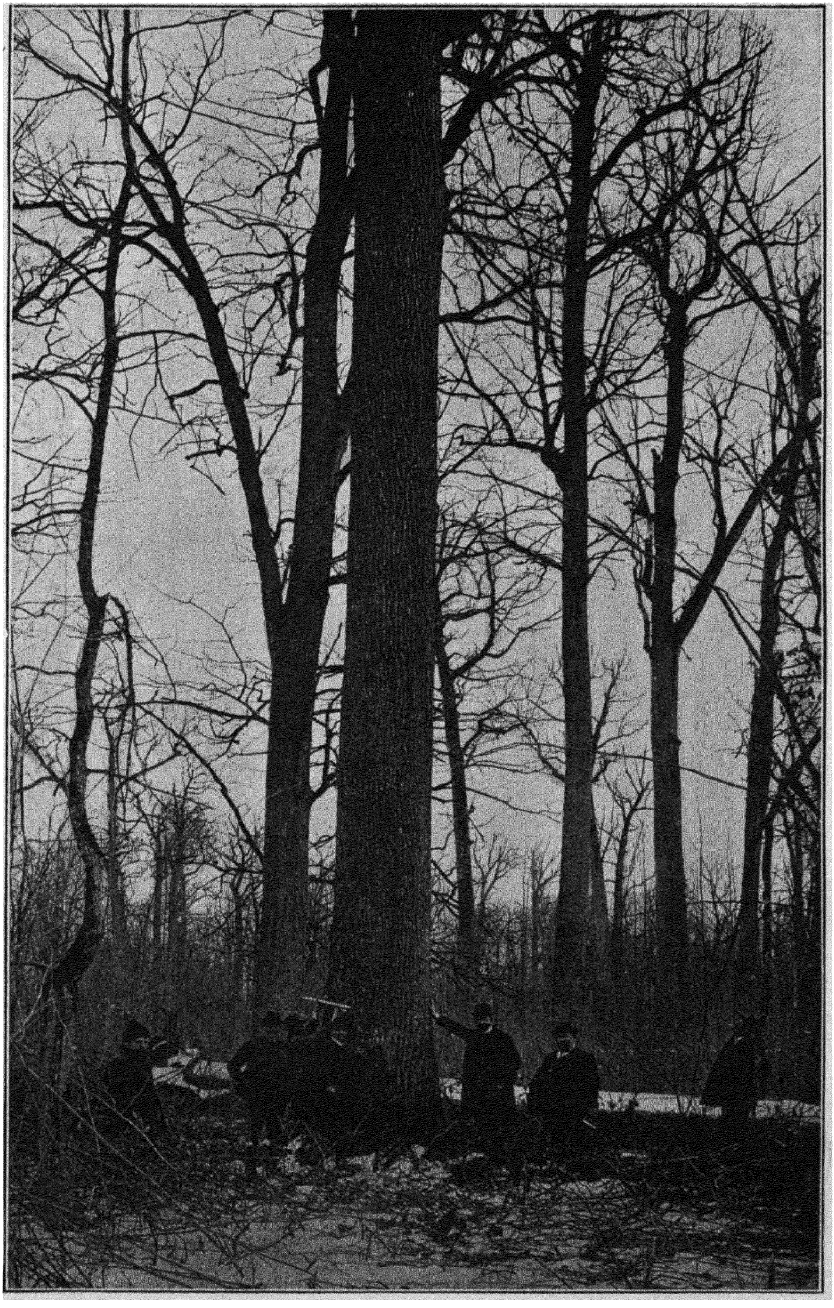


Photograph by kind permission of H. J. Elwes, Esq

OAK GROVE, KYRE PARK, WORCESTERSHIRE

at less than 1s. 9d. per foot cube, whereas I was told that in Slavonia an equivalent of 7s. 6d. per foot cube had been paid for similar trees for the English market.

The wood of such venerable oak trees is often " over-ripe " or otherwise faulty ; it is, in other words, more or less infected by wood-destroying



A.—OAK TREE OF THE SOCNA FOREST, SLAVONIA

fungus, which also attacks virgin forests in Bohemia. If the timber be only slightly affected it can be used in the manufacture of furniture, but is not sufficiently good in quality for export. Large sound trunks from Slavonia are dispatched mainly to Holland and Germany.

The method of cutting Austrian oak into billets and wainscot wood has already been described. In this respect also the English merchant has pursued a short-sighted policy with regard to the conversion of the native timber. With the foreign oak the best methods to suit the particular requirements of this country have been found and acted upon, but no such wise methods have been employed with the home-grown product. The cost of conversion in this manner is naturally greater than in the ordinary way, yet what is allowed to one timber is denied to the other. Even where someone has had sufficient enterprise to adopt this process with British oak, he has received neither support nor encouragement. The considerable demand in England for Austrian oak, which depends to a large extent on the automatic repetition of specifications, arose for the following reasons. Many years ago it was found possible to secure large butts of Austrian oak capable of yielding billets particularly clean and free from defects, and of a width exceeding that procurable elsewhere. Moreover, the wood is mild in quality, and shows bold silver-grain ; in colour it is of a uniform yellow-brown, and in this respect, as well as in its grain, is often indistinguishable from Russian oak. Apart from these features it is probably only slightly inferior to the timber obtainable from the more northern forests of South Russia.

In addition to the supplies of Austrian oak cut in the manner already indicated, a certain amount is exported in the form of round bark-covered butts, or these sawn into planks or boards, also in the form of square-edged planks (both plain and figured) and boards. The last-named serve for flooring and parquetry, but the trade in these for such purposes is limited by their high cost, as it is possible to procure equally suitable oak from other sources at a lower cost. In Hungary, however, an extensive industry in oak parquetry is conducted.

In the autumn of 1914, after the war had broken out, H.M. Office of Works issued a specification demanding the use of " Austrian oak " for the panelling of " Armament buildings," then intended to provide the office for the Board of Agriculture. Following a letter of remonstrance addressed to *The Times* by " Man in the Street," H.M. Office of Works altered the specification to a demand for British oak, and this was therefore used for trimming two rooms, which, beautiful in design and execution, have a very handsome effect. The work was carried out by Messrs. Cleaver, and a brass plate has been affixed which notes the botanical variety of the wood and the places whence the oak trees came.

OAK, BOG.

The oak which is known by the term " bog oak " is provided by trees which have been buried in peat bogs or elsewhere in England, Ireland, and according to report, in Russia. Also by trees which have been roughly hewn square by the axe and similarly buried or put under water, as in the case of dock gates, sluice gates, etc. In many cases these trees and logs have remained under ground for a great number of years, running into many centuries. The reasons for their having been buried are not always apparent, but in the case of those hewn square pieces taken out of docks and sluice gates, etc., the reason is apparent, and the age also is generally known. Reference is made in the article on British oak to some oak spikes taken from the foundations of Winchester Cathedral, and some oak from the foundations of Holy Trinity Church, Hull, also to some squared large-sized logs and beams from the London Docks. In all these cases the timber, generally saturated with moisture, had become nearly black or a rich black. In some cases when the timber is first found it is easily cut with a knife or axe. Upon exposure to the air it has sometimes broken and disintegrated and turned to dust, while in other cases it has hardened and become useful for furniture, panelling, etc. The whole of the oak taken out of the London Docks was used for making into small articles such as inkstands, etc. The same practice was followed with the timber which came from Hull, and to a limited extent from Winchester. Some large-sized squares and planks taken from the river Thames were supposed to be the remains of an old Roman bridge ; these were made into chairs, now used by the Chairman and Vice-Chairman in the County Hall, London. The library at Munden near Watford, Herts, the seat of the present Lord Knutsford, is panelled with particularly fine bog oak framed with live oak. Some timber was shown in London which purported to come from under one of the Russian rivers, and from what was said to be a submerged Russian forest. It caused considerable interest, and resulted in the Royal Box at the Agricultural Hall, Islington, being made from wood supposed to come from these forests. The wood was a beautiful black, but owing to its cracked and faulty condition was very wasteful in conversion. Sufficient timber was provided for the Royal Box, but subsequently no further news was heard of the Russian submerged forests.

OAK, BRITISH. *Quercus Robur pedunculata* Ehrh.
Q. Robur sessiliflora Sm.
Weight 52 lbs. 14 oz. The British Isles

The two kinds of British oak timbers hardly differ, if they differ at all, in their general qualities. On the whole, it is possible that the product of *Q. pedunculata* is slightly stronger and harder than that of *Q. sessiliflora*,

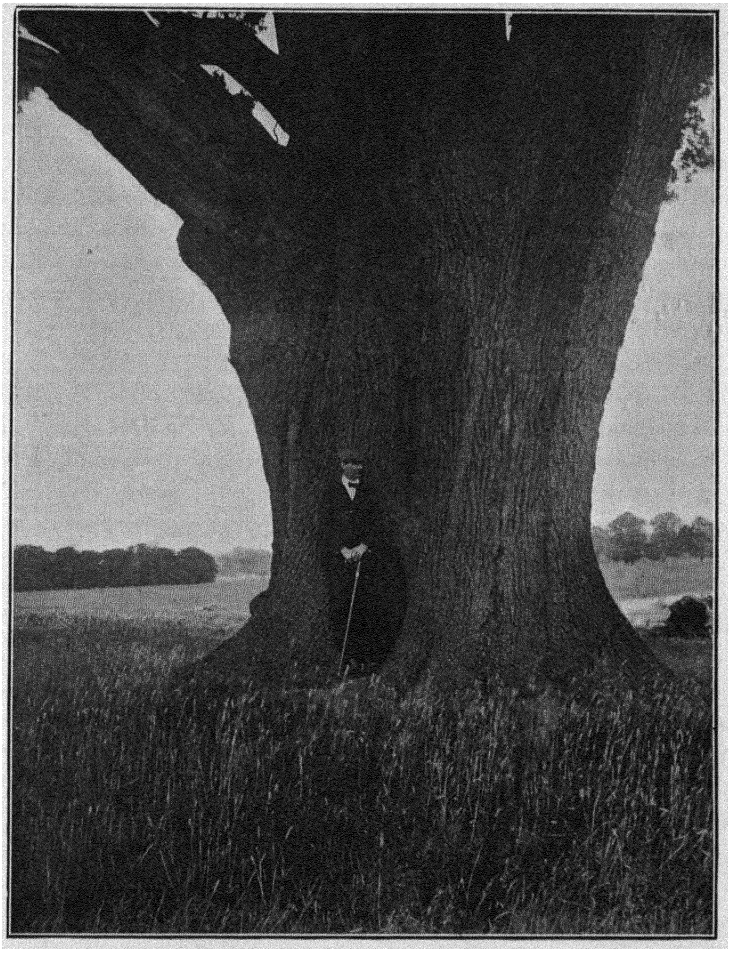
although, as the proportion of supplies of the latter is so much less than that of the former, I have been unable after close observation over many years to detect any real difference, and it appears to me that the quality of both varieties, either as regards mildness or strength, is dependent upon the soil and the situation in which they have been grown. There is no doubt that there is a much more marked difference in the qualities supplied from Continental sources. Laslett says: "It is the prevailing opinion that the wood of the *Quercus Robur pedunculata* is the best in quality, and that the *Quercus Robur sessiliflora* is slightly inferior to it; but while coinciding generally in this opinion, I feel bound to admit that, during a long experience in working them, I have not been able to *discover any important difference* between the two varieties. We find, indeed, the wood of the two species so closely resembling each other, that few surveyors are able to speak positively as to the identity of either. It is only by tracing the log from the first fall of the tree to the hands of the converter that we are able to say that the timber of the *sessiliflora* is a little less dense and compact in texture than that of the *pedunculata*."

With the knowledge of Laslett's experience in mind I have never allowed a single specimen of *sessiliflora*, many of which have come under my notice, to pass by unexamined. I believe it would be impossible to prove that there is any difference.

There is no oak in the world comparable to British oak. Pre-eminent among British timbers, it stands unchallenged for its strength and durability, which have become proverbial, and emblematic indeed of the nation which owes the foundations of its greatness to the "wooden walls" of oak, which in past centuries compassed the waters of the globe and gave this land the title of "Mistress of the Seas."

The unsurpassed strength of British oak is universally admitted, although to provide statistics of comparison is impossible, since the experiments made have not been sufficiently numerous; nor have those which have been made taken into account various factors, such as the amount of moisture in the wood. Evidence of its great durability has been provided in the report on European oak (*q.v.*), but interesting additional examples are cited by Laslett in connection with his discussion on the relative merits of winter-felled and spring-felled oak. Among these cases are those of certain ships built for the Royal Navy, the wood used being winter-felled oak. The *Sovereign of the Seas*, built in 1635, was pulled to pieces forty-seven years later and rebuilt, "and the greater part of the materials were found to be in sufficiently good condition for re-employment." The *Royal William*, built in 1715–19, was finally taken to pieces after a service of ninety-four years. The *Montague*, launched in 1779, was in active service and good condition in 1815. Opposed to these examples is that of the sloop, *Hawke*, of whose oak timber one-half was winter-

felled and the other half spring-felled. "She was built in 1793, and ten years later was in such a general condition of decay that she was taken to pieces, no difference being then observable in the condition of her several timbers." This does not imply that winter-felled and spring-felled timber are equally liable to decay. In this case the winter-felled timber "was



THE TWELVE APOSTLES OAK ON LORD PETRE'S ESTATE AT BRENTWOOD
14 feet high to the big branch; girth, 27 feet 1½ inches; diameter, 11 feet.

barked standing in the spring of 1787, and not felled until the autumn of 1790." In considering the meaning of these facts relating to the *Hawke* it is important to remember that wood-destroying fungi often require a starting-point opposing slight resistance to them, but after that stage is passed, having acquired full vigour, they can attack timber that would have successfully resisted their opening onslaught. In any case the

general consensus of opinion among Government authorities in England, France, and other countries is that winter-felled oak is the more durable.

Ordinary British oak timber is procurable in two extreme and various transitional forms. The general characters of the two extremes were well described by Laslett as follows: "The English oak tree, if grown in sheltered situations or in forests, frequently reaches a height of 70 to 100 feet with a clear, straight stem of from 30 to 40 feet [I think it would be more correct to put this figure at 30 to 60 feet.—A. L. H.] and a circumference of 8 to 10 feet, and much larger specimens (though now only rarely to be met with) were formerly common. If grown in open and exposed situations it is generally shorter, and frequently takes strange and eccentric forms, assuming a somewhat curved and crooked shape; this, however, is one of its most valuable characteristics, as naturally curved timber is almost indispensable for wood shipbuilding. It is when grown under these conditions that it appears to attain its maximum of hardness, and is often found so gnarled and knotty that it is difficult to work." Grown in appropriately shaded forests, the tree casts off its lower branches as the trunk elongates, so that knots are lacking on the long bole; and the trunk produces straight-grained wood arranged in annual rings of more or less even width. In these respects it resembles the typical forest-grown Russian, Austrian, and Japanese oak. When grown out in the open, or in well-lighted woodlands, the trunk retains its old branches, which develop into low-pitched boughs and produce huge knots. Moreover, the energy of the tree is diverted to producing a thick stumpy trunk with wide fibrous annual rings, and broad medullary rays. The annual rings are, however, apt to be very unequal in thickness, so that the grain is uneven and far removed from the straight by the intervention of numerous larger and smaller knots. The result is that this wild-grained timber is not so strong as the preceding kind, but has a much more varied, decorative effect, which is enhanced by bold silver grain, unsurpassed by any other European commercial oak.

It is strange to note that although British oak is generally admired and highly valued when it bears the stamp of antiquity, yet at the present time foreign varieties are more often used in preference to it. When it is employed, there is the assurance that not only is it beautiful and ornamental, but it is capable of remaining sound and excellent for future ages, thus presenting a record of the art and craft of the period in which the work was executed. The foreign oak, which is more commonly used, results in work which differs little in its spiritless uniformity from any ordinary stained and varnished wood.

An illustration of the enduring qualities of British oak can be found in the hammer-beam roof of Westminster Hall, which, erected in 1399,

lasted for over 500 years and has only recently (1919) been repaired. In contrast to these may be mentioned the elaborate fifteenth-century carved oak in the Frari Church and the Church of S. Stefano in Venice (alluded to elsewhere), which, executed in Italian walnut, is now perforated with worm-holes and is crumbling to dust. Other examples of the superior effect resulting from the use of British oak can be seen at the Court of Criminal Appeal at the Royal Courts of Justice, London; the sub-committee room at Lloyd's Registry in Fenchurch Street, E.C.; in the benches and ends of the seats in Lanteglos Church near Fowey, in Cornwall, and the following places:

The Thistle Chapel in St. Giles' Cathedral, Edinburgh, designed by Sir Robert Lorimer and built by Mr. N. Grieve. The British oak used in this building was sawn and sticked for over fifty years, and was grown in Essex.

Liverpool Cathedral, designed by Sir Gilbert Scott, the oak for which came from the same source as the above.

The dining-room of a house at Hyde Park, executed by Messrs. Holland & Hannen, which is a reduced copy of the Brewers' Hall.

The offices of the P. & O. Company in Leadenhall Street; many of the steamers of the company are also trimmed with British oak.

Mr. G. T. Wills' house at Sunningdale, built by Messrs. J. Bentley & Sons, Waltham Abbey. The timber used in this instance was mostly grown on Lord Chesham's estate at Latimer.

The late Mr. T. E. Collcutt's house at Totteridge, Herts; also Mr. Alfred B. Smith's, The Crossways, Totteridge; and Highwood, Highwood Hill, all possess beautiful woodwork entirely executed in British oak.

Much of the charm of this work depends not only on the varied colouring of the wood, but upon its very irregularities and faultiness, yet architects often reject such wood on account of its knots and uneven grain. Fortunately of late years its use for decorative purposes has increased, and as its beauty has become more appreciated, the difficulties attendant upon an irregular and uncertain demand tend to diminish. The present inadequate supplies will doubtless be augmented, as the craftsman learns that he can execute his work as easily and economically as with the foreign oak.

It is customary to consider British oak as difficult to work and incapable of standing well after completion—an erroneous and wholly groundless opinion. Much of the modern work catalogued above was executed by O. Ayton and his sons, who, originally country carpenters, were artists in this work, all of which is in perfect condition without shrinkages or any other fault.

Irish-grown oak is considered by some authorities to be inferior to English-grown, and *vice versa* other authorities claim it to be superior.

The Powerscourt Memorials, written by the 6th Viscount, says: "Even so early as the 11th century the Irish oak forests were well known, as is shewn by the request said to have been made by William Rufus for Irish oak for the building of Westminster Hall." There is evidence that the oak used for Westminster Hall came from the Royal Forest of Glencree. In a private letter from Dermot Doyne of Coollattin, Shillelagh, Co. Wicklow, addressed to the present Viscount Powerscourt (1931), he says: "My old grandfather always told us that Westminster Hall was roofed with Shillelagh oak from below Coollattin House, and that the huge trees now standing were then too small to cut. The old Lord never made a statement unless he was certain. I have seen the matter quoted in some book also." I am of the opinion that as good oak is grown in Ireland as can be grown in England, and that good, bad, and indifferent are to be found in both islands, and that any definite pronouncement is inappropriate.

For constructive work the strength and durability of oak are well recognised; it would be difficult to estimate its life when used submerged. The beech piles which formed the foundation, laid in 1202, of Winchester Cathedral were held together by oak spikes, which, a rich black, were found perfectly hard and sound when they were taken out after 700 years. James Thomson & Co., of Peterborough, found perfectly sound English oak in the foundations of Holy Trinity Church at Hull, built *circa* 1270, and said that in their long experience they had never found any other buried woodwork in as sound a condition. Large-sized logs and beams up to 35 feet in length and 20 inches square were used for the lock-gates for the London Docks. These were taken up for repair and renewal in 1915, having then been in position for periods ranging from 60 to 200 years; they were found to be hard, in splendid preservation, and nearly black. The oak which replaced the damaged portions was obtained from the Duke of Wellington's park at Strathfieldsaye, and measured 35 feet in length, squaring 18½ by 19½ inches. A tablet giving particulars of the wood and date of submersion was affixed to these logs before putting them down.

Elwes refers thus to a prehistoric boat which was dug up at Brigg in Lincolnshire in 1884 [1]:

"This wonderfully preserved dug-out was hollowed out of one huge oak log 48½ feet long, and approximately 6 feet in diameter, which showed no signs of branches, a log which must have contained nearly 1000 feet of timber, and which could not be matched now in England, or, so far as we know, in Europe or North America. . . . The boat was found embedded in the blue and brown clay which underlies the peat, and is considered on geological evidence . . . to be from 2600 to 3000 years old."

[1] Described in a lecture by the Rev. D. Cary Elwes, and published in 1903—*A Prehistoric Boat*. Stanton & Son, Northampton.

Oak is not unique, however, in its durability when totally submerged or completely buried in soil, for other timbers share this quality with it, but it does excel other woods in remaining sound for long periods when exposed to air and weather. The beams and uprights of the half-timbered Savoy Farm at Denham, Buckinghamshire, 500 to 600 years old, were in 1915 still in a wonderful state of preservation.

Yet oak timber is by no means immune from decay, especially if used without thought or care. For window-sills it would be difficult to find a better timber, and it is therefore generally specified ; yet the wood is continually being used in an entirely unseasoned state, and even before fixing is generally painted. The wet and the sap within the wood are consequently sealed up, and decay probably begins immediately the sill is fixed. Under such conditions the commonest description of Scots pine would last for a longer time.

A short time ago the oak beams in the roof of Bowes Museum, Barnard Castle, were found to be in a very bad state of decay, and had to be taken out and replaced with new. It is not certain whether these were all British or all American oak, but Professor Annan of Armstrong College, Newcastle, in his report attributes the dry rot of the beams to the fact that they were placed in position while unseasoned, then thickly varnished, and the ends built into the walls so that no evaporation was possible, all ventilation having been stopped.[1]

When used for pit-props and railway sleepers the life of oak is probably never more than, if as long as, twenty-four years, when unventilated or exposed to alternate wet and dry conditions, for it readily succumbs to the attacks of dry rot (*Merulius lacrymans*).

In contracts, engineers and architects often mistakenly demand that the oak timber to be used shall be taken from trees which are guaranteed to have been felled for a period of seven years (or perhaps not less than five years) prior to use. The object in view is not attained, as trees which have been felled for some years do not season, and they deteriorate.

Being easily cleft, oak is excellently adapted for the manufacture of palings, staves, barrels, wheel-spokes and the like, and is largely so employed. It would also be well adapted for shingles for roofs, though its use for this purpose is not now required. When steamed it is readily compressed, and in this form supplies keys and trenails for fixing railway lines. The presence of a considerable amount of tannin in oak should exclude its use in contact with iron, when discoloration ensues and ultimately results in the disintegration of the wood and the corrosion of the nails, fastening, and other ironwork. Copper is therefore preferably used, otherwise the ironwork should be galvanised.

[1] Private note. O. S. Scott, Curator, Bowes Museum, 19/2/14.

English oak is sometimes attacked by a fungus (*Chlorosplenium aeruginosum*) which stains the wood a brilliant vivid green. When so affected it is used for inlay work in Tunbridge ware. This fungus has generally been considered as appearing only in oak, but an instance has been known of its occurrence in a cherry tree grown in Ireland. In Great Britain and Europe generally the oak is peculiarly liable to be struck by lightning, which seriously damages, and often destroys, the whole value of the wood. The timber is attacked by various wood-destroying fungi, and is liable to many defects.

The seasoning and conversion of oak is of the utmost importance, too little attention having been paid to this in the past. Excepting where large timber is required for beams, dock-gates, and similar purposes, the best results are obtained by cutting the timber into planks and boards of the sizes likely to be required at the earliest possible moment after the tree has been felled. For all joiners' work, and especially where ventilation is restricted, the seasoning should be complete before use. Even after thorough seasoning, where the best work is desired, the wood should first be roughly worked, then kept for a short time in a warm chamber as near as possible of the temperature of the room in which it will finally be placed, and not until after this should it be fixed together and finished. It is desirable that a period of about forty-eight hours should elapse before fixing the wood, after breaking the skin by fresh planing, as on each occasion when this has to be done a further change and shrinkage will occur, even if the wood is 200 or more years old.

OAK, BROWN. *Quercus Robur* Linn.

Weight 47 lbs. 13 oz. The British Isles.

When certain individual British oak trees (*Quercus Robur*) are felled, their ordinary heart-wood is found to be partially or wholly changed into a richer toned reddish-brown wood which is known as "brown oak." It was formerly, and indeed it is occasionally even now, among English timber merchants and others in this country, called "red oak." The colour is much like that of polished crocodile leather, very variable in character, depth, and richness. It may be uniformly of a comparatively light brown, or again a deep, rich brown, having in some cases lighter streaks; while in some portions from one to two inches wide, the ordinary colour does not appear to have been affected at all; again, the warm brown may be spotted and streaked with almost black veins, presenting a rich appearance. This last form is called "tortoise-shell" pattern.

It is a strange fact that one single tree may be affected without others near or around it showing the slightest trace. Thus, out of a group of trees in Farming Woods Park, one large tree was found to be of a fine rich colour, although some five or six other similar trees quite close to it were

of ordinary colour. On the other hand, it sometimes happens that in a group of trees all are found to be more or less affected. This was specially noticeable in a small wood on the golf course at Stanmore in Middlesex, where a large proportion of the trees which were cut down proved to be all brown, while some were slightly affected and others not at all. One or two very old and large specimens of undoubted American red oak (*Quercus rubra* Linn.) growing in England, were found to have this peculiarity.

In the trunk the brown wood occurs either at the base, extending upwards to a variable height, or extending downwards from the crown towards the base to a variable depth, and it appears probable that in a few cases it may start from a large knot below the crown and extend somewhat downwards, but in such cases the proportion of the tree affected is slight. The trunk may be wholly of a rich brown from the base to the crown ; it may taper brown to a point, or prove to be brown on one side only. An example of this was noticed in a tree grown at Radlett, Herts, where the brown wood at the base of the trunk extended apparently completely across the heart-wood, then tapered very sharply in an upward direction, becoming at the same time confined to one side of the trunk, and continued thus upwards, gradually tapering to extinction at an approximate height of 15 feet. In connection with partially unilateral distribution may be mentioned the case of an oak tree which grew near a stream. The bole, when only 18 inches in height, gave way to two erect stems, each of which was about 18 inches in thickness over a length of 12 to 15 feet. The stumpy bole showed " brown oak " on one side only, and the erect leader topping that side was also characterised by brown wood, whereas the leader springing from the other side of the bole possessed quite normal wood. The brown wood extending up the trunk is often arrested by an extensive knot, and in any case a large knot acts as an obstacle. In the case of trees which have been pollarded, the trunk may be found to be all brown up to the crown, but it is rarely, if ever, found that all the leaders are also brown. A very large tree obtained from Danbury Palace, near Chelmsford, Essex, had five secondary trunks growing out of the butt, all of which were of a very rich brown colour. (After the tree was sold, a man was idly pulling out the decayed wood from a hollow in the side of the trunk when he felt something hard, which he discovered was a small coin, afterwards found to be of Roman origin.) Much more often, however, in the case of pollarded trees, only one or possibly two of the secondary trunks carry brown colour through, and in most cases it is noticeable that the secondary trunk or trunks which are affected occur on that side of the main trunk which has displayed the stronger and richer colour.

In considering the origin of this wood it must be emphasised that " brown oak " is the product of the ordinary species of British oaks (pre-

sumably *Q. Robur pedunculata* and *Q. Robur sessiliflora*). The cause of the phenomenon was unknown until it was investigated by Professor Percy Groom.[1] The following are the results obtained. The heart-wood is laid down as perfectly normal heart-wood, which is subsequently converted by the action of a particular kind of fungus into brown oak. The scientific name of the fungus is not absolutely established, though in all of three specimens, coming from different parts of Great Britain, it was one and the same in species. The fungus causes the wood to assume first a yellow colour, then a richer brown, culminating in a deep reddish-brown or sometimes blackish-brown. It advances most rapidly along the grain of the wood, often at first being distributed along certain strands of the wood and causing these to assume a colour darker than that of the remainder. This usually temporary condition explains the origin of the tortoiseshell variety. The fungus advances more slowly along the medullary rays. These two methods of progression explain how the wood may become thoroughly infected by the fungus, which, however, grows very slowly and incompletely in a tangential direction. Artificial infections of boards or ordinary heart-wood of the oak led to the artificial production of brown oak. The fungus is of a somewhat exceptional type among wood-inhabiting fungi, for it shows only the feeblest power of attacking the actual wood substance; while it is converting ordinary heart-wood into brown oak, it feeds on other substances in the wood (probably tannin among others). This fact is of importance in appraising the connection between the fungus and the decay exhibited in certain "brown oak" trees.

It is widely known that "brown oak" trees when standing sometimes undergo decay. I have observed many cases in which the trunks of oak trees showed the butt in a complete condition of white-rot up to the height of from 3 to 6 feet, but above this the heart-wood was firm, hard brown oak. This was specially noticeable with some fine butts which were cut down on Lord Chesham's estate at Latimer, Bucks. One of these trees, measuring about 36 inches in diameter, appeared when felled to be valueless on account of the white, fluffy, decayed wood which completely covered the trunk within a distance of an inch or two of the bark. Upon cross-cutting from 3 to 4 feet through the tree was perfectly sound, and of a very dark brown colour.

Moreover, "brown oak" trees sometimes show signs of ill-health as evinced in stag-headedness. Do these facts indicate that the browning process is one of incipient decay caused by the fungus responsible for that browning? Stag-headedness is a symptom of various kinds of diseases of the oak tree, some associated with wood-destroying fungi, and others not so, and it is very apt to occur on ordinary oak trees occupying light

[1] Percy Groom, "'Brown Oak' and its Origin," *Annals of Botany*, 1919, vol. xxix. pp. 393-408.

soils which are apparently unfavourable to the development of " brown oak." Again, Professor Groom thinks that the fact that large brown oak trees occur without showing any traces of decay in their hard, firm " brown oak," accords with the feeble powers of attacking wood substance shown by the browning fungus. On the other hand, there are many kinds of wood-attacking fungi that cause decay in the sap-wood and heart-wood of the oak tree. A number of them gain admittance through wounds, and several can simultaneously attack heart-wood at the same point. One or more of these may be responsible for the rotting of " brown oak," and at present there is not the slightest reason for believing that the fungus causing the production of " brown oak " is responsible for such rotting, or that " brown oak " is wood in a condition of incipient decay. The matter requires further investigation. As only the heart-wood of the tree is affected, and the sap flows up to the leaves exclusively in the sap-wood, it is not surprising that trees containing " brown oak " show no external signs of its possession. The fact that " brown oak " owes its origin to a fungus and therefore arises only when the tree is infected, gives some explanation of the distribution of " brown oak " trees and of " brown oak " in the individual tree.

Such trees are found in Great Britain in regions extending from the south up to Scotland. A large number of old oak trees in the northern vicinity of London are infected. This has been particularly noticed at Stanmore, Wembley, Edgware, Mill Hill, Totteridge, Enfield, Finchley, Golders Green ; also at Radlett and Stoke Park. Many handsome trees which developed the tortoiseshell pattern, and also the uniform brown colour, were found in Stoke Park, Stoke Poges, and were all shipped to America, some having since been utilised to form the panelling and furniture in the City Hall, Chicago. It is significant that in Cassiobury Park, close to several of the above-named places, where the soil is light, no " brown oak " had been found. Light soil in general seems to be inimical to its development. The peculiarity occurs in trees varying from very old ones to those which are perhaps as young as twenty years. As no evidence exists as to the date of infection, it is quite impossible to draw any conclusions as to the rate of production of " brown oak."

A remarkable fact about this beautiful form of English oak is that, although it is found at our doors, few people in England are even aware of its existence ; yet it is known in America as one of the finest decorative woods ; indeed, in general, Americans appear to think that it is the only form of oak which grows in England. There it is called simply " English oak," the term " brown oak " being seldom used. H. J. Elwes, *Trees of Great Britain and Ireland*, quoting Mr. C. M'Kimm, a distinguished American architect, says : " We regard it as the most beautiful oak in the world . . . preferred to all others for its finer quality, richer colour, and

endurance." The hall and staircase at The Lynch House, Totteridge, Herts, is entirely panelled and furnished in "brown oak," from trees which grew on the Totteridge Park estate, and which provide a fine example of this wood. The trees were cut down some twenty years ago, and their roots can still be traced. Elwes says: "The best example that I have seen of fine brown oak work in England is at Rockhurst, the residence of the late Sir Richard Tarrant, in Sussex. This was done by Messrs. Marsh, Cribb & Co. of Leeds, with brown pollard oak, showing very varied figure"; and since the date when he wrote this, the same firm has completed some equally fine panelling in the dining-room of Mr. H. J. Elwes' house at Colesborne. Indeed, it is doubtful if this is not on the whole a still finer example.

In my experience no such timber has ever been found either in France or elsewhere on the Continent. Professor Groom, however, says that he examined the French chêne rouge, derived from the same species of tree (*Quercus Robur*), and found the wood so similar that with the naked eye he could not distinguish it from "brown oak," but the microscope revealed considerable differences between the British and French woods, thus indicating that the causes of the anomaly in the two cases are different.

The question of seasoning is of more than ordinary importance in connection with the use of English oak, and especially with the brown variety under discussion. Excepting in the case of burry logs, they should always be cut as nearly as possible on the quarter. After cutting, the planks and boards should be stowed in a position entirely sheltered from sun, wind, or rain, and preferably in a place where drying will proceed slowly. This last precaution is specially necessary with curly, twisted, or burry grain. When first cut, the wood is unusually strong, and is liable to split and warp, although when seasoned it stands very well. A plan adopted by some has been to place the sawdust of the wood thickly in between the planks, but this practice may result in fermentation and formation of fungi, and it is very doubtful if it is effective. Elwes, writing of some magnificent specimens of panelling and wainscoting executed in brown oak for Dr. Weld, of Boston, U.S.A., by Messrs. Noyes & Whitcomb, thus describes the method of seasoning employed by this firm: "Dry white fine boards fresh from the hot-air kiln are laid on each side of the oak boards, and properly stripped (sticked) in an open covered shed. When the moisture has been partially absorbed, they are all turned over and again sandwiched between fresh dry fine boards; thus saving a great deal of time, which is rarely given to season timber properly in America, and preparing the wood to stand the conditions of dryness, which are more trying to furniture in American than in English houses."

Veneers cut from "brown oak" (especially from burr-wood) require

very special care in drying in order to avoid splitting, and to keep them flat. They should be stored in a cool place, a basement for preference, packed as tightly as possible, covered with tarpaulin, and loaded above with weights. After a time they should be carefully turned over, wiped with a cloth, and re-packed with the reverse side uppermost.

OAK, BURR and **POLLARD.** *Quercus Robur pedunculata* Ehrh. and *Q. Robur sessiliflora* Sm.

Great Britain.

Burr-wood shows the grain of the wood running in all directions, so that the cut surface is marked by small twists, curls, or bird's-eye specks, and often has scraps of enclosed bark (" gaul "). As always is the case with burr-wood, that of the oak is particularly liable to warp, twist, and even crack during drying, and especially so when used in thick pieces ; it is therefore invariably cut into veneers. When well chosen, burr-wood of " brown oak " produces a variegated decorative effect which is unrivalled of its kind ; while the burr of ordinary oak yields veneered panels whose ornamental qualities will be regarded by many as superior to those of certain more costly woods, including bird's-eye maple. Burr-wood is produced by pollard as well as other oak trees.

A pollard tree is one whose poll (head) has been cut off when the tree has reached a considerable age ; pollard willows, cultivated to produce osiers for basket-work, provide familiar examples of such trees. The results of such decapitation are : first, that the growth in length of the main trunk is permanently arrested ; and secondly, that a number of branches shoot forth from the top of the headless bole, and develop into more or less vigorous boughs.

Pollard oaks are abundant in England, and include most of the old oak trees in Epping Forest, as well as many in Sherwood Forest. All the old oaks in Moor Park, Rickmansworth, were and are of this type, and according to tradition owe their state to very human motives. It is stated that in 1685 the Duchess of Monmouth, desirous of revenging the beheading of her husband, caused all the oaks in this park to be pollarded, and thus rendered for ever incapable of supplying timber for the Navy of the hated English.

The more or less numerous branches ultimately springing from the head of the pollard tree gradually produce at the summit of the trunk a thick mass of burr-wood. Moreover, the rest of the trunk thickens, and from it there may burst forth countless young shoots, clusters of which produce at their bases large swollen humps, known as burrs. Elwes describes a good example of the result of this mode of growth : the trunk that he investigated was " ten feet high and nine feet in girth. . . . Its wood, when cut into veneer, was throughout the whole thickness of the

tree more like that of bird's-eye maple than oak, and has served to make the front of a very handsome bookcase."

Yet burrs are by no means confined to pollard trees, for they frequently arise on ordinary trees at various heights up the trunk. The causes responsible for the production of burrs are often unknown. In the oak they appear to arise sometimes as a consequence of attack by rabbits, which gnaw the bark at the base of young trees and thus stimulate the trunk to abnormal growth. This is localised and gives rise to a burr, which may extend completely round the base of the trunk.

It is thus evident that the terms " burr " and " pollard " should not be employed as synonyms. Still less correct is it to confine the term " pollard oak " to burr-wood of the " brown oak tree," as was formerly the custom among timber merchants. This burr-wood of " brown oak " was much admired and used from fifty to a hundred years ago, when it was known as " pollard oak." [1] It was more appreciated in the north of England, though some fine examples of Victorian cabinet work, made by Gillow and others, are to be found in the south (a handsome round table of that period veneered with this wood, stands in the Savile Club, London).

OAK, CALEDONIAN. *Carnarvonia aralioefolia.*
Weight 35–45 lbs. (Swain). Queensland.

Known as red or black oak. Swain reports it as " a firm, compact, moderate-weight wood of dully gleaming reddish chocolate hue, silkily mottled. . . . It is tough to cut but is straight-grained and fissile . . . a little heavier, harder, and finer-textured, and darker than Silky Oak . . . durable in the weather, but not in the ground . . . inclined to warp in seasoning." Suitable for cabinet work, panelling, moulding, and turnery.

OAK, CORK. *Quercus Suber* Linn.
Spain, Portugal.

This oak supplies the cork which is used for commercial purposes. It is the produce of the extraordinarily developed corky layer of the bark. Pliny mentions the use of cork for stopping bottles and casks, and also for nets and lifebelts. The general employment of corks for glass bottles, however, appears to date only from the fifteenth century.

OAK, FOREST. *Casuarina torulosa* Ait.
Weight 58 lbs. New South Wales, Queensland.

The colour of the wood is a dull brown, with a very coarse, harsh, sour grain, and it is specially inclined to warp in seasoning. It is reported as

[1] So far as can be ascertained, at that time " maiden " " brown oak " (*i.e.* wood having the ordinary straight grain) was never sought for, and was used merely when accidentally secured.

strong and durable, and used in Australia for shingles, staves, veneers, tool-handles, mauls, and cabinet purposes. It is liable to the attack of pin-worm.

The pores are rather scarce, irregular, and extremely small, open, and coarse ; wide medullary rays at irregular intervals, confused, sometimes duplicated, showing on the radial section as in live oak, with numerous fine, wavy belts of light tissue ranged between the medullary rays in the lines of the concentric growth, and innumerable minute fine rays between the principal rays, crossed at right angles by tiny lines forming a very fine network pattern.

OAK, FORMOSAN. *Quercus gilva* Bl.

Formosa, South Japan.

This wood, known in Japan as ichii-gashi, is of a brick-red colour, hard and heavy, with a firm, close texture, capable of a very smooth surface from the tool. It has never been imported on a commercial basis, but according to Goto " is valued in the making of the handles of agricultural and other tools and implements ; also in making wheels and rudders." In its qualities it resembles English live oak, from which it only differs in colour.

The pores are very scarce and rather less than moderate size. In between the strong, bright, principal medullary rays are innumerable exceedingly fine, secondary rays which are only visible with the lens (+12).

OAK, FORMOSAN. *Quercus pseudo-myrsineaefolia* Hay.

Weight 75 lbs. Formosa.

This wood resembles that of *Q. Morii* Hay in weight, texture, and general characteristics. It is, however, of a brighter colour, almost of a rose shade, and while lacking the darker streaks of that wood, the effect is more uniform. It is a very beautiful wood, and should be highly valued for cabinet and decorative woodwork.

The transverse grain has a very pretty appearance. The pores are scarce and small. The principal medullary rays are very strong, and running parallel between them are numerous equidistant secondary rays, with similar fine white lines at right angles ; the beautiful effect thus given resembles delicate lace or a fine spider's web.

OAK, HIMALAYAN. *Quercus spicata* Smith.

Weight 58 lbs. India.

VERN—*Danwa singali, phaco singali, arkaula,* Nep.—*Bara chakma,* Beng. —*Kacheeng,* Lepcha—*Sahu hingori,* Ass.—*Dingjing,* Khasia—*Sagat, thitcha, thitè,* Burm.

The wood is of a rather dirty reddish-brown colour, showing little of the general characters of *Quercus*, while it has a rather rough and fibrous grain.

Troup recommends it as being durable and not inclined to warp. He mentions it as being used for "building (Assam), well construction, ploughs, mortars, helms of boats."

There are singular, short, dark wavy ripples, following the lines of concentric layers. The pores are very small and scarce. The medullary rays are strong, wide, and conspicuous.

OAK, HOLLY. *Quercus Morii* Hay.
Weight 67 lbs. Formosa.

The wood is of a bright salmon-red colour, streaked with wide, dark reddish-brown markings, and is of a very hard texture which is capable of a smooth surface. The colour and the pretty marking of the pores, which make a pleasing pattern on the radial section, and the strong wide clash or flower caused by the medullary rays, render the wood very valuable for ornamental, cabinet, or decorative work. It has never been imported into this country, but would undoubtedly be much sought for if it became known and were available. It is one of the most beautiful of all the oaks. According to the report of Mitsui & Company, there is an estimated supply (1920) of about 30 million cubic feet.

The pores are very small and scarce. Besides the strong, broadly marked principal medullary rays there are, evenly distributed between them, smaller secondary rays, which are numerous, very fine, and parallel.

OAK, HOLM. *Quercus ilex.*
Weight 60 lbs. Europe, North Africa.

In common with many other home-grown trees the holm oak is either burned or wasted. Having before us this beautiful evergreen tree, it is strange that no serious attempt has been made to realise its usefulness. Elwes says the timber is valued for "cart-wheels and other farm implements, and preferred to that of the cork oak." It is reported to be largely used in Algeria for carriage-building and joinery, and that the Romans used it for axles.

The colour is slightly darker than that of the ordinary English oak, with a very hard, close grain, and it is very durable. This tree should be planted both for its beauty and utility.

OAK, INDIAN. *Quercus dilatata* Lindl.
Weight 58–69 lbs. (Gamble). Northern India.

VERN—*Záih*, Kafiristan—*Bán, banji, banchar, barachar, baráin, banni, parúngi, chora, kálı ring, máru, máur, moru, karsh, marghang*, Pb. —*Moru, tılangsa, tımsha*, N.-W.P.—*Kılonj*, Kumaon—*Tılonj*, Garhwal—*Ramshing*, Byáns.

Excepting that it is slightly harder and darker in colour, this wood might pass well for European or American live oak. Gamble reports it as

a useful, strong wood excepting that it is very apt to warp and shrink, and difficult to season.

The very small pores are arranged in long, narrow, wavy lines, with very strong, aggressive medullary rays, as usually found in evergreen oak.

OAK, INDIAN. *Quercus lanceaefolia* Roxb.
Weight 42 lbs. (Gamble). British India, The Himalayas.

VERN—*Patlé katús*, Nep.—*Siri*, Lepcha—*Shingra, chauko*, Gáro—*Bucklai*, Ass —*Hingori*, Cachar—*Dingsning*, Khasia.

This attractive evergreen oak, brownish-yellow in colour, with an even grain which works well under the tool, resembles the British oak *Quercus pedunculata*, but with little show of medullary grain.

The pores are uniform in size, arranged in short, wavy belts, making a rather pretty pattern. The numerous, very fine medullary rays are hardly discernible under the lens, and crossed at right angles by darker belts, forming an unusual pattern for oak.

OAK, JAPANESE. *Quercus grosseserrata* Bl.
Q. crispula Bl.
Q. glandulifera Bl.
Q. dentata Thunb.
Weight 40 lbs. 12 oz.–47 lbs. 13 oz. Japan.

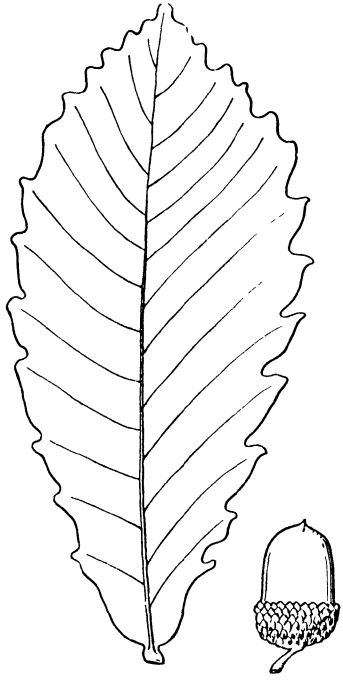
Quercus grosseserrata and *Q. crispula* are known in Japan by the name of " Ohnara," *Q. glandulifera* by the name of " Konara," and *Q. dentata* as " Kashiwa."

According to Goto, " the several varieties of kashi (oak) are the most widely distributed of the broad-leaved evergreens." Ubame-(Imame) gashi, *Quercus phyllireoides* A. Gr., " is white with a shade of yellow, and the hardest and heaviest of all timbers produced in Japan. Is used in house-building where hardness and strength are required, but the chief use is in charcoal-making." The same author classes Ichii-gashi, *Quercus gilva* Bl., Shira-kashi, *Q. vibrayeana* Fr. & Sav., Aka-gashi, *Q. acuta* Thunb., in the same category with Ubame-gashi. The European supply of Japanese oak is produced almost exclusively from *Q. grosseserrata* and *Q. crispula*, with a very small supplement of *Q. glandulifera*.

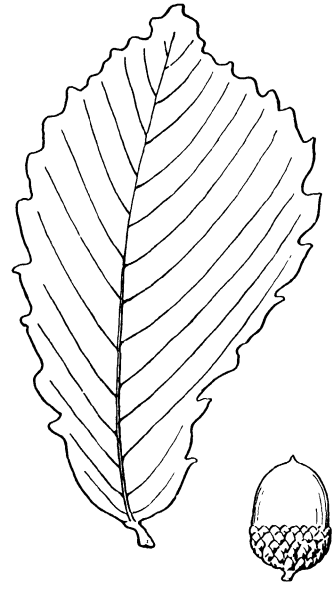
There have been imported from Japan into the United Kingdom during the last few years very large quantities of oak logs, hewn square, in lengths of from 8 to 26 feet, and in widths of from 14 to 36 inches, and a small number of round logs with the bark on as felled, also boards, planks, and staves. The first shipment was in 1905, and, as often the case with fresh timber supplies, through lack of experience in dealing with it, a great quantity was found to be very defective. By degrees, however, producers have learnt the best methods of handling it, and so avoiding the errors of

those who have not yet learnt by experience. The quality now obtainable is of a high class.

In 1920 the shipments to the Continent had reached the enormous total of 50,000 loads per annum. This timber comes from the north island of Hokkaido, and is shipped from the ports of Otaru, Muroran, and Kushiro. The trees are felled between the months of November and March by men who camp in the forests. When the logs are hewn they are pulled by horses over the snow to the nearest railway, the frozen surface enabling them to be transported over the hills and rough places.



QUERCUS CRISPULA, "OHNARA"



Q. GLANDULIFERA, "KONARA"

The product of virgin forests of great age, the timber is remarkable for its extreme regularity of growth and freedom from faults. In no other oak, with the exception of the "Spessart" oak (*q.v.*), are the yearly layers so uniform throughout the whole life of the tree from heart to bark. As the annual rings are very narrow, growth being exceedingly slow, any scantling sawn out represents a much greater age for its size than in British or other commercial oaks. For instance, in two pieces 4 inches wide, taken at random, the British showed 28 layers or annual rings, whilst the Japanese showed 81. A further examination of five more pieces of the same size gave a variation from 62 to 93 years; it thus took 28 years to put on 4 inches of British growth in thickness, against 81 years

for the same size in the Japanese wood. Many specimens of British, Continental, and American oak could be found, produced in even less time, perhaps only five or six years for the same size, whilst it would be very hard to find any of the imported Japanese oak with much variation.

The wood is of uniformly good colour and texture, and is of slightly milder quality than the European. The trees also yield a much greater percentage of clean timber free from knots and other defects, and the hearts are extraordinarily straight and sound. These features constitute its great commercial value.

Notwithstanding the prevailing opinion held at the time when the wood was first introduced that it would not prove to be durable, and the very mild character of the grain, the results have been surprising. Japanese oak, used as half timbers and posts, shows no deterioration or any fault to-day (1932), after 25 years' exposure, so that it may be said to be highly durable for both inside and outside work. Sleepers of Japanese oak, laid on the Metropolitan Railway between King's Cross and Farringdon Street, London, were taken up quite sound after many years, with the portion of the sleeper in contact with the ground not decayed or injured, notwithstanding the special strain of this portion of the line, where the steam and the continual change from wet to dry condition tell heavily on the timber. Where there was a previous indication of decay it became a little extended internally, but the general result is favourable to the durability of the wood in contact with the ground.

One of the defects of oak from all countries is its liability to brown streaky stains running through the wood, and this is perhaps the worst defect of Japanese timber, and is no doubt due to some of it being over-ripe.

The wood shrinks a little more than some kinds of oak, but seasons more quickly, and is more easy to work and fume or stain, and has a good appearance. This oak is particularly suitable for floorings, either in parquet or long boards. As the wood is mild and clean it holds its shape after planing, and being closely grained as well as elastic, the fibres are not so cut by the wear of the rough tread ; and as its cost is moderate, the best and most mature timber can be used for the purpose. In Austrian or other European or American oak, on the contrary, the well-grown trees can all be utilised for making wide boards for wainscoting, and consequently realise a much higher price than is paid for floorings, with the result that immature wood and large branches are converted for this purpose.

On more than one occasion perfectly fresh logs have been sawn up, seasoned in kilns, and worked into panelling and fittings, which have been fixed and the whole process completed within three months, while the work executed has afterwards shown no sign of shrinkage or other fault. It is doubtful if such a proceeding could be carried out with any other kind of commercial oak with the same satisfactory results. Panelling, church

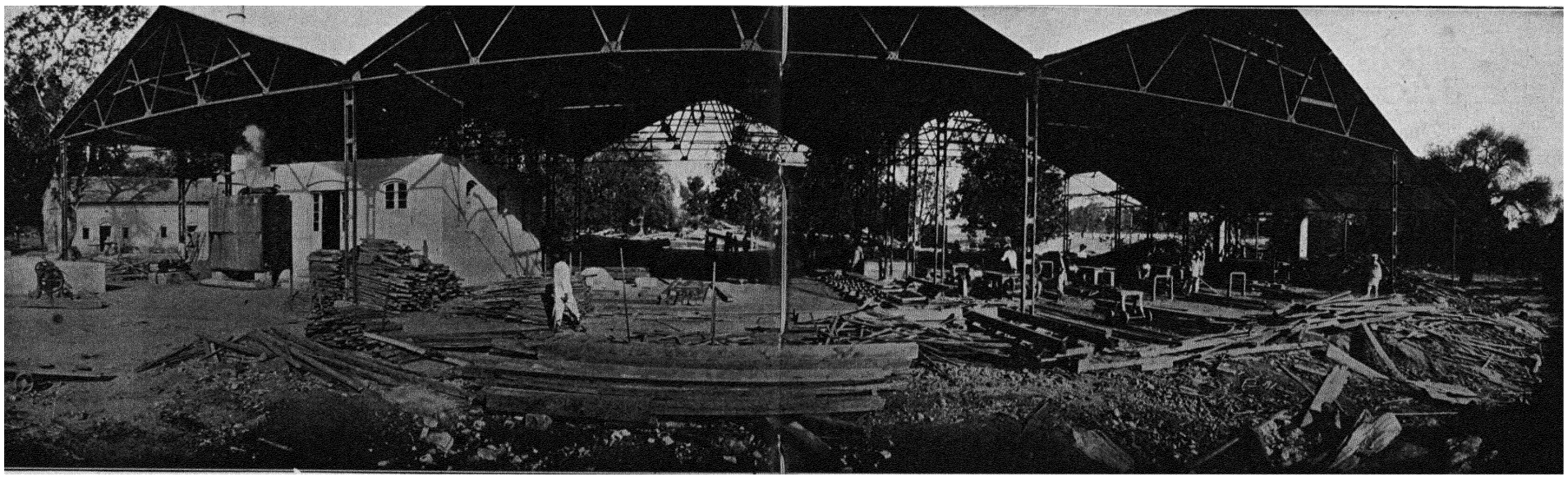
seats and roofs, ship's fittings, and all kinds of high-class cabinet and joiners' work, when finished, give very pleasing results, hardly, if at all, distinguishable from work in European oak (British excepted).

Many very important buildings, both in the United Kingdom and on the Continent, have been completed in Japanese oak, and the wood grows more in favour and demand every day. Whilst relatively strong, it has not the strength of the British or some kinds of American oak, and on this account is not in favour for heavy railway waggon planks, though, apart from this fact, the cost of transport would prevent its competition with the kinds obtainable. Neither has it found much favour yet for staves,

oaks, though rarely seen in others. The timber of this oak is unlikely to be shipped to the United Kingdom in any quantity.

The pores are very regular and uniform, appearing only in the spring wood, generally in duplicate in each concentric layer. The medullary rays are very strongly defined, but inclined to form curved lines from the centre to the circumference of the tree, rather than to radiate in straight lines. There is a fine secondary medullary ray strongly defined, which is also common to most, if not all, of the Indian oaks.

The following figures illustrate the increasing demand for this wood during recent years :



PART OF THE GOVERNMENT SAWMILL, PORT BLAIR, ANDAMAN ISLANDS

as *Quercus crispula* is somewhat too porous to be used for this purpose, and *Q. glandulifera* has been shipped only in very small quantities.

In addition to the timber supplied from Hokkaido, there is an unimportant source of supply in the central district of the main island, on which stands the mountain of Kiso. From this source a small quantity of boards and planks were sent to London in 1914. The species are the same as those of the north island, but in appearance it is of a pinker shade. The wood also is a little harder, and the medullary rays are bolder and larger. This wood was found to be pierced by small holes slightly wider than the head of a pin, which had been made by insects boring through the trunks of the trees. These worm-holes are seldom, if ever, to be found in the timber from the north island, and recall those so prevalent in American

EXPORTS OF OAK INTO THE UNITED KINGDOM FROM JAPAN

	Loads.	£		Loads.	£
1908 . .	4,349	20,524	1929 . .	14,007	242,671
1928 . .	12,979	214,592	1930 . .	18,023	311,062

OAK, JAPANESE. *Quercus glabra* Thunb.

Japan.

This tree, a native of Japan, according to Elwes and Henry was introduced into England in 1842, and is frequently seen in English gardens, but has not been found to attain to any size larger than a bush. The wood is very hard, resembling that of our British-grown live oak, *Quercus virens*.

A specimen taken from a tree grown at Powerscourt Castle, in Ireland, produces a wood similar to that of the live oak. It has not been, and is not likely to be, seen in commerce.

The pores are exceedingly small, rather scarce, arranged in short straight lines, slightly more pronounced in the spring wood, with strange belts of light-coloured wavy lines between. The medullary rays which show on the radial section are clearly defined, with beautiful marking as in live oak, but on the transverse section are very straggling and confused, unlike the usual other kinds of *Quercus*.

OAK, JAPANESE. *Quercus vibrayeana* Fr. & Sav.

South Japan.

Shira-kashi is a hard, very dense, close-grained timber. The colour is a warm brick-red with dark streaks, not unlike the rich red colour of some British brown oak. It is somewhat like American red oak (*Q. rubra*), though browner and of a more pleasing tone. The texture of grain and appearance of the medullary rays are exactly similar to the European evergreen oak, and also in its characteristic liability to diagonal splits. The wood resembles that of *Q. gilva*, except that it is even harder and heavier. Not any of the above species named—that is, of evergreen oaks—have ever been imported on a commercial basis.

The pores are small and very scarce, nearly always following an irregular single line. The medullary rays are very numerous, and stand out thick and conspicuous to the naked eye. They are crossed at right angles by exceedingly fine parallel lines (? parenchyma).

OAK, LIVE. *Quercus virens* Ait.

Weight 59 lbs. (Hough). North America.

Although the close observer has found planks of live oak included in the general shipments of American oak, yet so far as can be ascertained no regular supplies of the wood have been seen in this country. This is unfortunate, as the timber undoubtedly contains qualities of strength and durability, and its exceptional value should make it sought after. It is stronger than any other known oak. My specimen is very hard ; it is of a nut-brown colour, and is close and smooth-grained. Gibson refers to the former great use of this oak in the American Navy, and says further : " In strength and stiffness it rates higher than the white oak. . . . It takes a smooth polish. When the wood is worked into spindles and small articles and brightly polished, its appearance suggests dark polished granite. . . . Its value as a cabinet material has not been appreciated in the past, nor have its possibilities been suspected."

A library at Lord Knutsford's house has live oak employed in the panelling.

The pores are not numerous; they are very smooth and clear-cut. The medullary rays are clearly defined, showing with beautiful marking on the radial section.

OAK, RUSSIAN. *Quercus pedunculata* Ehrh. and *Q. sessiliflora* Sm.

Russian oak is very similar to British and Austrian oak. In strength it compares rather with the former than the latter, but the detailed tests so far made give no really reliable basis on which to compare the strengths of British and Russian oak, while as a constructional timber Austrian oak does not come into question in Great Britain. Russian wainscot oak on the whole may show slightly less bold silver grain than Austrian, yet the best qualities of the former vie with those of the latter in decorative effect.

Russian oak is exported from Danzig, Libau, Memel, Odessa, Riga, and Stettin.

(*a*) **DANZIG OAK.** Weight 47 lbs. 7 oz.—A large quantity is imported in the form of

(1) Logs hewn nearly square, from 8 to 30 feet long and from 10 to 20 inches square.

(2) Plançons—hewn logs with very large wanes.

(3) Planks of various lengths.

(4) "Deck-deals," which are planks varying in length from 24 feet upwards (but averaging about 32 feet), in breadth from 9 to 15 inches, and in thickness from 2 to 6 inches.

(5) Staves, which are imported only in comparatively small quantities, and are used for making casks and barrels. The wood is rather brownish in colour, and is slightly harder and heavier than other Continental European oak.

(6) Wainscots. The import of wainscots from Danzig, at one time considerable, has now almost ceased, and the quality of the few shipments which have been made has much deteriorated.

In earlier times there is little doubt that a large trade was carried on in oak brought from Danzig. Mr. E. Haynes quotes from the subsidy rolls of the second year of King Henry IV. A.D. 1400, 519 years ago (1919), an early reference to the import of "wainscots, clapholtz (barrel staves), tonholtz (wood for tuns), bow staves (arrow shafts), righoltz (rails or spars), Bords (planks), delles (deals), renus (oars), plyning bords (folding boards), masts, spars de firr (firewood spars)." There would be a roll for London, and others for principal ports. The one for the ports of the Humber—Hull, Grimsby, etc.—was in the Augmentation Office, London, a century ago, and may now be in the Record Office. In 1827 Charles First, F.S.A., published "notices relative to the early history of the town and port of Hull," in which as an appendix he printed this Hull and Grimsby subsidy

roll, saying : " It is a document of singular interest as a mercantile record." The enrolment is in the Latin of the period. " The number of wainscots landed is amazing, which, with the low values, even with the then high value of money, suggest they were small in size." Elwes and Henry (*op. cit.* p. 342) quote thus from a note in Hollinshed's *Chronicles* (vol. i. p. 357, ed. 1807) : " According to Mr. J. C. Shenstone, Harrison of Redwinter in Essex, who lived in the reign of Henry VIII., was the author of this note : ' Of all oke growing in England the parke oke is the softest, and far more spalt and prickle than the hedge oke. And of all in Essex that growing in Bardfield Parke is the finest for joiners craft ; for oftentimes have I seene of their workes made of that oke so fine and faire as most of the wanescot that is brought out of Danske, for our wanescot is not made in England. Yet diverse have assaied to deal with our okes to that end, but not with so good successe as they have hoped, because the ab or juice will not so soone be removed and cleane drawne out, which some attribute to want of time in the salt water.' " It is therefore clear that at these very early dates oak wainscot was imported into England. Elwes is in some doubt about the meaning of " Danske," but there is little doubt surely that it meant " Danzig." What the words " spalt " and " prickle " meant is doubtful, but it is likely that they relate to the kinder nature of the timber.

Of Danzig oak Laslett wrote : " It is of fair durability and is largely used in the construction of the mercantile ships of this country, but only sparingly for our ships of war, except for their decks, for which purpose it is regarded as a *specialité*, as it stands well the wear and tear of gun-carriages. For planking it is much esteemed, as the grain is straight, clean, and almost free from knots. Further, it is so pliable and elastic, when boiled or heated by steam, that it may be bent into the most difficult or curved forms without showing any signs of fracture." The use of this timber for shipbuilding has now entirely ceased. Moreover, it becomes each year increasingly difficult to obtain satisfactory supplies, for the quality has deteriorated. The timber is now largely used in the building of railway carriages and railway waggons.

(*b*) **LIBAU OAK.** See RIGA OAK.

(*c*) **MEMEL OAK.**—The timber is similar in all respects to Danzig oak and is derived from the same regions.

(*d*) **ODESSA OAK.**—This wood is brought from Volhynia, Kieff, and the southernmost provinces of Russia, and is imported in the same manner in all respects as the Riga and Libau. During later years a very large quantity of high-class oak logs, hewn nearly square, and others, both hewn and sawn into octagonal shapes, have been imported, which have been used for railway carriage and waggon building and constructional purposes, as well as to a certain extent for joiners' work. A very large quantity also of wainscots of good size and high-class quality has been regularly

imported. The quality of the wood is similar in colour and texture to the other Russian oak, but a little milder and softer, more nearly than the others approaching to the quality of Austrian.

(*e*) **RIGA OAK.**—The oak shipped from Riga and Libau is derived from forests in the interior of the Russian Baltic provinces and of Russian Poland. It is shipped as wainscot logs or billets, hewn logs (only in small quantities), and floorings. The principal trade, however, has been in wainscot billets. About twenty-five or thirty years ago Riga logs were the best obtainable, and realised the highest prices, although their sizes were small, the billets each averaging scarcely more than 18 cubic feet. The quality of these old shipments, and especially the Kieff logs, was the highest yet attained. The wood was bright, of uniform colour, close-grained, hard and firm in texture, and very durable. Laslett wrote : " It is characteristic of this oak timber that the medullary rays are very numerous and more distinctly marked than is the case with Danzig oak " ; and the same authority quotes that " it was customary to select the logs into ' Riga,' ' English,' or ' Dutch ' ' crown ' qualities ; or the ' brack ' quality, at prices varying with the market rates. In 1875 these prices respectively were 100, 90, 80, and 60 shillings per 18 foot cube, in the order named." Kieff logs from about 1885 to 1890 cost about 120 shillings per 18 feet cube. This method of selection and of selling has long since been abandoned, although the term " crown " applied to the quality is still quoted, though more often than not incorrectly, and the logs are now sold always at so much per foot cube. Although the best modern shipments are not of the former superlative quality, it is doubtful if any other European oak, excepting British, equals this in quality or texture. Riga and Libau wainscot logs do not command so high a price as Austrian, since their smaller size and mode of conversion involve greater waste.

The square hewn logs are used for constructional purposes in buildings, for window-sills, and in the construction of railway carriages ; while the planks and boards are utilised for joinery and floorings. The boards are too often cut from small immature wood, or secondary trunks and branches, with the result that they are strong and inclined to warp and twist, and are not very satisfactory.

(*f*) **STETTIN OAK.**—The timber agrees with that exported from Danzig and Memel, since it is derived from the same regions. In recent years there has been an increased export from Stettin of hewn logs and logs sawn octagonally. This timber is mainly used for railway carriages and railway waggons.

OAK, SPESSART.

The oak known as " Spessart " is that which comes from a highland forest district belonging mainly to the Bavarian province of Lower

Franconia, but in the north to the Prussian province of Hesse Cassel. It does not appear perfectly clear whether the timber is the product of *Quercus sessiliflora* or *Q. pedunculata*, but it is probable that both sorts occur, and some authorities have stated that *Q. sessiliflora* is the hill oak and *Q. pedunculata* the valley oak. The predominating features of this wood are its mildness and extremely regular growth of the annual rings. Nearly every tree produces the same thickness of growth to every annual layer; on this account, and because of its exceedingly mild nature, the timber is greatly valued throughout Germany, where the greater part of the production is used for the best quality of knife-cut veneers. The regularity of its growth and closeness of its annual rings are only comparable with some of the oak grown in Japan, no other country producing these peculiar qualities.

OAK, TASMANIAN.

See STRINGYBARK.

OBECHI and **ARERE.** *Triplochiton scleroxylon* K. Schum.

Weight 20–21 lbs. Africa.

Known in the English market as obechi and arere; in the German market as abachi; and in the French market as ayous, from the Cameroons, and as samba, from Grand Bassam.

Record reports that there is an abundant supply, but the logs deteriorate so quickly that exceedingly good transportation facilities are essential.

It does not appear to be quite certain that the timber known as ayous and that known as obechi are precisely the same, although it is probable. Ayous has been used extensively for the core wood in ply-wood manufacture, but is reported as being found unsatisfactory.

Occasional logs have found their way into Liverpool and London for many years past (1930) until a short time ago, under the name of African whitewood.

It is of a light yellow straw colour, with a firm, straight grain, which at first sight gives the impression of woolliness, but a smooth surface is easily produced, and the wood is, relative to its weight, remarkably strong. As it is obtainable in long lengths and wide widths, sound and free from defect, and at a very reasonable price, it has become in demand for a great variety of purposes where its economical working, light weight, and good quality have rendered it most popular. *Tropical Woods* publishes a list of shrinkage tests which established the knowledge that it stands as well as, and similar to, other woods of this weight and density.

The scarce pores are rather large and open, with confused rough-edged medullary rays varying in thickness, and not showing on the radial section.

OBOBONEKHUI. *Guarea Thompsonii* Sprague & Hutchinson.

Nigeria.

Reported by the Imperial Institute in *Descriptive List of Some Empire Timbers* as a wood of good quality, already marketed in some parts as a "mahogany," for which it is said to be a good substitute; the grain is somewhat similar to Honduras mahogany. A better timber than okwein (which might also sell as a mahogany), being of better colour and milder in working. It could be used for carriage-building.

Ocotea usambarensis.

Weight 34–36 lbs. East Africa.

The East African wood known as camphor, or by the native name of muzaita, is a wood with a fine, close, mahogany-like texture and colour, resembling and practically indistinguishable from many of the lighter coloured so-called West African mahoganies; it also resembles that of the cinnamon tree, *Cinnamomum zeylanicum*, in appearance. The East African camphor-wood stands well without warping, twisting, shrinking, or swelling, and it is in all respects a valuable timber. There is a strong scent of camphor and the pores are plugged with a bright glistening gum.

The numerous pores are irregularly placed in groups, and plugged. The rather fine medullary rays are not very prominent.

Odina Wodier Roxb.

Weight 50 lbs. India.

VERN—*Kiamıl, kımúl, kamlái, kashmala, jhıngan, mowen, molıen, moyen, moyna, gınyan,* Hind.—*Jıgna,* Oudh—*Garja,* Bijeragogarh—*Bara dabdabbı, hallorav,* Nep.—*Jıyal, lohar, bhadı,* Beng.—*Gob,* Ajmere —*Gol,* Merwara—*Wodıer, wude, uthi, odi,* Tam.—*Gumpını, gumpina, gumpna, dumpını, dumprı, dumper,* Tel —*Kaıkra, gumprı, gharrı,* Gondı—*Kekeda,* Kurku—*Shımtı, púnıl, gojal,* Kan.—*Moı, moja, moye, shımbat, shımtı,* Mar —*Kalasan,* Mal.—*Jır, jıvál,* Monghyr—*Dowka,* Sonthal, Kól—*Dowka gıa,* Bhumij—*Moı,* Uriya—*Dopé,* Khond—*Hneingpyoing,* Magh—*Nabè,* Burm.—*Hık,* Cingh.

The wood is of a light yellow-brown colour, with a straight, even grain, somewhat resembling cigar-box cedar (*Cedrela odorata*). It appears to stand well without warping or shrinking. It should be useful as a substitute for plain mahogany or cedar.

The pores are small and rather scarce, and regular in position. The medullary rays are exceedingly fine and rather obscure.

OGUGU. *Sterculia cordifolia* Cav.

Nigeria.

The Imperial Institute says this wood is remarkable for the absence of shrinkage in seasoning, but has little market value.

OITY or **CABRAIBA.** *Moquilia tomentosa* Benth.

Brazil.

VERN—*Oiti, oity da Praia, aiti guayti, oitiçica* ?, Braz.

The colour is a lustrous red-brown, with a hard, close grain, capable of a smooth surface from the tool. Record says that it is strong and easy to split, and likens it to satinee, for which wood it should make a very good substitute. He adds, " it is used in civil and naval construction, for fence-posts, piling, and railway ties." An uneconomical use for a very fine cabinet wood.

The numerous tiny pores are regularly placed, fully plugged, with very fine regular medullary rays, parallel, not showing on the radial section.

OKWEIN. *Brachystegia spicaeformis* Benth.

Nigeria.

As reported by the Imperial Institute, the wood resembles iroko in grain, although not so hard, and in colour that of a light mahogany.

Olea ferruginea. Royle.

Weight 66 lbs. (Pearson & Brown). India.

VERN—*Khwan, shwan,* Trans-Indus—*Zaitún,* Afgh —*Ko, kohu, kao, kau, wi,* Pb.—*Kau,* Jaunsar—*Kahu, khau,* Sind.—*Olive.*

Pearson and Brown, in *Commercial Timbers of India,* report this wood as " variable in colour from light brown with close, narrow, darker streaks through shades of olive-brown to deep purple, regularly shaped . . . straight-grained or somewhat shallowly interlocked-grained, very fine and even-textured . . . durable. . . . It takes a beautiful polish. . . . The North-Western Railway uses it extensively for all classes of shafts and handles of tools. . . . It should be valuable for inlay work in its darker shades and for small panels when of lighter colour."

Olearia Macrodonia.

A greenish olive-coloured wood resembling the well-known olive wood, capable of smooth surface under a sharp plane. If sound pieces can be secured in any size, it would be an attractive medium for inlaid, fine-class decorative woodwork.

The pores are rather scarce, plugged, ill-defined. Medullary rays short and wavy, not parallel.

OLEO VERMELHO. *Myroxylon toluiferum* H. B. K.

Weight 54 lbs. Brazil.

VERN—*Oleo vermelho,* Trade—*Balsamo, oleo vermelho, cabreúva, cabreúva vermelha, caboré, incienso,* Braz.—*Quina, quina-quina, kina, kina-kina, kina morado, incienso,* Arg.—*Quina-quina,* Boliv.—*Balsamo, balsamo de tolú, tolú, tache,* Col.—*Balsamo,* Venez., Pan.—*Balsamo, palo de balsamo,* Salv.—*Balsamito,* C.R.

The colour is a very bright red, with an extremely close, rather con-

trary grain, very hard, requiring a sharp tool to secure a smooth surface. The wood has a delicate, agreeable scent and somewhat resembles the French satinee ; it is very suitable for decorative cabinet work, especially of the Empire style.

Record says that cabreúva vermelha is the common name in Sao Paulo, and that it is also exported from Brazil under the name of oleo vermelho. He mentions that there is a considerable supply, that it is an excellent substitute for Cuba mahogany, and promises to become of much greater importance in the foreign trade, as well as in the local markets.

The concentric layers are marked by dark lines. The very numerous minute pores are mostly plugged ; the medullary rays exceedingly fine, and hardly discernible under the lens.

OLIVE. *Olea europoea* Linn.
Weight 58 lbs. 6 oz. Southern Europe.

Olive is imported in round logs varying from 4 to 12 inches in diameter, though occasionally a few pieces are somewhat larger. It is of a yellowish-brown colour streaked with darker markings of all shades, sometimes verging almost to black. A very smooth, marble-like surface can be made with the tool, when the wood somewhat resembles the surface of boxwood. It is used for inlay and for small work of a decorative nature, such as the ink-stands, paper-knives, and table ornaments which are frequently brought from the East as mementoes of a visit.

The pores are scarce and obscure. The medullary rays, which are very small and exceedingly fine, are clearly marked.

OLIVIER. *Chuncoa obovata* Poir., allied to *Terminalia* aff. *januarensis* DC.
Weight 48–50 lbs. Trinidad.

VERN—*Amandier du bord de mer, amandier du pays, almendron de playa, olivier, yellow olivier, aceitunillo, poirier,* Trin.

This is a moderately hard wood, greenish-brown in colour, figured with red markings. It takes two years to season and should be immersed in water immediately after felling.

It is used locally for building construction, is considered durable even in damp situations, and is immune from insect attack.

ORANGE. *Citrus aurantium* Linn.
Weight 49 lbs. (Gamble). India, Southern Europe, Tropical America, Africa.

VERN—*Narangi, naringi, santara, kumla nebu,* Hind.—*Jairum,* Kumaon —*Janmera, jamera,* Garhwal—*Suntala,* Nep.—*Sulum,* Lepcha—*Narangi,* Mar.—*Kitchli,* Tam.—*Kittali,* Tel.—*Shaung-pang,* Magh —*Leinmaw, kabala,* Burm.

The wood is yellowish-white, hard, close-grained, with rather a tough

surface after planing. A specimen grown at Powerscourt Castle displays a useful and strong wood for walking-sticks, and might perhaps be used for making golf clubs, but has no special characteristic fitting it for use as a decorative medium.

The very close-grown concentric layers are visible to the naked eye, marked by white lines. The tiny pores open, not very numerous, and ranged in narrow and short wavy belts of light tissue. Medullary rays are pronounced, irregular.

ORELHA DE MACACO. *Enterolobium elipticum* Benth.

Weight 49 lbs. Brazil.

Record classes orelha de macaco, vinhatico de boi, and mihatico amarello as the same, and gives the source as *Plathymenia reticulata* Benth., while Pereira distinguishes between them. It is probable that in commercial usage they become mixed. A bright orange-coloured wood, the general appearance being similar to the American Osage orange, with a silky lustre and a smooth grain.

The pores are large and numerous ; they are sometimes joined and are surrounded by a patch of loose tissue. The medullary rays are very fine and numerous, and radiate from the centre in wavy lines.

ORHAM WOOD. *Ulmus* sp.

Weight 32 lbs. Canada, United States.

The name " orham " is undoubtedly a corruption of the French " orme," elm. The wood which is commonly known under this name is a very good quality elm, though it is neither hard nor tough enough to be useful for the purposes for which Canadian or American rock elm are usually employed. It might be described as being half-way between this and English wych elm, though it is whiter and milder in character. It has been used extensively in the United Kingdom for many purposes, particularly for making coffins.

ORMOSIA STRAITA.

Burma.

A rather soft, close-grained wood of a dirty, yellow-brown colour, liable to warp and twist, and not likely to prove attractive in decorative woodwork.

The pores are in belts varying in size, and fairly numerous. The medullary rays are uneven and irregular, varying in density and thickness.

OSAGE ORANGE. *Toxylon pomiferum* Raf.
Maclura aurantiaca Nutt.

Weight 48 lbs. (Hough). North America.

This wood, which is imported in lengths of 6 to 8 feet and 12 to 18 inches in diameter, is of a bright orange colour, deepening with exposure

to air and light. It is rather lustrous, very pliable and elastic, and has been used for walking-sticks and golf shafts, though for the latter purpose it is too pliable in these days when stiff shafts are in demand. In Texas and other American States it is largely used and valued for posts, agricultural implements, and waggons.

Sargent says it was used " formerly by the Osage and other Indians west of the Mississippi river, for bows and war clubs." He also gives it the alternative name of " bow-wood." Fine trees have been grown in various parts of this country, and especially at Lord Aldenham's seat near Radlett in Hertfordshire, and also at Kew.

There is a strong contrast of dark and light rings in the annual growth. The pores vary considerably in size, and are filled with a bright, shining gum. The medullary rays are fine and distinct and rather irregular.

PADAUK, AFRICAN. Source unknown.
Probably *Pterocarpus santalinoides* L'Herit. or *P. angolensis* DC.
Weight 60–61 lbs. West Coast of Tropical Africa.

Logs hewn square and in the round, in sizes from 16 inches to 36 inches, have found their way into London and Liverpool included in shipments of mahogany, without creating any interest. A demand arose from America, and shipments in fair quantities resulted. There is a resemblance in this wood to that of the Andaman padauk, but it has a softer, more open grain, is lighter in weight and colour, and distinctly inferior in general quality ; neither is it so hard nor so strong as barwood (*q.v.*). Exposed to a strong light it bleaches to a dull light brown, while with a moderate exposure to light it turns a dull plum-red colour, and as in the case with barwood, water is stained with the dye.

The pores are exceedingly variable in size, very unevenly distributed, plainly visible to the naked eye, and sometimes sparsely filled with gum. Medullary rays very fine, close, and obscure ; while much more strongly marked are seen irregular bands of white lines, which follow the lines of the concentric layers.

PADAUK, ANDAMAN. *Pterocarpus dalbergioides* Roxb.
Weight 54 lbs. The Andaman Islands.
VERN—*Chalanga-dá*, And.

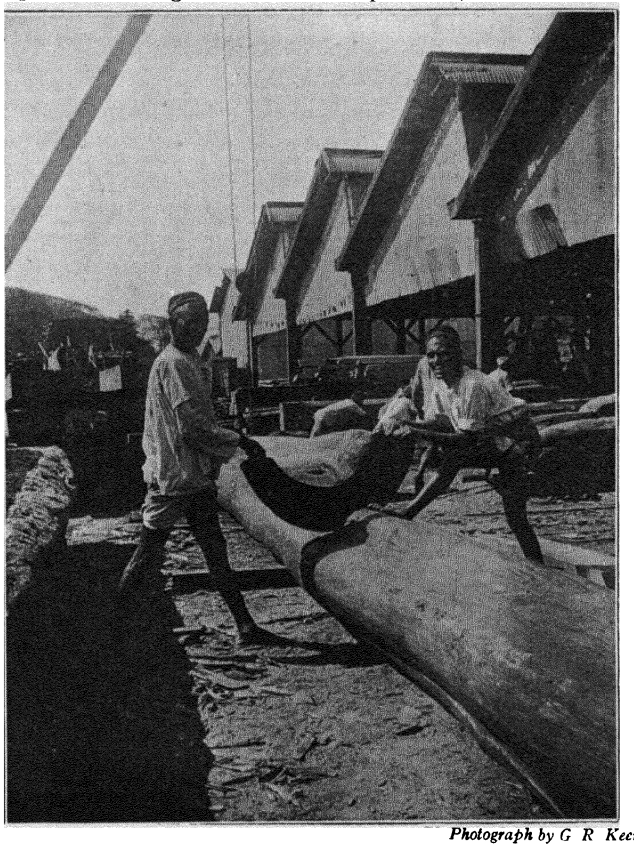
When Burmese convicts first went to the Andamans, they saw a tree which resembled the padauk of their own country and gave it the same name—padauk, the *au* pronounced as *ou* in gout. In other countries, America and on the Continent, etc., it has been called East Indian mahogany, vermilion, Indian redwood, false satinee, and other names. The colour ranges from all shades of golden brown to a violent red, hence

the name vermilion. With exposure some logs deepen in colour, while others fade (increasingly in India), so that there are those that turn almost black while others bleach to a golden yellow ; this is no doubt the reason why Gamble states that padauk fades to much the same colour as teak. Those who know only the results of exposure in temperate climates would be amazed at the effect created by the fierce light and atmosphere of tropical countries, where woods of even the lightest colour when first cut —such as sissoo, champak, and the very bright golden-yellow jackwood— deepen in course of years to almost black. Yet at the same time the wood of certain logs will bleach, and all the colour go out.

In the Andamans padauk used to be selected and classified as " on-coloured " and " off-coloured," the proportion being about 70 per cent " on " and 30 per cent " off," but only a proportion of the " on-coloured " wood contains the very brilliant red. After its first introduction to the markets of the West, little notice was taken of it in England or France, notwithstanding considerable efforts which were made to recommend it, but a very large inquiry arose in the American market, from whence considerable demand was made for the heavy " on-coloured " wood. This quickly earned publicity began to wane in 1911, and practically faded out before the war. The logs generally contain alternate layers of hard and soft grain, which necessitate the use of a sharp tool to produce a smooth surface, *plain wood being scarce*, while a small percentage of the trees yield wood with beautiful figure, including all the descriptions of figure which are found in mahogany, *i.e.* stripe or roe, broken roe with mottle of all classes, even up to the very best splash mottle, fiddle mottle, the predominating feature being the handsome narrow stripe, often with dark-coloured veins, which add to the general attractive effect of the wood. On this account as well as for its rich colour, it is chiefly valued for ornamental decorative woodwork, furniture, and panelling. It has a handsome appearance in parquet flooring, makes a splendid chair wood, and is very strong and durable under all conditions. In India, besides being used for these purposes and for planks and beams, it is considered the best wood for gun-carriages and wheels. The greater part of the vast Marshall-Field store in Chicago is trimmed and furnished with it, while it forms the panelling and furniture of many large public buildings, clubs, and private houses. It provided handsome cases for a number of pianofortes and organs, and the Pullman Car Company formerly used it in very large quantities for trimming dining, sleeping, and smoking compartments in railroad cars. The dull kind of polish (not french polish) used in America, or perhaps it should be called a flat coach-builders' varnish, suits the appearance and wear of this wood better than the usual methods adopted in England. Of late years the demand in England and on the Continent has increased. Fine examples may be seen in Sir Francis Peek's buildings

in Eastcheap ; the Bank of England's new offices in Finsbury Circus, and it will also be seen prominently in the new Bank now building (1932) ; the library in the office lately occupied by the High Commissioner for India at Grosvenor Gardens ; and more extensively than elsewhere, in the new India House, Aldwych, London. A handsome store has also been trimmed and fitted throughout at The Hague in Holland.

The pores are irregular in size and position, and are occasionally seen



Photograph by G R Keen

CROSS-CUTTING LOGS

in duplicate and triplicate. The medullary rays are very fine, rather obscure and numerous, mostly parallel and joined at right angles by wide, irregular, light-coloured bands.

PADAUK, BURMA. *Pterocarpus macrocarpus* Kurz.

Weight 53–59 lbs. (Troup). Burma.

In England this wood is commonly pronounced pad*oo*k, the " au " as " oo " in " hook." The correct pronunciation is pad*au*k, the " au " as " ou " in " gout." This wood is the product of the true forest padauk tree.

" Trees are obtainable which will give clear pieces ranging in length from 16 to 28 feet with a centre girth of from 6 feet to 8 feet 3 inches, but larger logs are obtainable, although the difficulties of transport prevent their extraction."

The timber varies in colour from a bright yellowish-red to a dark brick-red, and is sometimes streaked with brown ; its brilliancy of colour is not so marked as in that of the Andaman padauk. In moderate climates it generally bleaches to an attractive golden brown, or golden yellow colour, and with the strongest exposure to sun and light will eventually take on almost the exact colour of Ceylon satinwood, while in Burma and other tropical countries it may darken to a deep warm brown, and sometimes almost black. It possesses a hard, firm texture, and like the Andaman wood, its close, contrary grain causes some difficulty in producing a smooth surface. It seasons well, but in the early stages it should not be exposed to extremes of heat and cold, or left unprotected from the wind, as this is likely to cause it to crack. For many years it has been accepted as being stronger and more durable than the Andaman wood. Mr. R. S. Pearson says that the Andaman padauk (*Pterocarpus dalbergioides*) is now considered to be better in all respects. Further inquiry does not support Mr. Pearson's contention as regards the strength, as it is probable that the earlier opinion is supported by experiment, while in durability there is nothing to choose between the two. It is far stronger than teak, and very suitable, as Troup has pointed out, for " naves, spokes, and felloes of cart and carriage wheels, solid cart wheels, axles, carriage building, furniture, ploughs, harrows, and Burmese harps." In England it was formerly used by the Ordnance Department, but of late years does not seem to have been in demand for that Department. All of these uses, excepting perhaps for the making of furniture and harps in Burma, may be considered as a wasteful use of one of the finest decorative and cabinet woods the world provides. This can be seen by viewing the library in the new India House, which is entirely panelled and furnished in Burma padauk, and presents an appearance second to none of the outstanding representations of the finest woodwork to be seen in London. Individual logs have been sold on the London market from time to time, at prices ranging up to even 48s. per foot cube, and even now (1932) the true value of this fine wood has never been realised. During the war 175 logs, collected for use in different parts, eventually reached the Government Depôt at Mandalay. So little was their value recognised that sales were made from these accumulated stocks at a maximum price of less than £4 per ton. Those remaining on hand in 1920 were shipped to London, and high prices were realised, that for one log reaching a maximum of £96 per ton, and a considerable number of the same shipment were used to make the woodwork, referred to above, at India House.

The pores are very irregular in size and position ; they are generally

plugged with a white gum. The fine medullary rays are rather obscure and very irregular. At irregular intervals they are crossed at right angles by similar light markings which appear round the concentric layers in fine, narrow, wavy lines.

PAGATPAT. *Sonneratia Pagatpat* Blanco and *S. alba* Smith.
Weight 53 lbs. The Philippines.

Foxworthy says that these two species are very much alike and may be identical.

The wood is hard, dense, and fine-grained. In appearance it much resembles guizo, but the grain is finer. It has never yet been imported on a commercial basis. If the difficulties and expense attending the export of such a heavy wood could be overcome, there is every reason to believe that the timber would meet with a good reception. Foxworthy reports it as " working readily, but contains quite a large amount of salt, and consequently is said to cause nails or spikes to rust quickly. . . . Air-dry wood sometimes contains as much as 1 per cent of its weight of salt."

The pores are small and irregular, sparkling somewhat on the tangential section. The medullary rays are not very strongly defined, and the texture and growth are very close.

PAHAUTEA. *Libocedrus Bidwilii* Hook.
Weight 28 lbs. (Stone). New Zealand.

The Board of Agriculture, New Zealand, says that this wood is of a " red colour, remarkably straight in grain, and durable. Procurable in lengths up to 30 feet and up to 12 inches wide. Used for bridge-building, telegraph posts, fencing-posts, and rails."

Palaquium ellipticum Benth.
Weight 43 lbs. (Pearson & Brown). India.
VERN—*Panchoti, palla,* Mar.—*Kat illupei,* Tam —*Pála,* Mal.—*Kei pála,* Trav. Hills—*Pauchonta,* Kan.—*Illupei,* Kader—*Pali.*

Pearson and Brown, in *Commercial Timbers of India,* state this wood to be " light red to light reddish-brown . . . straight-grained or sometimes wavy-grained in the radial plane, medium and even-textured. . . . Moderately durable if not placed in exposed positions. . . . It is used in Madras for building, as doors, window-frames, planking, flooring, and ceiling boards ; for cheap furniture. . . . A sound timber, which gives the best results when seasoned in kilns."

Palaquium grande Engler (*Dichopsis grandis* Benth.).
Weight 35–36 lbs. Ceylon.
VERN—*Kirihiriya, mihiriya, kirihembiliya,* Cingh.

The colour is a deep brown, with a tinge of purple, and a very hard,

close, compact grain, capable of a very smooth surface from the tool. Gamble reports it as used for roofs of bungalows and store-houses, on coffee and tea estates. Its qualities would indicate that this is a wasteful use of a wood which would be valuable for decorative woodwork and turnery.

Pores exceedingly fine, very numerous, plugged. Medullary rays irregular, indistinct, very fine, difficult to locate.

Palaquium petiolare (*Dichopsis petiolare*).

Weight 37 lbs. Ceylon.

The colour is light brick-red, with a softer grain, and less hard and heavy than *Palaquium grande* (*q.v.*). J. S. Gamble does not report it.

The concentric layers of growth are marked by confused dark lines, the pores are very small and arranged like splashes of rain.

PAO D'ARCO. *Tecoma* sp.

Weight 69 lbs. Brazil.

VERN—*Lapacho, lapacho amarillo, lapacho blanco, l. crespo, l. negro, l. rosa, lapachillo, tally, taye, tayi*, Arg.—*Tajibo*, Boliv.—*Ipé, ipé amarello, ipé cascudo, ipé folhas rôxas, ipé jabotiá, ipé preto, ipé tobaco, ipé rôxo, ipé una, ipé do campo, ipé da varzea, páo d'arco, páo d'arco amarello, páo d'arco rôxo, quiarapaiba, uruparuba*, Braz.—*Hackia, iron-tree, ironwood, wasiba, washiba, bow-wood*, B.G —*Groenhart, groenhati, ijzerhout*, Sur —*Ebène verte, bois d'ebène verte, guparuba*, Fr. G —*Arahoní, arrhonée*, Galibis—*Araguaney, acapro, curarire, echahumo, flor amarillo*, Venez.—*Pui, poui*, Trin —*Chicalá, cañaguate, guayacan polvillo*, Col —*Guayacan*, Pan.—*Cortes, corteza, mano de léon*, Guat —*Cortez amarillo, c. negro, c prieto*, Salv.—*Corteza amarilla, guayacan*, C.R.—*Quebracho, masicarán*, Hond —*Amapá, amapá prieto, guayacan, roble, verdecillo*, Mex.—*Yellow guayacan bastard lignum-vitae, Surinam greenheart, bethabara, washiba, noibwood.*

In Colonel Gamble's collection there are two samples, one of which is marked " ipé pardo " and the other " páo d'arco." The latter is also marked with the botanical name of *Bignonia pentaphylla*, but no species is given with the former. I can detect no difference in these two specimens, either in general appearance or in the structure as seen in the transverse section. Baterden refers to this wood as *Tecoma speciosa* and says that the name means " arch-wood."

Record says there are numerous species in Brazil, the common name in the south being " ipé " ; in the north " páo d'arco " is a name applied to other woods as well (according to Pereira). Páo d'arco amarello is one of the tallest trees of the Amazon region, but pao d'arco rôxo is taller still. There is much confusion of identification with these, but both belong to *Tecoma* genus, and generally no distinction is made between them.

Pereira names two kinds in the State of St. Paulo, the red and the yellow, both as being Bignoneacea.

In *The Naturalist on the Amazons*, by Henry Bates, are some interesting notes on several Brazilian trees. He speaks of a sawmill near to Para where " they frequently squared logs for sawing 100 feet long of the pao d'arco and the massaranduba. The total height of these trees, stem and crown together, may be estimated at from 180 to 200 feet ; where one of them stands, the vast dome of foliage rises above the other forest trees as a domed cathedral rises above the other buildings in a city." This poetic description of the forest is worthy of repetition, for who is there that has not been thrilled and astonished by the grandeur of a mighty forest and the glory of its trees ; even a great warrior of antiquity halted his army to view a single enormous plane tree, and our artists in wood and stone have been indebted to the exquisite forms of bark, leaf, and fruit for their models, as shown in our great cathedrals, and wood carvings, indeed many of our most treasured examples of Art are due to the inspiration derived from the beauty of the trees of the forest.

Colonel Gamble notes that the páo d'arco is plentiful throughout Brazil, and that it grows to a height of over 20 metres, and to a diameter of over 2 metres. He says that it is identical with ipé pardo (*Tecoma speciosa*). The colour is a lustrous brown with a slightly greenish tinge, somewhat resembling a dark greenheart, but with a much closer and firmer grain.

Ipé tobaco has a reputation for first-class sleepers, which are said to last for eleven years, while ipé una ranks second, lasting only nine years. All of the different varieties have astringent qualities and are reported as of medicinal value. Record reports the wood as used for carts, barrels, casks, and general construction ; *Brazilian Woods* states that they are excellent for piles, boom, and harbour work.

Some of the logs are highly figured, with small broken roe and mottle, and veneers have been obtained which give the appearance of a dark golden-brown Ceylon satinwood, and have been used for high-class decorative work in America and England. There is reason also to believe that veneers of this wood have passed for green ebony. It is also valued for decorative cabinet work, panelling, chair-work, etc. The practice of using it for casks, general construction, etc., should be condemned as a wasteful use of a precious wood.

The pores are very small and numerous, and are sometimes joined in wavy bands. The medullary rays are very fine and numerous.

PAO BRANCO. *Auxemma Gardneriana* Miers.

Weight 50 lbs. Brazil.

VERN—*Páo branco*, Braz.

This is a valuable wood of a dark brown colour ; it resembles American black walnut (*Juglans nigra*) though it is more attractive in appearance. It gives evidence of possessing those qualities of strength, toughness, and

elasticity which give to European walnut (*J. regia*) its value ; and consequently it should be a good medium for gun-stocks, than which no higher recommendation could be made, but the colour is richer and darker. Shipments should find a ready market.

The pores vary both in size and position, and the concentric layers are marked by bands in which pores are alternately found and absent. The medullary rays are well-defined and show on the radial section in fine light flecks.

PÁO CARGA. Source unknown.
Weight 39 lbs. Brazil.

This is a pale reddish-brown, straight-grained wood, which is smooth and lustrous in appearance.

The pores are very numerous, and are generally joined in twos and threes. Medullary rays are exceedingly fine and numerous, and are crossed at right angles by similar light wavy concentric lines. The concentric layers are marked by narrow bands of darker-coloured tissue.

PÁO FERRO. *Caesalpinia* sp. Mart.
Weight 69 lbs.
Brazil, The Guianas, and other parts of Tropical South America.

This wood adds one more to the long list of timbers known as " ironwood." Over eighty distinct botanical species can be traced in various countries of the world, all of which are known by this name (Foxworthy).

Brazilian Woods mentions two different species of páo ferro, one of which is given as the produce of *Swartzia tomentosa*, known also in British Guiana as " ironwood " (Record), and the other of *Apuleia ferrea*. Of the former the following description is given : " This wood, which is as hard as iron, a peculiarity which gives it its name, is especially used for hydraulic works." *Apuleia ferrea* is described as a " first-class wood for building, hydraulic works, harbours, piles, etc." Colonel Gamble's specimen, however, is marked as above, *Caesalpinia ferrea*, and this name he also gives in his notes, where he mentions that the wood lasts for hundreds of years underground.

In colour it is a deep purplish-brown merging almost into black, and it has a firm, smooth, marble-like texture which is reminiscent of African blackwood (*Dalbergia Melanoxylon*), a wood which it resembles in other respects.

The pores are very small and numerous, and are linked together in wavy lines of loose tissue. The medullary rays are so exceedingly fine and close that they are only visible under the lens. Concentric rings are clearly marked by darker-coloured wood.

PÁO MULLATO. *Calycophyllum Spruccanum* Benth.
Weight 59 lbs. Brazil.

This wood is pale nut-brown in colour, with a very dense, close, and even texture. The pores, which show longitudinally on the radial section, have glistening contents. There are several worm-holes in the small specimen examined, a defect to which the wood is liable.

The pores are exceedingly small and are generally linked in wavy lines. The medullary rays are fine and numerous, and are crossed at right angles by similar light, wavy concentric lines.

PÁO D'OLEO. *Copaifera Langsdorffii* Desf.
Weight 49 lbs. Brazil.

This is a bright red, slightly lustrous wood, with a smooth, close texture and a strongly marked silver grain on the radial section. There is a noticeable similarity between its appearance and that of the Burmese thitsi (*Melanorrhoea usitata*). A wood deserving careful attention, which would make a very fine cabinet wood.

Baterden says that it is used for furniture and sleepers as well as in general construction.

The pores are variable in size and are plugged with a dark oily substance. The medullary rays are very fine and numerous. Dark, irregularly spaced lines mark the layers of concentric growth.

PÁO POMBO. *Tapirira guianensis* Aubl.
Weight 30 lbs. Brazil.

VERN—*Páo pombo, fruta de pomba,* Braz.—*Tapiriri,* Galibis—*Duka, dooka,* B.G —*Bois tapiré,* Fr G.

This wood is of a whitish straw colour, and a smooth and lustrous texture, unusual in a wood so light in weight. Stone gives the name as an alternative for simaruba (*Simaruba amara*), but I doubt whether the wood to which he refers is identical with the specimen in Colonel Gamble's collection. Stone says that simaruba may easily be mistaken for quassia, but this specimen of páo pombo is unlike quassia. He also speaks of it as having a bitter taste, but there is no taste in this specimen.

The small and rather infrequent pores have a somewhat curious effect in that, like the medullary rays, they are also darker than the groundwork of the wood, which is the reverse of what is usually the case. The rays are fine and numerous. Dark-coloured concentric lines appear at irregular intervals.

PÁO SANTO. *Zollernia paraensis* Huber.
Weight 89 lbs. Brazil.

VERN—*Páo santo, muirapinima preta,* Braz.—*Santo wood.*

The colour is a dark purple with still darker streaks, while the sapwood is a bright yellow. It is even harder than lignum-vitae, with a closer

and more even grain, scarcely, if at all, interlocked. The wood possesses a sweet aromatic scent.

In his pamphlet on *Lignum-vitae* (Bulletin No. 6), Professor Record mentions in regard to Paraguay lignum-vitae: "This is the wood of *Bulnesia Sarmienti* locally known as 'palo santo' on account of its use for incense in churches . . . this wood has a place on the market in the manufacture of the 'oil of guaiac wood' used by perfumers." Also that the equivalent Portuguese term is "páo santo," and that the wood of the *Zollernia paraensis* of Brazil is known by this name, having been exported as a substitute for *Guiacum officinale*. He further states that the pores in *Bulnesia Sarmienti* and *B. arborea* are arranged in radial lines, and that this is the important distinguishing characteristic. The pores in my sample are quite irregularly distributed, and in this respect resemble *Guiacum officinale*.

The very small pores, which are irregularly placed, are linked at right angles by concentric wavy belts. The medullary rays are exceedingly fine and very numerous.

PÃO SETIM. Source unknown.
Weight 39 lbs. Brazil.

In Colonel Gamble's collection there is a specimen marked "pão setim." In colour and almost every respect it resembles pão amarello (*Euxylophora paraensis*), which is also sometimes termed pão setim. The fact, however, that there is such a marked difference in the arrangement of the pores and medullary rays, suggests two different woods.

Brazilian Woods describes pão setim (literally satinwood) as *Aspidosperma eburnea*—giving an alternative name, Pequia marfim—of a bright sulphur colour. This corresponds with the description of another of Colonel Gamble's specimens marked Piquia marfim (*q.v.*) and seems to indicate that *A. eburnea* is not the same wood as his specimen of pão setim.

In pão setim the pores are large and rather regularly placed, plugged with a sparkling substance, with clearly defined thin bands of lighter-coloured tissue, following the line of the concentric layer; these are crossed by exceedingly numerous medullary rays.

In pão amarello the pores are very small, showing singly or grouped in pairs between very strongly marked medullary rays.

PAPAW. *Carica Papaya* Linn.
Weight 23 lbs. India, South America.
VERN—*Papaya, papita*, Hind.—*Perinji*, Kan.—*Thinbaw*, Burm.

The papaw or papita tree is familiar to every traveller, more on account of its agreeable fruit than for the wood which it yields. This is of a rather dirty yellow straw colour, with numberless tiny spots of sparkling gum,

very light in weight, and soft in grain. The wood could be used as a substitute for balsa.

The not very numerous pores are very large, generally open, with scarce, rough-edged, irregular medullary rays, not prominent, and, unlike *Sterculia* sp., hardly show on the radial section.

PARAGUAY LIGNUM-VITAE.

See PÁO SANTO.

PARAHYBA.

See *Simaruba Amara.*

PARAJU. Source unknown.
Weight 69 lbs. Brazil.

This is a straight-grained wood of a nut-brown colour ; it is close and even in texture, and has a very dense grain. The medullary rays show on the radial section in small flecks. My specimen shows small pin worm-holes.

The pores are rather small but very numerous ; the concentric rings are marked by an absence of pores. The medullary rays, which are exceedingly fine and numerous, are only discernible under the lens.

Parashorea stellata Kurz.
Weight 50 lbs. Burma.
VERN—*Kaunghmu, thingadu,* Burm.—*Panthitya,* Tavoy.

The colour of the wood is light brown, with an even grain, comparable with mahogany, for which wood it might become a substitute.

Supplies are of good dimensions, and fairly plentiful. During the last few years (1931) the wood has been imported into the London market, and only the general prejudice against new woods has hindered its popularity.

The pores are large and open, with strong medullary rays at wide intervals, intersected at right angles by exceedingly fine lines, of a similar light character.

Parishia insignis Hook. f.
Weight 24 lbs. (Pearson & Brown). Burma, Andamans.

Pearson and Brown, in *Commercial Timbers of India*, report this wood as " light pinkish-grey, ageing to pale brownish-grey ; lustrous when first exposed . . . straight-grained, coarse and even-textured. . . . Not durable in the open, fairly so under cover. . . . An excellent board wood of the better class, very suitable for match-boarding, bottoms of drawers, backing for cupboards, wainscoting, partition work, and should make up into a sound plywood board."

PARTRIDGE-WOOD. *Andira* sp.

Weight 85 lbs. 15 oz. Brazil.

Holtzapffel says that this wood is " sent in large planks or in round or square logs, called from their tints, red, brown, and black, and also sweet partridge. The wood is close, heavy, and generally straight in the grain. The colours are variously mingled, and most frequently disposed in fine hair streaks of two or three shades, which in some of the curly specimens cut plank-wise resemble the feathers of a bird. The partridge-woods are very porous ; cut horizontally, the annual rings appear almost as two distinct layers ; the one hard, woody fibre, the other a much softer substance thickly interspersed with pores ; this circumstance gives rise to its peculiar figure, which often resembles that of the palm tree woods. Partridge-wood was often formerly employed in the Brazils for shipbuilding, and is also known in our dockyards as cabbage-wood. It is now principally used for walking-sticks, umbrella and parasol sticks ; in cabinet work and turning ; and . . . also for fans."

The very small pores, plugged, are linked together by short wavy bands ; the medullary rays are hardly discernible on the transverse section.

PASANIA or **PASINIA.** *Quercus Junghuhuii* Miq.

Weight 41 lbs. Formosa.

In appearance this remarkable wood resembles a veritable cross between the English sweet chestnut and English oak. The colour is similar to that of the chestnut, from which it is only distinguished by the presence of strong medullary rays. The pores show on the radial section in a series of pretty, uneven lines, and improve the effect. It should be a valuable decorative cabinet and trimming wood.

The annual layers are very strongly marked, there being a very wide and distinct difference between the spring and the autumn growth. The pores are scarce and small. The medullary rays are very sparse, uneven, and irregular.

PATAPSCO or **PAPAPSCO.**

For some reason which remains unexplained, this is a name given to a particular form of figured maple (*q.v.*). The figure is a curly, wavy mottle with a blister, or indications of blister, without any bird's-eye being apparent.

PAU or **PÃO AMARELLO.** *Euxylophora paraensis* Huber.

Weight 56 lbs. 3 oz. Brazil, Para.

VERN—*Páo amarello, páo setim, amarello,* Braz.—*Sateen wood.*

This wood has a grain like a fine Spanish mahogany, but is of a bright, rich, warm golden-yellow colour. The tint is not that of satinwood, but

is more like a bright prima vera. It is used in Para for decorative cabinet work and for flooring. It has never been imported on a commercial basis, although it is such a handsome wood, that it would be much sought for in furniture and decorative cabinet work of all sorts, if it were known and obtainable.

The pores are very small, singly or grouped in pairs between very strongly marked medullary rays.

Paulownia.

China.

The specimen of Professor Chung's has no name on it but it is identified by Professor Record as *Paulownia.*

The wood is very light in weight, very soft in grain, but not comparable to the Japanese Paulownia.

It is a soft, pale yellow straw-coloured wood, with a very wide annual growth from $\frac{1}{4}$ inch to 1 inch, somewhat pithy, similar to, but not so good as the obechi of Western Africa.

PEAR, NATIVE. *Xylomelum occidentale* R. Br.
Weight 46 lbs. (at 12 per cent moisture).
Western Australia.

This is a soft wood of a deep red colour, with pronounced medullary rays, and, according to Lane-Poole, a beautiful figure. It is used as a very fine furniture wood ; when finished with a wax polish it resembles moiré silk.

The wood is not exported, as supplies are very limited.

PEAR TREE. *Pyrus communis* Linn.
Weight 47 lbs. 13 oz. Europe.

This wood is remarkable for its extraordinary smoothness and evenness of texture, which renders it excellent for carving, as it can be cut easily with a sharp edge in any direction. It is a pale yellowish-red, resembling flesh colour more nearly than any other timber. Thus, if a statue were made of pear-wood it would probably be the closest resemblance to the human figure that could be produced. It is used for mathematical and drawing instruments and rules. Elwes and Henry mention its use for cogs, wood-screws, and tool handles.

It has also been used for furniture. A recent addition to the Victoria and Albert Museum is a seventeenth-century table of pear-wood from Boughton House, Northamptonshire. It is also to be seen in the form of marquetry, together with sycamore, ash, and maple, in a cabinet of pine, which, dating from the second half of the sixteenth century, is carved on

the base with the rose and portcullis, emblems of the Tudor sovereigns of England.

Pear tree wood, together with many other British woods, was more commonly used in earlier times, as there was then a much more limited choice ; an illustration of this is the pear-wood inlay on a walnut writing-desk which bears an inscription showing that it dates back to a little after the year 1703.

A large trade is carried on in France and Germany in pear-wood stained black to resemble ebony, which is used extensively in the piano-forte and cabinet trades.

The pores are exceedingly fine and numerous. The medullary rays are hardly discernible with the aid of a lens (+ 12).

Pê-ch'i-sha. Source unknown.

China.

A close-grained wood with the colour and grain of birch, but not so hard, liable to warp and twist.

The pores are from very small to small, some plugged, with a faint line which probably indicates layers of concentric growth. Medullary rays very fine and numerous, hardly showing on the radial section.

Pê-li.

China.

Professor Record says this is *Michelia* sp. It is an attractive wood resembling, but harder than, *Michelia Champaca*. While somewhat similar in colour and character, it is of a harder, closer grain than English sycamore. The specimen has marked on it " good for printing blocks," but it would not be approved for this purpose in England.

The concentric layers of growth are marked by strong, light and dark bands. The pores are exceedingly small and plugged. The medullary rays are very strong, numerous, and close, showing strongly on the radial section.

Pentace Griffithii King.

See also MAHOGANY, BURMA.

Weight 50 lbs. Burma.

VERN—*Thitkalé*, Burm.—*Thitsho*, Tavoy.

The colour is similar to that of *P. burmanica*, but individual logs are liable to a blue stain, which is persistent and cannot be removed. The same description covers both woods ; *P. Griffithii* is perhaps somewhat harder, closer-grained, and heavier. It may be used with impunity in work of minor importance, although the timber is inferior to that of *P. burmanica*.

The concentric layers are well-defined and observable to the naked eye. The exceedingly numerous pores are evenly distributed, and are smaller even than those in *P. burmanica*, while the medullary rays, which are parallel, wavy, and nearly equidistant, are not so strongly marked or so well-defined as in the latter.

PEPPERMINT. *Eucalyptus Australiana* R. T. B. et H. G. S.
Weight 47–48 lbs. New South Wales, Victoria.

Known as narrow-leaved peppermint.

The colour of this wood is brownish-yellow, with a hard, close grain, resembling a dark-coloured stringybark. Baker reports it as a good timber to work, and used for cabinets, coach and carriage framing, general building purposes, and it is said to be sold in Sydney as a substitute for hickory. It would be difficult to discriminate between this wood and many specimens of stringybark.

The numerous small pores, mostly plugged and surrounded by a halo, are arranged in wavy belts, with numerous, very fine medullary rays almost indiscernible under the lens.

PEROBA BRANCA. *Tecoma Peroba* Record.
Weight 50 lbs. Brazil.
VERN—*Peroba, ipé peroba, peroba amarella, peroba branca, peroba reseca, peroba verdadeira, peroba do campo,* Rio to Bahia, Brazil.

In Colonel Gamble's collection this wood is called peroba branca, and a further specimen sent from Brazil names it pau peroba. The wood is light greyish-brown in colour, close and fine in the grain, and not difficult to work, although possessing wide patches of contrary grain. It attains large dimensions, and is fit for employment in architecture, for furniture, and in the domestic arts. The tree is of straight growth, is stronger than teak (*Tectona grandis*), agrees well with iron, and is very durable. It has been used in the constructional work of Brazilian ironclads, and is a valuable timber which should find many important uses.

The pores are very numerous and small. The medullary rays are exceedingly small and fine, but clearly marked.

PEROBA-ROSA. *Aspidosperma polyneuron* Muell. Arg.
Weight 59 lbs. Brazil.
VERN—*Palo rosa,* Arg.

This wood is of a pale rose colour with some darker streaks. It has a very hard, firm, close-grained texture. In appearance it much resembles the East African pencil cedar, but is very much harder. It is capable of a smooth surface from the tool, and is reported as being largely used in

Brazil for sleepers, also for furniture and floorings. It is possible that it might be well adapted for pencil-making.

The pores are exceedingly small and are scarcely discernible. The medullary rays are very fine and slight.

PERSIMMON-WOOD. *Diospyros virginiana* Linn.

Weight 49 lbs. (Gibson). North America.

This is the ebony of America. Gibson describes it thus: "The wood is hard, strong and compact, and is susceptible of a high polish. . . . The value of persimmon depends largely on the proportion of sap-wood to heart-wood. That was the case formerly more than it is now; for until recent years the heart-wood of persimmon was generally thrown away, and the sap-wood only was wanted; but demand for the heart has recently increased. The demand for persimmon in a serious way began with its use as shuttles in textile factories. Weavers had made shuttles of it for home use on hand looms for many years before the demand came for power looms. . . . Persimmon-wood is suitable for shuttles because it wears smooth, tough, and of proper weight. Most woods that have been tried for this article fail on account of splintering, splitting, quickly working out, or wearing rough. The shuttle is not regarded as satisfactory unless it stands 1000 hours of actual work. Some woods which are satisfactory for many other purposes will not last one hour as a shuttle."

Its use in Great Britain for golf heads has been continually growing, and it is hard to find a better or even as good a wood for the purpose. Very rarely a few pieces are found that have such a handsome marking of light yellow, brown, and almost black streaks that the wood has been of great value as a veneer. In New York a table was made of such a piece which is as remarkable as it is unique, and has been much admired. The nearest resemblance to it would be a narrow-striped ebony.

A fine whitish ring which may mark the concentric growth is clearly visible. The pores are somewhat irregular in size, not large, but very uniform in position. The rays are very fine and distinct, parallel, regular, and almost equidistant.

A similar persimmon-wood of equally good quality is obtainable in Japan, but it is not imported commercially into this country.

PETALING. *Ochnasostachys amentacea* Mast.

Malay Peninsula.

VERN—*Mentati.*

The wood is a yellowish-brown colour, with an exceedingly hard, close, compact grain, similar to that of boxwood, for which it might be substituted for many of those purposes where boxwood is required. Foxworthy reports it as a strong wood subject to splitting when left in the sun, and to

dry rot when used as bridge timber. The qualities of the timber would suggest that neither of these propositions should be entertained; no timber should ever be left in the sun, and this timber certainly ought not to be used for bridge-building.

The innumerable tiny, plugged pores as well as the very numerous fine medullary rays are reminiscent of the transverse surface of the Knysna boxwood.

Pê-ya. China.

Professor Record identifies this as *Symplock* sp. The colour is a fine yellow-white, with a close, tight grain, and giving a very smooth surface, between that of English holly and Venezuelan boxwood. A very useful, fine-quality wood.

The concentric layers are marked by rather faint, dark lines. The tiny pores are very numerous. Medullary rays well-defined, but show very faintly and small on the radial section.

Phyllanthus emblica Linn.

Weight 52 lbs. India, China, Japan.

VERN— *Imbal, ambli,* Pb —*Daula, amla, amlika, aura, aola, aunra,* Hind. —*Aoula, imli,* Kashmir—*Aunla,* Nep —*Suam,* Lepcha—*Amla, ambolati, amulati,* Beng —*Ambari,* Gáro—*Owla,* Mechi—*Amluki,* Ass —*Aolay,* Melghát—*Onra, ounla,* Uriya—*Alá thanda,* Cuttack —*Nilli, milli, nalli, aunri, usir, lalla,* Gondi—*Aunre,* Kurku—*Meral,* Kól & Sonthal—*Durga,* Khond—*Usirki,* Reddi—*Usiri,* Koya—*Nelli, nellekai, toppinelli,* Tam.—*Osirka, usri, osereki, usirika, amala kamu, usari,* Tel.—*Nelli, nilika,* Kan.—*Ohalu, gondhona,* Uriya—*Aonli, awla,* Mar.—*Nelli,* Cingh.—*Zibyu, tasha, shabyu,* Burm.

Gamble speaks of this wood as being " red, hard, close-grained, warps and splits in seasoning, no heart-wood. . . . A pretty and ornamental tree, but of not much importance. . . . The wood makes good poles, and is useful for agricultural implements, building, and furniture: it is durable under water and can be used for well-work."

Pearson and Brown, in *Commercial Timbers of India,* quote that Talbot mentions its use for gun-stocks.

Annual rings not distinct. Pores small and moderate-sized, uniformly distributed, often subdivided, or in short radial lines. Medullary rays moderately broad, the distance between two rays generally greater than the transverse diameter of the pores; silver-grain prominent.

Phyllanthus indicus Muell.

Weight 54 lbs. Ceylon, Southern India.

VERN—*Karawu,* Cingh.

The wood is a light, dull plum colour, generally like a pale-coloured purpleheart, with a close, firm, compact grain, capable of a smooth surface

from the tool and showing the medullary rays on the radial section prominently, as in beech. A very useful wood for minor decorative woodwork and turnery.

The very small pores are numerous and plugged, with regular, parallel, strongly marked medullary rays.

Pien-ch'ai.

China.

Professor Record has identified the specimen which was sent from the Amoy University as *Liquidambar* sp. The wood bears a close resemblance to that of American satin walnut (*Liquidambar*) but shows a brighter colour, and has a somewhat harder and closer grain.

The pores are very numerous, regular, and exceedingly small, with very numerous, very fine medullary rays.

PIMENTO. *Pimenta officinalis* Linn.
Weight 68 lbs. The West Indies.

The timber is of a dark to light salmon colour, with a very firm, hard, close texture and a smooth surface. It is inclined to warp unless used in very narrow widths, and is principally employed for making walking-sticks.

The pores are exceedingly small and numerous. The medullary rays are very fine and small, and are indeed hardly discernible with the aid of a lens (+12).

PINDAHYBA. *Xylopia frutescens* Mart.
X. emarginata Mart.
Weight 49 lbs. Brazil.

The specimen from Colonel Gamble's collection is greyish-white in colour with darker streaks, and has a very smooth, close grain. It is used for interior work and for boxes. *Brazilian Woods* says that it is used for tool handles, but I think that such a use must be limited to axe handles and the like, where a hard wood is not necessary. The uses in the United Kingdom would be for decorative work, for which its artistic colour would recommend it.

The Ministry of Agriculture (Rio) says there are two varieties, the *pindahyba* and *pindahyba preta*, and adds that the tree grows to a great height. Pindahyba is also one of the Brazilian names given to lancewood (*Oxandra lanceolata*) (*q.v.*).

The pores, which have white contents, are small and very numerous. The medullary rays are fine and numerous, and are joined at right angles by similar white lines making a minute check pattern.

PINE and **FIR.** Sources various.

The softwoods of commerce consist chiefly of the following :

Pinus sylvestris	Redwood or red Baltic pine.
Picea excelsa	Whitewood or spruce.
Larix europoea	Larch.
Pinus Strobus	Yellow pine.
Pinus resinosa	Red pine.
Pinus rigida or *P. palustris* . .	Pitch pine.
Pseudotsuga Douglasii . . .	Douglas fir or Oregon pine.

The subject is one which is somewhat difficult of comprehension, both

PINES IN [illegible] PARK, SUSSEX

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on account of the many different sources and consequent variety of the wood itself, and also of the perplexing nomenclature. Names which are in common use in England differ from those on the Continent, and even within the confines of this country they vary according to locality ; different names are applied to the same wood ; names change with the lapse of time ; and finally, names which are botanically quite incorrect are very generally employed, so that these conflicting elements result in continual confusion and dispute.

According to Mackenzie's *Ancient Man in Britain* and Lyell's *Antiquity of Man*, the first appearance of foreign wood coming into this country would be perhaps as much as 3000 years ago. Mackenzie says: "It is probable that the earliest *foreign* wood to reach this country in a manufactured state was in the form of 'dug-out' boats or canoes, made of Oak and Pine, examples of which have been found in Scotland, in silt, 25 feet above the present sea level. These boats have a distinctly Mediterranean character, and in one of them a plug of cork was discovered. It is therefore almost certain that this boat had come from Spain, where the Cork Oak tree (*Quercus Suber*) has always grown in profusion—but is absent from the British Isles. The date of the boats mentioned has been estimated by experts to have been about 3000 years ago, and this is the earliest record of cork being used for the purpose described."

Although it is not improbable that timber in the raw state found its way into the country at a much earlier date, the first authentic information places it in the reign of William III., about 1689.

PINE. *Pinus Caribea* Mor.

Weight 38 lbs. South Florida, British Honduras, The Bahamas.

Known as Cuban or splash pine.

Record says: "There are at least five species in Guatemala, the most important commercially being the Cuban or splash pine, *Pinus caribea* Mor. This species is common in Southern Florida and the coast regions of the Southern States, where it gradually replaces long-leaf pine (*P. palustris* Mill.)."

The wood is a red colour, with exceptionally strong dark lines on the concentric layers, which do not show so prominently on the tangential face. While harder in grain and redder in colour, it is not otherwise unlike yellow pine, called white pine in America, *Pinus Strobus*.

PINE. *Pinus Coulteri.*

California.

A pine belonging especially to California. The wood has not been seen in commerce in the United Kingdom, but Mr. Wardle has sent me a specimen grown in Ballarat, which is of quite fair quality, resembling that of *P. ponderosa*.

PINE. *Pinus ponderosa* Laws.

Western North America.

This wood, which goes by the name of yellow pine, resembles the yellow pine *P. Strobus*, but with dark concentric layers, similar to the dark lines of pitch pine, *P. palustris*, although less pronounced. In a specimen in the

possession of Lord Powerscourt, the lines are limited to one side of the board, while the other side is exactly like yellow pine. Mr. Wardle has sent me a specimen cut from a tree grown at Ballarat, which shows that this wood can be grown in Australia of a quality equal to that in its own country.

The tree, which is indigenous in western North America, has been introduced in a great many parts of the world. Elwes and Henry, in *Trees of Great Britain and Ireland*, say: "As a timber tree it is not likely to have any importance in Europe, the timber being coarse in comparison with that of native species."

PINE, ALEPPO. *Pinus halepensis* Mill.

Mediterranean District.

The colour and grain are similar to that of the well-known Weymouth pine (*Pinus Strobus*), but the quality is not so good. It is reported as being used in its own country for packing-cases, telegraph poles, turnery, and as a source for the supply of turpentine.

Mr. Wardle, of Ballarat, has been good enough to send me a piece of a tree of *P. halepensis* grown in Ballarat, Victoria, Australia, which appears to have produced a wood equal in quality to the growth in its native country.

PINE, ALPINE. *Pinus Cembra* Linn.

Northern Russia, Europe.

The wood is a yellowish-brown colour, with a close grain, very durable, light, soft and fragrant, easy to work, polishes well and does not warp or shrink. It is rarely seen in the United Kingdom except in carvings and toys, for which work it is in great demand in Switzerland owing to its softness, density, and absence of hard rings. It cannot be procured in large sizes without knots, and clean boards of more than a foot in width are rare.

PINE, BLUE. *Pinus excelsa* Wall.

Weight 26–33 lbs. (Gamble). Afghanistan, The Himalayas to Bhutan.

VERN—*Piuni*, Afg.—*Nukhtar*, Kuram—*Biár*, Hazara—*Chil, chir, chiltu, chitu, chiú*, Kashmir to Jaunsar—*Chila*, Garhwal—*Kail*, Beas, Sutlej—*Lim*, Chamba, Kunawar—*Yara, yúr, yiro, kairu, kair*, Kashmir—*Shomshing, limshing*, Lahoul—*Raisalla, lamshing, durrasalla*, Kumaon—*Tongschi*, Bhutan.

A large tree producing good timber, which ranks next in value to that of the deodar. The wood is of a light red colour, close-grained, durable; it floats well, is less brittle, and free from the strong scent and oily nature

of deodar, and consequently is better than the latter wood for planking, furniture, doors, and windows.

PINE, BOSNIAN PITCH. *Pinus Laricio* Poir.
P. nigra Arnold.
Asia Minor, Southern Europe.

In or about the year 1925 shipments of square-sawn pine logs arrived and were offered for sale in London under the name of Bosnian pitch pine. According to Elwes, the common names are "Corsican pine" and "Austrian pine."

The colour is similar to that of the well-known American pitch pine, but although reported upon by Elwes and Henry in *Timbers of Great Britain and Ireland* as being strong, heavy, and resinous, and the first quality considered equal to that of American pitch pine, this high recommendation has not been sustained, the shipments of the wood not being approved. The import has now completely stopped (1932).

PINE, BRAZILIAN. *Araucaria brasiliana* Lamb.
Weight 29 lbs. Brazil.

VERN—*Paraná pine*, Eng—*Pinheiro do Paraná, pinho, pinho branco, pinho vermelho*, Braz—*Curiy, kuviy, pinho, pino*, Arg—*Curi-y, pinheiro do Brasil, pino blanco, pino colorado*, Par.

The large and beautiful Parana pine tree which grows in the south of Brazil, commonly reaches a height of from 30 to 60 feet, and sometimes even attains to 135 feet.

Brazilian Woods reports it as an effective substitute for the pines and firs of Europe and America, and as being used for building, joinery, ships' masts and yards, cases and barrels.

Record in *Tropical Woods*, No. 14, says that while the total export from Brazil in 1926 was 107,292 tons, 79,939 tons were of the Parana pine, thus indicating its commercial importance.

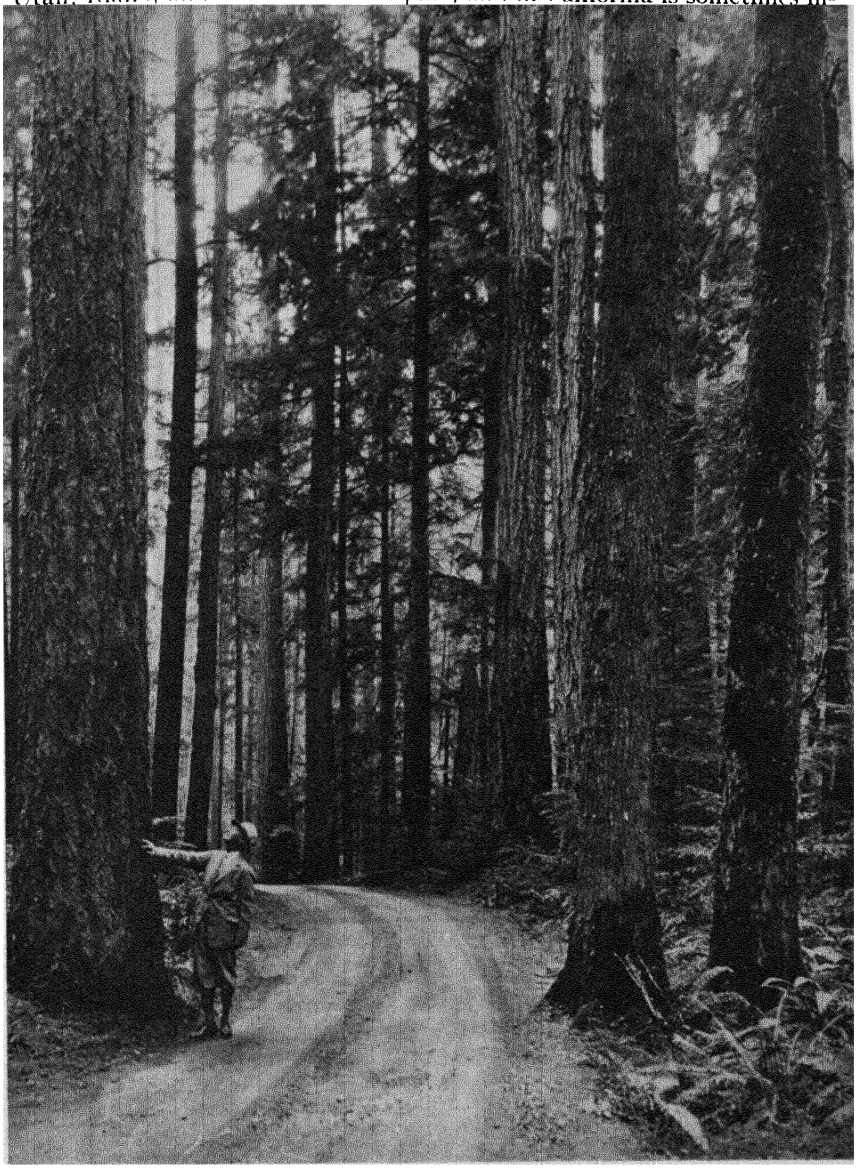
The colour is a warm yellowish-brown, having a much closer and finer grain that that of ordinary pine (*Pinus*), or other species of *Araucaria*. With this exception it greatly resembles the usual *Araucaria*, and also the kauri pine of New Zealand, for which, in spite of its lighter weight, it would easily pass.

The medullary rays form a pretty silver grain on the radial section, with annual rings of darker-coloured wood.

PINE, BRITISH COLUMBIA. *Pseudotsuga Douglasii* Carr.
(Douglas Fir). *P. Taxifolia* Brit.
Weight 34–35 lbs. British Columbia, N.-W. United States.

Elwes, in *Trees of Great Britain and Ireland*, says: "It is known in the European, South African, and Australian markets as Oregon pine or

Oregon fir, on the Pacific Coast of North America as red or yellow fir, in Utah, Idaho, and Colorado as red pine, and in California is sometimes in-



FOREST OF BRITISH COLUMBIA PINE IN VANCOUVER, B.C.
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correctly called spruce or hemlock." It would seem preferable to call it "Douglas fir" since it is neither Oregon, red, nor yellow fir, certainly not pine, and the name Douglas fir is that under which it is cultivated in

England. In America two different sorts are recognised by lumbermen. Gibson describes these as being known as " yellow " and " red," the former being considered the more valuable. He further states : " Both may come from the same trunk, and the reason for the difference in colour and quality is not well understood."

In its native forests the Douglas fir is one of the most magnificent of all the trees in the world. Writing in *The Hardwood Record*, Gibson says : " The largest are 300 feet high, occasionally more, and from 8 to 10 feet in diameter. The average among the Rocky Mountains is from 80 to 100 feet high and 2 to 4 in diameter. The amount of timber yielded by one tree may be realised from the experience of Dr. Watney (of ' Buckholt,' Pangbourne), who was present at the felling of one in Washington Territory, U.S.A. The height of the trunk was 250 feet and that to the lowest bough was 157 feet. The following were the diameters at different heights above the ground : 83 inches at 7 feet, 65 inches at 37 feet, 52 inches at 107 feet, and 32 at 191 feet. The trunk was sawn off at a height of 7 feet above the ground (where it showed 420 annual rings), and 184 feet of its length yielded 21,503 feet converted, equalling $1958\frac{7}{12}$ foot cube. It took nine railway trucks to convey the timber from London to Pangbourne. The timber contained practically no sap, very few shakes, but some of the planks contained dead knots. Large sections of the trunks (exceeding 7 feet in diameter) are familiar in England to those who visit Kew Gardens and the Natural History Museum, South Kensington." The Douglas fir flagstaff formerly at Kew Gardens, which was presented by the Government of British Columbia in 1861, was well known. It was 159 feet in length, and measured 1 foot 8 inches in diameter at the base and 5 inches in diameter at the small end. This is now surpassed by the flagstaff which was erected in 1919, and, like the former one, it was presented by the Government of British Columbia. The gigantic trunk towers to the height of 214 feet. The width at the base is 2 feet 9 inches, and it measures 1 foot across at the small end.

The timber occupies one of the most important positions in the timber world, and is known and used in nearly every civilised country. " No other single species in the United States or in the world equals the annual cut of Douglas fir. . . . In 1910 the lumber cut from this fir amounted to 5,203,644,000 feet " (Gibson).

With the ever-decreasing number of large trees of Scots pine (*Pinus sylvestris*) and pitch pine (*P. palustris*), this timber comes increasingly to the fore as the remaining source of big coniferous constructional timber, especially so in virtue of its great strength. It is imported into the United Kingdom from British Columbia and the United States, in the form of sawn logs, planks, and boards.

The wood is of a reddish-yellow colour, usually mid-way between yellow

pine (*P. Strobus*) and pitch pine in tint and general appearance. The resinous grain of Douglas fir is milder and less pronounced than that of pitch pine, but some specimens of the former are difficult to distinguish from those of the latter, or from Canadian red pine (*P. resinosa*).

The uses of the timber are manifold, and as Gibson (dealing with America) wrote, "it would be easier to list industries that do not use it than those that do." When used for constructional work indoors it

LOGS ON THE OTTAWA RIVER, CANADA

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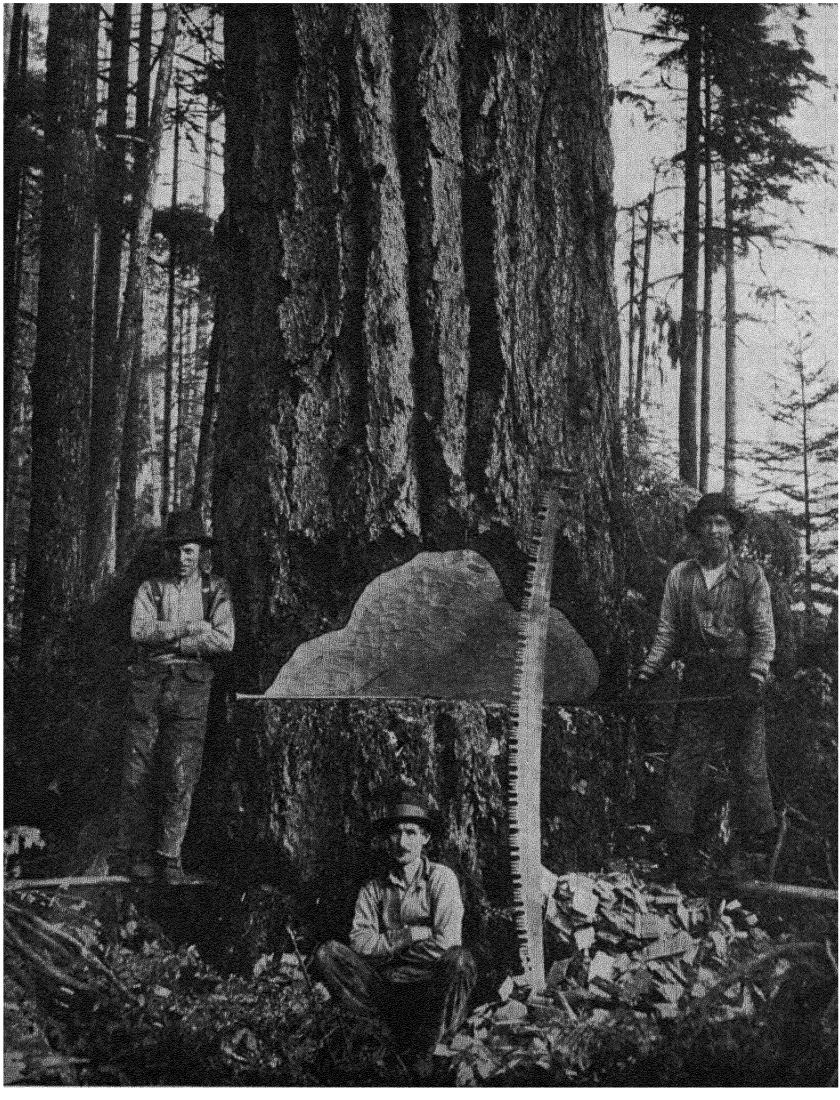
possesses sufficient durability for reasonable requirements. For exposed work, however, it cannot be said to compete with Baltic or pitch pine.

The principal value of Douglas fir lies in the fact that it is a timber obtainable in large sizes, logs, scantlings, and planks, free from sap-wood, objectionable knots, or other defects. The facility with which wide widths of the timber clean and free from sap-wood can be obtained, renders it valuable for internal woodwork. Yet as a joiners' wood it is not entirely free from deficiencies. The marked difference between the hard and soft grain is associated with a ridgy surface when the wood is worked. The

grain is apt to rise after either polishing or painting, and this increases the expense of finishing.

For floors and decks the timber should be " rift-sawn " in such a



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manner that the broad faces of the boards or planks are at right angles to the annual rings ; for when the boards are cut with their broad faces tangential to the annual rings, the grain is liable to flake out and a rough

surface results. For decorative work, where variety of figure is desired, the latter type of sawing should be followed.

Among many other uses the timber has been employed extensively in various countries in the making of masts and spars. In England pitch pine or Baltic pine is preferred, but the latter cannot compete with Douglas fir in dimensions, while the former is sometimes too heavy.

Douglas fir is also used in the manufacture of railway sleepers and paving-blocks. The sawn wood opposes very considerable resistance to

AVENUE OF DOUGLAS FIRS AT MURTHLY CASTLE, NEAR DUNKELD, PERTHSHIRE

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the penetration of creosote, and therefore requires high pressures to inject quantities sufficient to satisfy engineers accustomed to deal with Baltic pine.

Baterden, in *Timber* (p. 80), points out that Oregon pine, although "apparently more open in the grain . . . will nevertheless take in much less creosote than either pitch pine or Baltic timber, and that is rather against its use for sea work. On one occasion some Oregon logs were tanked with Baltic redwood logs; the latter took in nearly 11 lbs. of creosote per cubic foot, whilst the maximum for the Oregon was only $2\frac{3}{4}$ lbs., and the same thing applies to thin planks. On several occasions the

author has made careful comparisons in creosoting this timber, and he has got 7 to 9 lbs. of creosote per cubic foot into pitch pine which has been air-drying for about three months, whilst Oregon logs dried under the same conditions and for the same period, and subjected to the same pressure in the cylinders along with the pitch pine, rarely took in more than 3 lbs., and many of them not 3 lbs. per cubic foot, and retanking and repressing made no appreciable difference in the quantity injected."

Douglas fir grows rapidly and well in suitable positions in England; magnificent specimens are to be seen in Dropmore Gardens and many other places in England and Ireland. Though its young twigs are liable to attack by a special kind of fungus mildew, the species at present suffers from no special serious attacks by either fungus or insect. In view of the variability of the timber, even in its American home, far-reaching assumptions as to the quality of British-grown timber would be premature.

With the advent of the national slogan "Use Empire Timbers" great efforts have been made to bring this timber into general use in place of those supplies from Northern Europe. These efforts have resulted in an increased consumption, shown by the following figures:

TOTAL IMPORTS FROM U.S.A. INTO THE UNITED KINGDOM DURING THE YEARS 1927–1931

1927	28,857 Stds
1928	49,225 ,,
1929	56,736 ,,
1930	70,848 ,,
1931	46,807 ,,

TOTAL IMPORTS FROM CANADA INTO THE UNITED KINGDOM FOR THE YEARS 1927–1931

1927	13,895 Stds.
1928	21,492 ,,
1929	23,925 ,,
1930	33,897 ,,
1931	33,941 ,,

(Excluding railway ties.)

A pamphlet has been issued (1933) by the Department of Scientific and Industrial Research, entitled *Empire Timbers for Structural Design—British Columbia Douglas Fir*, in which a claim is made that reduced sizes (one quarter of an inch in thickness and width) of B.C. pine are from 15 per cent (in the case of $1\frac{3}{4} \times 3\frac{3}{4}$) to 29 per cent (in the case of $2\frac{3}{4} \times 8\frac{3}{4}$) stronger than the scantling sizes a quarter of an inch more in thickness and breadth in Baltic timber. This statement is said to be based on experiments carried out in the Forest Products Laboratories of Canada for pine, and at Princes Risborough in England for red or yellow deal. Independent tests give contrary results, and pending the publication of a proper scientific inquiry

it is safe to assume that as a general rule the Baltic pine (*P. sylvestris*) is the stronger wood.

PINE, BROWN. *Podocarpus elata*
P. amara
P. pedunculata.
Weight 30–40 lbs. (Swain). Queensland.
VERN—*She-pine, yellow pine, Port Macquarie pine, native deal—Kidney wallum, dualgual, gooyum, dyrren-dyrren,* Aborig.

Swain suggests that this wood should be included with hoop pine and bunya pine, and marketed under the inclusive name of Queensland pine.

It is a plain, fine-textured, non-aromatic coniferous softwood, of pale golden-brown hue and some lustre ; a little harder and heavier than hoop pine, but slightly brittle. It takes a good polish, and is esteemed for wood-carving, its special advantages being lightness, evenness of texture, ease of working, and durability. While not always immune, it has a reputation for resistance to white ants and marine borers.

Suitable for indoor work, including joinery, cabinet-making, furniture, floorings, and planking and decking of small boats.

PINE, CELERY TOP. *Phyllocladus rhomboidalis* Rich.
Weight 40 lbs. (Baterden). Tasmania.

Tasmanian Timbers describes this wood as " a heavy, strong pine, of a clear yellow colour, useful for boards, internal fittings, or implements. It is very tough, and the shrinkage is so small that the general belief is that it will not shrink at all. The smaller trees furnish masts for small vessels."

PINE, CYPRESS. *Callitris* spp.
New South Wales, Queensland.
VERN—*White pine, Murray pine, cypress pine, white cypress pine, black cypress pine, bay or fir cypress, Stringybark or jungle cypress pine* (Swain).

According to Baker and Smith, " Callitris is the genus descriptive of the Australian Cypress generally . . . the most common . . . is *glauca* . . . widely distributed throughout Australia " (private letter from Agent-General for N.S.W.). None of these timbers has yet been seen in the European markets.

Murray pine, commonly called cypress or turpentine pine, the produce of *Callitris verrucosa,* is said to be a distinct species. The colour of the wood is olive brown with a greenish tinge, reminiscent of olive wood and sufficiently alike to deceive even the expert, but while the grain is equally smooth, the wood is softer, and less difficult to work. A very attractive, decorative furniture wood.

The Forestry Commission report it as "a very showy timber . . . many of the planks are so gorgeous in appearance . . . it may be readily dressed up to a smooth and glossy surface."

The concentric layers are marked by dark rings.

PINE, DANZIG. *Pinus sylvestris* Linn.
Weight 26 lbs.

This is generally known abroad as "redwood," and when referring to hewn square logs in England as Danzig "fir," and in the last few years, when sawn in various sizes into boards, battens, deals, and scantlings as "yellow" or "red." There used formerly to be a very large export trade in what were termed deck deals, but this trade has entirely ceased. In hewn square logs the sizes varied from 8 to 20 inches in width and from 10 to about 30 feet in length, though these measurements may at times have been exceeded. Specifications shipped of late years in sawn sizes have been similar to those sizes exported from Sweden and Finland, and in competition with the same. Specifications for the deck deals were from 2 to 4 inches in thickness, with an average width of 8½ inches, and in lengths from 20 to 40 feet. The British Admiralty purchased considerable quantities under the specification as follows:

Deck Deals.—The Dantzic deals for decks of 4 inches thick shall be cut 8 inches in breadth, and shall be 8 inches clear of sap for the greater part of their length and nowhere less than 7½ inches clear of sap, and shall be 26 to 40 feet in length, averaging not less than 33 feet The deals of 3½ and 3 inches thick shall be cut 8 inches in breadth and shall be 7½ inches clear of sap for the greater part of their length, and nowhere less than 7 inches clear of sap, and shall be 25 to 35 feet in length, averaging not less than 30 feet. The deals of 2½ inches thick shall be cut 7½ inches in breadth, and shall be 7½ inches clear of sap for the greater part of their length, and nowhere less than 7 inches clear of sap, and shall be 25 to 35 feet in length, averaging not less than 30 feet. The deals of 2 inches thick shall be cut 7½ inches in breadth, and shall be 7½ inches clear of sap for the greater part of their length, and nowhere less than 7 inches clear of sap, and shall be 20 to 35 feet in length, averaging not less than 28 feet.

Longer deals of each thickness may be supplied, but only 10 per cent over the greater lengths shall be considered in ascertaining the required averages.

The deals of each thickness shall be delivered at each Dockyard in the proportion of not less than 70 per cent Crown quality, and the remainder Crown Brack quality. The whole shall be bright, clean, sound, yellow wood, converted in the country, of an equal thickness and square-edged, and shall be clear of unsound sap, shakes, injurious knots and defects, according to their respective brands, and thoroughly air-dried before inspection.

In colour the wood is similar to that from other North European sources; it is generally even and straight in the grain, tough, elastic,

easily worked, harder in texture than similar timber from other sources. On account of its stronger character and harder qualities it has been famous for use as heavy timbering and in general constructional work. Employed as piles in fresh tidal water and exposed to wet and dry, its life varies from 16 to 20 years as compared with the 25 to 30 years for American pitch pine.

In earlier times Danzig " fir " was thought highly of by architects and engineers, so that in all specifications a demand was made for the joists and timbering to be of the best quality Danzig fir, a condition of terms which were universally employed but rarely carried out, and in common with other terms which have been handed down for generations is still sometimes to be found in specifications to-day. While the timber exported from Danzig is undoubtedly hard, strong, and durable, the sawn timber shipped is not generally up to the quality of the other shipments from the Baltic, and in consequence ordinary specifications imported from Danzig have been on a lower basis of cost than other supplies. The tendency lately has been to increase the import, but while longer lengths can easily be obtained, the timber is more knotty, contains more sap, and carries more waney edges than the general shipments from the Baltic, so that it is mostly used for the commonest description of building purposes, rough constructional purposes, and packing-cases, etc.

PINE, HUON. *Dacrydium Franklinii* Hook. f.
Weight 33 lbs. Tasmania.

" The Huon pine, so called from the Huon River, where first found, is a pine which grows to a great size in the river-bottoms of the West Coast ; it has a diameter of 8 to 10 feet, but the ordinary size of the tree will give a plank of from 14 to 30 inches in width and up to 20 feet in length. The wood is straight-grained and heavy for a pine, of a bright yellow straw colour, and very full of an essential oil which causes it to be almost rot-proof. When made into furniture, the oil slowly oxidises, and the wood turns to a smoky-fawn colour with age. It is a splendid joiners' wood, and is especially useful for boat-planking, as the teredo objects to the essential oil.

" The supply is little more than sufficient for the local demand, but it is a timber that is well worth systematic cultivation, Huon pine being one of the most durable timbers known. It is not a tough wood, having rather a short fracture, but it steams and bends well. Some trees will cut very handsome figured panels. It has a strong and, to some people, rather a sickly odour " (*Tasmanian Timbers*).

PINE, JACK. *Pinus Banksiana* Lam.
P. divaricata Du Mont de Cours.
Canada, Labrador, Michigan, Maine.

Known also as " Gray pine." The colour is from a very pale brown to a pinkish straw, nearly always with a red stripe. The wood is soft, light,

close-grained, not strong, resembling red pine closely enough for the lumber of both to be mixed; occasionally obtainable clear of knots. It is not considered durable and resists impregnation with creosote.

Elwes, quoting J. C. Langelier, *Canadian Forestry Association*, 1905, says: "Banksian pine ties are from year to year coming to the front. . . . When there will be no more cedar (*Thuya occidentalis*) to supply the enormous quantities of ties required yearly by railroads, one of its most valuable substitutes will unquestionably be found in the Banksian pine, which the northern region is in a position to supply for a very long period."

PINE, JAPANESE RED. *Pinus densiflora* S. & Z.
Weight 24 lbs. Japan.

This wood is known in Japan by the name of akamatsu. According to Goto there are two species of pine, which the Japanese distinguish by the names of "akamatsu" or red pine, and "kuromatsu" or black pine. The former "is the most widely distributed of all the coniferous trees in Japan, being found from the southern extremity of Kyushu to the southern portion of Hokkaido." It is used in Japan for building purposes.

The wood is softer and lighter in weight than Baltic pine, and has the characteristic mildness of Canadian yellow pine (*Pinus Strobus*), while the grain is also similar to that wood; it is, in fact, something between the two. It is milder and softer than the Siberian pine (*Pinus mandschurica* Rupr.). There is apparently a very large supply, but it is exceedingly difficult to obtain in clean lengths free from knots. It has been found to yield good results when used for the sounding-boards of violins. Supplies of this wood have reached England mixed with white pine, and it has been found difficult to discriminate between the two.

The annual rings are close and regular.

PINE, KAURI or COWDIE. *Agathis australis* Salisb.
Dammara australis Lamb.
Weight 30–39 lbs. (Baterden). New Zealand.

Laslett said the "Kaurie or Cowdie Pine is a native of and found only in New Zealand," but there are other varieties of kauri pine in Queensland, Australia. It is most plentiful about the middle part of the northern island, where there are very extensive forests, but it is only moderately abundant a little farther south, and towards Wellington only occasionally seen. Kauri pine, when used for masts, yards, etc., is unrivalled in excellence, as it not only possesses the requisite dimensions, lightness, elasticity, and strength, but is much more durable than any other pine, and will stand a very long time before it is thoroughly worn out.

The duramen, or heart-wood, is of a yellowish-white or straw colour,

moderately hard for pine, strong, clean, fine, close, and straight in the grain. It has a very pleasant and agreeable odour when worked, planes up well, and leaves a beautiful silky lustre upon the surface, resembling in some degree the plainest satinwood. It shrinks very little, and stands well after seasoning; further, it takes a good polish, and is therefore valuable for conversion into planks and boards; also it is very suitable for cabin and other fitments in ships, for joiners' work generally, or for ornamental purposes. It is also employed for the decks of yachts, as, from the regularity of its grain and the absence of knots, it has a better appearance than the Danzig pine that is commonly used. It wears more evenly, and does not require the reconciling or planing over which is frequently found necessary where other woods are worked.

The kauri pine is generally sound and free from the defects common to many other descriptions of timber; it very rarely has more than a slight heart-shake, even in old trees; the star- and cup-shakes are also very rare. It is therefore a remarkably solid timber, and may be considered one of the best woods that the carpenter can take in hand. Results of tests show that the wood possesses an exceptional strength in proportion to its weight and character.

Two other kinds of kauri pine are recognised in the markets of New Zealand, viz. "wavy" and "mottled" kauri. The names themselves denote that in the case of the "wavy" kauri the grain is inclined to be wild, with dark-coloured streaks; and in the case of the "mottled" kauri the same characteristic is shown in irregular streaks, which in mahogany would be termed "snail" pattern.

The demand has increased very considerably during the last few years, and it is much to be regretted that general reports seem to anticipate a short supply in the future. It is difficult to season this wood in the United Kingdom, and the customary calculations of time which apply to ordinary woods will be found all too little in this case.

Dark rings clearly mark the concentric layers. The medullary rays, which are only noticeable in some specimens, cause a fine, mottled appearance on the radial section.

PINE, KAURI. *Agathis robusta*
A. Palmerstoni
A. microstachya.
Weight 21 lbs. (Swain). Queensland.

Known as Queensland kauri and resembling the New Zealand kauri pine, but much lighter in weight, and softer in grain. Swain states that "it is easy to work, cut, saw, and nail; it glues well, and can be stained and polished readily . . . its durability is low in the weather or ground . . . has no great degree of strength."

A. robusta is lighter, softer, and weaker than the other species, and is now seldom seen on the markets.

PINE, KING WILLIAM. *Athrotaxis selaginoides* Don.
A. cupressoides Don.
Weight 22 lbs. (Baterden). Tasmania.

"The wood varies in colour from pinkish-yellow to pink. It is extremely light, and has a scent like cedar, from which it is called the 'pencil cedar' locally. After it is planed up there is a slight exudation of the resin. It is used for cabinet and joiners' purposes, and for making sculls for racing-boats. Notwithstanding its extreme lightness, it has considerable toughness and strength, and is very durable in the weather, being second only to Huon pine in this respect" (*Tasmanian Timbers*).

PINE, KOREAN. *Pinus Koraiensis* S. et Z.
Weight 24 lbs. 1 oz. Japan, Manchuria.
VERN—*Chosen-matsu.*

The wood is slightly redder in colour, and shorter in grain (apparently close-grown) than the Canadian yellow pine (*Pinus Strobus*) (*q.v.*), for which it is a very good substitute.

PINE, LIMBER. *Pinus flexilis* James.
N.W. North America.

Sargent names this the "Rocky Mountain white pine." In colour the wood is light yellow, turning red with exposure; it is soft, close-grained, and light. Sometimes used as lumber.

PINE, LODGE-POLE. *Pinus contorta* var. *Murrayana* Engelm.
British Columbia, Western North America.

Known also as tamarack pine and black pine.

The wood is light yellow to nearly white in colour, soft, close, straight-grained, light, not durable nor strong, easily worked, very knotty, and warps and cracks badly. Used for railway ties, mine-timbers, fuel, and sometimes manufactured into lumber.

PINE, LONG-LEAFED. *Pinus longifolia* Roxb.
Weight 40 lbs. for North-west wood, 40–43 lbs. for Sikkim wood (Gamble). Northern India, The Himalayas.
VERN—*Nukhtár*, Afg.—*Chíl, chír, dráb chir*, Pb.—*Gúla, thansa*, Kangra—*Anander*, Jhelum—*Shti*, Sutlej—*Sirai, sirh, kalhain*, Jaunsar—*Chír, salla, sapin, kolon, kolan, kolain*, Garhwal, Kumaon—*Salo*, Dotiál—*Dhúp*, Oudh—*Dhúp, sala dhup, sula*, Nep.—*Gniet, nyit*, Lepcha—*Teadong, tang*, Bhutia.

The wood is very similar in all respects to that of yellow pine (*Pinus Strobus*), except that it is a little harder and possesses more "pitchy"

layers. It would be highly suitable for most of the purposes for which yellow pine is used. As may be seen, Gamble regards it mainly from the standpoint of its usefulness for sleepers in India. We should consider it in England far too valuable for such use, and as there is evidence that there is a considerable supply, every effort should be made to obtain the required sleepers in India from timbers of less value. The world's supply of pine is steadily decreasing, and for many purposes of great importance it is the only suitable timber. Gamble states: "In his *Hints on Arboriculture in the Punjab*, Ribbentrop says: 'I am convinced that this tree will yield the greatest net money return when once we begin to impregnate.'" Also: "The wood is used in building houses and boats, for making tea-boxes, shingles, etc. The wood of the Sikkim trees is heavier, harder and stronger, more durable and of better quality, than that of the North-west."

Its real value, however, should be found in its suitability for joiners', cabinet, and other high-class work for which yellow pine is used in this country. Any other employment such as that which has obtained, viz. its use for sleepers, is uneconomic.

PINE, MARITIME. *Pinus Pinaster* Soland.

Northern India, Cape Colony, Australia (Vic.), France, Mediterranean region, Portugal, Great Britain.

Known also as the "cluster pine."

The wood is of a reddish colour, soft and coarse-grained, not durable. It is used as fuel, for packing-cases, and very extensively for pit-props.

PINE, NEW ZEALAND. *Podocarpus dacrydioides* A. Rich.

Weight 31 lbs. 15 oz. New Zealand.

The tree yields clean timber of long lengths and wide widths. It is a light whitish-yellow colour, in appearance much resembling yellow pine (*Pinus Strobus*). The native name is "kahikatea." It is soft and straight-grained, and is largely used in New Zealand and Australia for butter-boxes. It is reported as being not durable for exposed work, and in its own country is liable to attack from boring insects. A very large quantity was imported a few years ago (1919) into the United Kingdom, but has given disappointing results, as it shrinks, warps, and twists to a considerable extent even after many years of seasoning. Although used experimentally for many purposes as a substitute for yellow pine and American whitewood (*Liriodendron tulipifera*), it has generally been condemned.

The concentric layers are clearly defined. The medullary rays are confused and indistinct. The fibres are so soft and pulpy that it is exceedingly difficult to make a clean cut on the transverse grain sufficiently smooth to display the construction of the wood.

PINE, OREGON.

See PINE, BRITISH COLUMBIA.

PINE, PITCH. *Pinus palustris* Mill.
P. rigida and other species.
Weight 42–43 lbs. United States of America.

This timber is known as southern pine in the United States and pitch pine in all other parts of the world, and the supplies for the last seventy years have consisted of the mixed produce of several species of *Pinus*. The best of this is produced by *P. palustris*. The ordinary supply includes short-leaved pine *P. echinata*, as well as other sorts ; what proportion of these are included has varied according to the convenience and circumstances of the shipper. Both hewn and sawn until before the war were imported merely under the terms of " hewn " or " sawn " respectively and without any further additional term of quality, but since then it has come forward under the terms " *long-leaf* merchantable sawn pitch pine " or " *short-leaf* merchantable sawn pitch pine " ; quite lately the import of the merchantable short-leaf class has ceased, probably on economic grounds. Also deals, planks, scantlings, and boards are imported under the various qualities of " prime," " Rio prime," " merchantable," and " square-edged and sound."

Gibson, in *American Forest Trees* (p. 43), says : " There is no precise agreement as to what should be included in the group of hard pines in the United States, but the following twenty-one are usually placed in that class." In this list, besides *P. palustris*, are included *P. echinata*, *P. taeda*, *P. heterophylla*, *P. rigida*, which have been exported to the United Kingdom and abroad, and there are possibly others. Laslett in 1875 gave *P. rigida* as the only source.

Pitch pine is a wood which is so well known that it seems unnecessary to describe its appearance. Of a similar grain, although much harder in texture and with strong pitchy growth, it resembles in appearance that of Scots pine (*P. sylvestris*).

Laslett said : " The principal defects in pitch pine are the heart- and cup-shake." The cup-shake often extends a long way up the tree, and it would be impossible to better this description of its defects if the timber referred to is the product of the true pitch pine (*P. palustris*). Unfortunately, in recent years shipments have deteriorated in quality and have included the product of other species ; consequently, to the defects mentioned by Laslett others must be added, such as open grain, coarse, sour-grown wood, large knots, and a far too great preponderance of sap-wood, which latter is often seriously discoloured. The cutting during the last thirty or forty years has been on such a vast scale that the forests will now

no longer produce so much of the large-sized and better quality timber. For decorative work for churches, public buildings, and private houses it was greatly in vogue during the early Victorian era. Its good qualities suffered, in common with other material, from the ugly and ungainly style then general, and although to a limited extent the timber is still used for decorative purposes in public buildings, it is no longer sought for such work. For floorings, however, it still maintains a considerable reputation, although its use is somewhat curtailed, as such wood is generally required to be rift-sawn. Wood so converted is wasteful and costly, and on this account floorings intended to be laid in pitch pine are often superseded by other woods. It is stated that George Washington built the Mount Vernon mansion of pitch pine in the year 1743, and it is reported that the wood is still generally sound and good.

The wood is very durable, and on this account, and also because of its large size and long length, it is in great demand for constructional work, for which it is admirably suited in all respects. Used for piles on tidal water, where timber is subjected to alternating wet and dry conditions, its life is from ten to fifteen years longer than that of Danzig or Memel pine. It would be difficult to estimate its length of life for interior construction ; but provided that good material is used, and the timber is well ventilated, it probably equals in durability that of any other soft wood. Every precaution should be taken to see that the timber is in good dry condition, and thoroughly ventilated. There is at least one case on record where the joists which composed the flat roof of a costly building, being unfortunately improperly ventilated, were reduced to powder within two years of the completion of the building. There is evidence that under unfavourable conditions pitch pine readily falls a prey to the attack of dry rot.

Among the supplies a small proportion is occasionally found containing very finely figured wood, the logs yielding a curly and twisted grain which produces a most pleasing effect. This class of figured wood was in great vogue about thirty years ago for a short period, but is now only occasionally in request.

According to a publication of the United States Department of Commerce, a " total of 11,625,385,000 feet (about 5,871,000 Petrograd standards) was produced in 1929 by approximately 8000 sawmills scattered through the Southern States. More than 821,000,000 feet (about 414,700 Petrograd standards) in 1929 found their way to foreign markets. Reduced to boards 12 inches wide and 1 inch thick placed end to end, this amount of pitch-pine lumber would encircle the earth at the Equator more than six times."

As already outlined, it is encouraging to notice that something in the nature of reafforestation is being practised in regard to this most valuable timber.

PINE, RED. *Pinus resinosa* Sol.
P. rubra.

North America.

In America the wood is known as Norway pine or American red pine. It is relatively strong and resembles the Baltic pine, but is harder in the grain, has a slightly redder tint, and carries a wider margin of sap-wood. Shipments to London, Liverpool, and Glasgow were common thirty to thirty-five years ago, but it was only supplied in lengths of 10 to 16 feet, which were not very convenient for the general demands, and the sap-wood was often discoloured, so that it was never popular. Imports became less and less, and it is now rarely seen in the English or Scottish markets.

PINE, RED BALTIC. *Pinus sylvestris* Linn.

Timber in the form of hewn logs first found its way into the United Kingdom from several different ports on the Baltic, but notably from Danzig, Memel, and Riga. Swedish timber was also imported, but whether direct from seaports in Sweden, which may have been possible, or whether transported to Danzig and shipped from there, is not known. All of this timber was called "fir," with the prefix Swedish, Danzig, Memel, or Riga, as the case might be. The logs were rough-hewn and varied greatly in length and size. In the earlier time there was no differentiation made between what was afterwards known as "red" or "yellow" or "white," but at a later date shipments were divided into two sorts, one described abroad as "red" and in England as "yellow," and the other known everywhere as "white," this latter being the produce of spruce (*Picea excelsa*) (*q.v.*). All this timber was used throughout England, but especially in London and on the east coast, for constructional works of every kind, for beams, roofing, piling, general wharf construction, and for shipbuilding. Hewn logs, bearing the original shipping and quality marks clearly rased (marked by a knife called a rase), are still to be seen in many old buildings. At a later date the same timber was imported from Norway, hewn and hand-sawn, in two dimensions only, namely, 3 inches thick by 11 inches wide, and 3 inches thick by 9 inches wide; the first were styled "planks" and the second "deals."

On 23rd June 1663 Samuel Pepys records in his Diary how he went with Sir W. Warren "about business . . . discoursing about deals, I did offer to go along with him among his deal ships which we did to half a score, where he showed me the difference between Dram, Swinsound, Christiania, and others . . . their manner of cutting, sawing them by water mills," and again on 16th July of the same year he "made a great contract with Sir W. Warren for 40,000 deals Swinsound @ £3 : 17s. per 100." As the

deals would have been all in lengths of 12 feet 3 inches by 9 inches, the actual cost at that time would amount to £2 : 17s. 6d. per Petersburg standard against the price of £18 to £25 per Petersburg standard which rules to-day (1932).

Timber so imported was considered to be the finest material obtainable for all classes of joinery work, and even to this day specifications can still be seen demanding the use of " best Christiania deal " for the joiner's work, although probably the last import of genuine Christiania deals was made fully fifty years ago (1932). Subsequently the trade from Norway was confined to planed flooring and match boards, with a limited quantity of small-sized battens and scantlings, and pit-props. In the Swedish trade, which at first was also confined to the same sized planks and deals, by degrees a development took place, which resulted in all kinds of sizes and qualities being produced in planks, deals, battens, boards, and scantlings. Laslett names the figure of import in 1874 as being about 3,500,000 deals, 7000 loads of timber, and 18,000 fathoms of firewood, besides a large quantity of boards for flooring, etc. A quantity of hewn flitches from 2 to 3 inches thick, with waney edges, in widths of about 10 to 11 inches, and of good lengths, was imported, probably from Memel, to provide the flooring in the galleries at Knowle Park, where it still serves its useful purpose. Lord Sackville was good enough to have some of the planks lifted for inspection (1932), when they were found to be hard and sound in both heart-wood and sap-wood, and nearly as good as they must have been more than 150 years ago. In this same building the oak beams and cills are in many cases much decayed and suffering severely from beetle attack.

There is evidence that the timber was familiar in England in the seventeenth century, for Milton wrote in *Paradise Lost*:

> His spear, to equal which the tallest pine
> Hewn on Norwegian hills to be the mast
> Of some tall Ammiral, was but a wand

Most of the carved work in pine of the late sixteenth and seventeenth centuries, many fine examples of which can be seen in the Victoria and Albert Museum at South Kensington, was executed in this wood. Norwegian, Swedish, and Danzig pine were probably used indiscriminately. An interesting record of the early use of the wood is provided by the following account for the building of a partition in Glasgow Cathedral in 1713, which was quoted in a letter to the *Timber Trades Journal* some years ago :

	£	s.	d.
To five long hundred dailles and ane short hundred and ten dailles at 15 shill. the peice	523	0	0
To sawing 210 of the said dailles at 9 pound per hundred . .	18	15	0
To 130 foot firr timber to the said use 14 shill. 6d. per foot is .	94	5	0
To six draught long trees at 125 shill per draught is . .	3	12	0
To sawing 18 draught trees at 6 shill. 8d. per draught is. .	6	0	0

	£	s.	d.
To Francis Stevenson, wright, for himself and servitors for wright work wrought be him in the outer and inner kirks, putting up the partition wall betwixt the outer kirk and queir (choir) and making up a broken pend and purple wall behind the wistloft, and scaffolds to the work, and sarking and lyning the spars, and taking off the lead and putting on new, and to pleasterers conforme to particular accompt . .	220	0	0

Documentary evidence is available to show that in 1798 the following imports were made :

Timber	31,302
Deals	21,503
Wainscot . . .	21,072

The list of timber imports at the beginning of last century is :

	Russia	Prussia	Norway	
1807 . .	6101	3645	44,329	in Petersburg standards
1808 . .	517	114	784	
1809 . .	433	1480	12,606	
1810 . .	1340	2419	57,041	

It is interesting to make a comparison between the above and the import for 1928 to 1931 from all countries, as follows :

	All Countries	
1928 . . .	1,574,300	in Petersburg standards
1929 . . .	1,671,284	
1930 .	1,658,232	
1931 . . .	1,471,371	

To-day the supply, though not illimitable, is still assured, largely through the economic forestry systems of these countries.

The quality of all timber from the Baltic has gradually deteriorated, a state which it is expected must continue. The sizes obtainable have also diminished. Thirty-seven years ago it was possible to obtain from the Baltic 75 per cent of sizes 3 inches by 9 inches and 3 inches by 11 inches, the remaining 25 per cent only being of the smaller sizes, while in 1919 the produce of the forests was not of sufficiently large size to yield more than 25 per cent of the 3 by 9 and 3 by 11 size, and 75 per cent of the smaller. There is now hardly any 3 by 11 from the Swedish forests. With regard to the question of the size produced, it should be understood that shippers would always cut the largest possible sizes from the trees, as the price increases in proportion to the dimensions, and the cost of conversion is less.

The trade in Swedish and Finnish timber has gradually developed during the last fifty years, so that now practically every port in the Baltic Sea and the Gulf of Finland round to Gothenburg on the North Sea, exports all manner of timbering, floorings, joinery, and general woodwork.

The trade is so varied, and the qualities and descriptions of the wood range over such a wide field, that to attempt to describe it would require a whole book ; only a brief reference to it can here be made. As stated elsewhere, every district produces wood containing its own peculiar characteristics. For instance, supplies from one port will excel in respect to freedom from shakes, while those from another in the absence of sap, and the best quality from one port will hardly equal the worst from another. Generally speaking, the highest standard of quality is obtained from Bjorneborg and Kemi on the Finnish coast, and from Gefle to Sundsvall on the Swedish. The wood exported from North Russia, particularly that from Archangel, Onega, Kem, Leningrad, and Siberia, excels all other supplies, having a greater percentage of large dimensions and showing no depreciation in quality as compared with earlier productions. The imports from Archangel and Leningrad generally have a hammer stamp on the butt ends of the planks, deals, battens, and boards ; those from the Finnish ports are stencilled. It is customary to brand with a coloured stencil mark the produce from Sweden and Norway, while various other methods are adopted at the remaining sources of supply.

PINE, SILVER. *Dacrydium Westlandicum* T. Kirk.
Weight 41 lbs. (Baterden). New Zealand.

This timber has not been imported on a commercial scale. The Board of Agriculture, New Zealand, reports it as " yellowish-white in colour, sometimes mottled, straight and even in grain, dense, firm and compact, of great strength and toughness. Procurable up to 20 feet long and 15 inches in width. Used for bridges, wharves, sleepers, mining-timbers, cabinet-making ; also in building and joinery generally."

PINE, SUGAR. *Pinus Lambertiana.*
Weight 30 lbs. (Baterden). Western North America.

The wood resembles Baltic redwood, with rather a satiny lustre, very resinous, durable, and free from odour. It is extensively used in the Western States of America for all classes of softwood woodwork. It also closely resembles the wood of *Pinus Strobus.* Dallimore in an article, " The Economic Value of the Coniferae," says : " Two species with rather similar timber [to *Pinus Strobus*] are ' western white pine ' (*Pinus monticola*) from western North America and ' sugar pine ' (*P. Lambertiana*) from Oregon and California. Considerable use is now being made of the timber of these two species, particularly of the sugar pine."

PINE, TONAWANDA. *Pinus Strobus.*
North America.

During the war a large quantity of Tonawanda pine was imported into the United Kingdom. This supply from America produced a wood which

competed favourably with the Canadian pine (*Pinus Strobus*), but no further supplies have been forthcoming.

PINE, WHITE. *Pinus albicaulis* Engelm.

British Columbia, Western North America.

Also known as the " white-bark pine." The colour is light brown, with a close grain ; the wood is soft, light, and brittle. " The timber when accessible is used by miners for props, fuel, and sleepers " (Elwes).

PINE, YELLOW or **WHITE.**[1] *Pinus Strobus* Linn.

Weight 27 lbs. 9 oz. Canada, North-eastern United States.

This pine, known in America and Scotland as the " white pine " and cultivated in England under the name of " Weymouth pine," is indigenous in a rather restricted region ; the north-eastern parts of the United States and adjoining Canada, extending from Winnipeg to Newfoundland, and down the Atlantic States to Virginia. Formerly vast forests abounded, with trees over 200 feet in height and 7 feet in diameter at the base of the trunk. The ruthless felling operations of the American lumbermen, unaccompanied by adequate afforestation, have greatly reduced supplies. Of later years the quality also has deteriorated, and it becomes increasingly difficult to obtain the wood free from knots and sap-wood, although a fair quantity free from defects can be obtained. The timber has steadily advanced in price, which eventually reached the figure of 6s. per cubic foot for the best quality. As the result of the large import of Siberian pine, the price slightly declined towards the year 1914. During the war, the Timber Controller fixed the maximum price at 9s. 8d. per foot cube.

It is probable that *Pinus monticola* was included in the supplies of yellow pine.

An interesting handbook (*A History of the Lumber Industry in the State of New York*, by Wm. F. Fox), which was published in 1902 by the U.S. Department of Agriculture, informs us that " in 1614, the year when the first houses were built at Albany and on Manhattan Island (now the city of New York), the territory which now constitutes the State of New York was forest-covered throughout. . . . New York was not only a forest State but essentially a white pine State. This valuable species was plentiful throughout the territory. . . . Many New York lumbermen still living recall giant white pines that measured 7 feet or more across the stumps and over 220 feet in height. . . . Dr. Toorey wrote in 1843 : ' The white pine is found in most parts of the State. . . . Our chief extensive forests of this noble and most valuable tree are on the headwaters

[1] The name " yellow pine " in the United States is not given to this wood, but to entirely different kinds of pine timbers.

of the Hudson and on the rivers which empty into the St. Lawrence.' . . . The Adirondack tourist of to-day can still see in the tall trees at Paul Smith's or in the noble colonnade of white pine along the shores of Forked Lake further evidence of its extensive habitat." A quotation given in the same book from the *Ulster County Gazette* of 13th November 1779, reads :

For sale. The one-half of a Sawmill. With a convenient place for building in the town of Rochester. By the mill, there is an *inexhaustible* quantity of Pinewood.

It is imported in the form of sawn boards and planks of various sizes and thicknesses, also in wide planks, with square sawn edges, sometimes termed " sidings " ; also in long logs hewn square but showing waney edges. From these logs deck planks and other exceptional sizes are sawn out.

The wood is a pale straw colour, and contrasts with other commercial pines and firs by the very thin, dark, parallel lines (resin ducts) running with the grain. Strong in comparison with its weight, and very durable, it is perfectly reliable. Being a " soft pine " (as opposed to the hard pines, represented by the Scots pine and pitch pine), it is soft and easy to work, as it is also straight-grained. For various indoor uses it is admirably fitted, since although it requires a longer time to season than the majority of soft timbers, yet when properly seasoned it undergoes remarkably slight shrinkage, warping, or twisting. For a great number of years, until shortly before the war, when its high cost militated against its use, yellow pine was the chief wood used by joiners in most parts of Scotland, for window frames, linings, skirtings, and doors. On account of its unique standing qualities it is favoured by engineers for pattern-making. For the decks of ships this is a favourite wood, and in yielding clean, white flooring for pleasure yachts it has no rival. Yellow pine was formerly used largely for signboards, but is now sometimes replaced in this relation by less costly woods. Immense quantities are used in the manufacture of matches (" white pine or cork pine " matches), for which purpose it is unsurpassed.

The annual rings are clearly marked, but in contrast with the Scots pine and pitch pine, the spring wood merges very gradually into the summer wood.

PINHO DO MINAS. *Araucaria* sp.

Weight 39 lbs. Brazil.

This is similar to the pinho do Paraná (PINE, BRAZILIAN, *q.v.*), though the specimen in my collection is not of quite such high quality.

Although Record does not give pinho do Minas by name, there can be little doubt that the " two important species of *Araucaria* " mentioned are the P. do Minas and the P. do Paraná.

PIQUIA. *Caryocar villosum* Pers. (probably).
Weight about 51 lbs. (Record). Amazon region.
VERN—*Piquiá, piquiá-été, pequi, pequiá,* Amaz., Braz.

The colour is a straw-yellow, the wood showing marked layers of hard and soft grain, and requiring considerable work to produce a smooth surface. Record says: "According to Huber this is one of the most important woods in the Amazon region. It is a large tree scattered throughout the upland forests of that region, and supplies wood which, though porous, is very strong and tough on account of its interlaced fibers. It is valued especially for frames, knees, and floor timbers of ships and boats. It is used also for hubs and felloes of wheels, piling, posts, cross-ties, cooperage, and miscellaneous civil and naval construction."

There is a great liability to twist in seasoning caused by the contrary grain of hard and soft layers. Shipments of this wood have been received in the course of the last two or three years, but so far the wood has not received favourable notice.

The pores are in singles and multiples, plugged, and surrounded by marked bands of light tissue. The exceedingly numerous, very fine medullary rays are very close, parallel, crossed at irregular intervals by dark- and light-coloured lines, which probably mark the concentric layers of growth, and crossed also by the finest possible light lines, making a fine network pattern.

PIQUIA MARFIM. *Aspidosperma eburnea* Fr. Allem.
Weight 69 lbs. Brazil.

This wood is of the brightest yellow satinwood colour, and has an exceptionally close and smooth compact grain. It very closely resembles West Indian satinwood (*Xanthoxylum*), except that the grain is closer and finer. It would provide an excellent substitute for the latter.

Record says: "It is only available in very limited quantities, and highly prized for cabinet work, mathematical scales, and for engraving purposes."

Brazilian Woods describes pão setim (literally satinwood) as *Aspidosperma eburnea*, giving an alternative name, pequia marfim, of a bright sulphur colour.

In Colonel Gamble's collection there is a specimen marked pão setim, in colour and other respects resembling pão amarello (*Euxylphora paraensis*), which is also sometimes termed pão setim; but a marked difference in the arrangement of the pores and medullary rays suggests two different woods.

In pão setim the pores are large and rather regularly placed, plugged with a sparkling substance, with clearly defined, thin bands of lighter-coloured tissue, following the line of the concentric layer; these are

crossed by exceedingly numerous medullary rays. In pão amarello the pores are very small, showing singly or grouped in pairs, between very strongly marked medullary rays.

In piquia marfim the pores are exceedingly minute, and medullary rays very fine. Concentric rings are marked by bands of deeper-coloured wood in which the pores are very evenly distributed.

PIQUIA PEROBA. *Aspidosperma tomentosum* Mart.

Brazil.

VERN—*Guatambú, guatambú amarello, pequiá* (or *piquiá*), *pequiá amarella, peroba amarello,* Braz.—*Lemon wood.*

According to Record, " ' Peroba ' is the name of a highly important group of Brazilian woods which are comparable in general utility to our oaks. Entire buildings are often constructed of this timber—sills, framing, flooring, interior finish, sash, and doors—while the same material is employed for the furniture."

In other respects Record's description, in which he names it " lemon-wood " and as " mostly bright, clear canary-yellow colour," is not in any way in agreement with shipments of timber marked " peroba " which have been seen in the London markets during the last two years. This wood is of a strong reddish-salmon colour, interspersed with very dark splashes resembling more the appearance of a dark-coloured British-grown plum ; the grain also bears a pronounced lustre, and is capable of a very smooth surface. In seasoning the wood is apt to warp.

Shipments which have arrived up to the present have not created much interest, and the wood does not seem likely to find a use in this country.

The very numerous tiny pores, all plugged, are regularly placed with exceedingly fine medullary rays difficult to discern with the lens.

Pirus Japonica Max., var. ***P. aucuparia*** Gaertn. (or *Sorbus aucuparia*).

Weight 54 lbs. Japan.

VERN—*Nanakamado.*

The colour is yellowish-brown with a very close, smooth, hard grain. Only very small dimensions are obtainable from timber grown in this country, which yields a firm wood of good quality and suitable for works where hardness and toughness are required. The wood is reported by Goto as of small value, generally used by miners and fishermen as firewood.

Baterden calls attention to a variety *Pyrus aucuparia* as a " rowan " or " mountain ash," and says the wood is tough and elastic, but only procurable in small sizes.

The concentric layers of growth are marked with fine dark lines. The innumerable tiny pores and the medullary rays are hardly discernible under the lens.

Pistacia integerrima Stewart.

Weight 49 lbs. (Pearson & Brown). India.

VERN—*Kaka, kakkar, kakrangche, kakring, kangar, tung, sish, hurkli,* Pb. —*Kakroi,* Jaunsar—*Karkar, kangar, batkal,* Kashmir—*Kakar, singi,* Kumaon—*Shué, sarawan, masua,* Afg.

Pearson and Brown, in *Commercial Timbers of India*, report this wood to be " olive-yellow to yellowish-brown, beautifully marked with narrow close veins . . . turning to a rich brown with age. . . . The timber is very durable . . . is not really difficult to saw. . . . An extremely handsome timber, used for all kinds of ornamental work and carving. Used for furniture . . . would be very suitable for small panels, inlay work, for picture frames and similar small articles."

PITTOSPORUM. ? *Mayii* or *Tenuifolium.*

Weight 40–45 lbs. Australia.

The colour of the wood is ivory-white, with thin, dark-coloured lines, and having a very hard, close, smooth grain much resembling holly.

Pityrantha verrucosa Thw.

Weight 54 lbs. Ceylon.

VERN—*Vidpani,* Tam.—*Dik-wenna,* Cingh.

The colour is a bright yellow, with a hard, tough grain, but it is difficult to produce a smooth surface. The wood is tough and very strong. Trimen reports that it is much sought after in the Eastern Provinces for axles of timber carts ; a wasteful way to use such a valuable timber, which should be employed in those works where boxwood is required.

The transverse grain shows a very pretty pattern of innumerable little bands or belts of pores, all plugged, ranged between the finest possible regular and numerous medullary rays.

PLANE. *Platanus orientalis* Linn.

P. acerifolia Willd. (sometimes known as Lacewood).

Weight 30–42 lbs. Europe.

The plane tree, so familiar to Londoners, in whose city it thrives so well despite the smoky atmosphere, and which is generally known by the name " London plane," includes two or more varieties, viz. the American plane (*P. occidentalis*), which, according to Prideaux Selby, may have been introduced into London towards the end of the eighteenth century, and the Oriental plane (*P. orientalis*), which, according to the same

author, was introduced into England nearly 300 years ago. In regard to the former, Selby mentions a " beautiful tree growing in the Palace garden at Lambeth [which] had, we are informed by Loudon, in 1837, at 40 years' growth, reached that lofty elevation, and another in Chelsea Garden, planted by Miller, was then estimated at upwards of one hundred and fifteen feet in height." In regard to the latter, he quotes Turner in his *Names of Herbes*, 1541, as his authority for the date of the introduction of the tree into England. There are to be found in many parts of England, Scotland, Ireland, and Wales further varieties of the same tree, at any rate in the leaves and fruit, but the wood of all these trees is similar and may be taken under one general description.

During the recent Persian Exhibition held in London the catalogue made reference to the stately, majestic, and graceful Chenar trees (the oriental plane) as being an outstanding feature in Persia.

Prideaux Selby calls attention to the greater hardiness of *P. orientalis*, which he says stands the English climate better than that of *P. occidentalis*, quoting more than one account of the destruction by frost or severe weather of the western plane when the oriental plane has survived. He describes the difference between the two kinds as follows: " In the oriental plane . . . the leaves are smaller and much more deeply lobed or divided into segments than in the western tree . . . and the petioles of the leaves, which in the oriental species are green, in the American tree are purplish red. The fruit or ball-shaped catkins also of the occidentalis plane are larger and not so rough externally as those of the other." The wood varies from a very pale yellow to a light red or a greyish-blue, and at times presents the variegated effect of a mixture of all these tints. The colour is probably affected partly by the situation and soil from which the tree is taken, but perhaps more by the time of year when the tree is felled. It is difficult to understand why the wood is not more largely used, as there is little doubt that, if its qualities were more studied, its merits would commend it for many purposes.

The grain is tough, elastic, and hard. Prideaux Selby says that the wood of *P. occidentalis* was scarcely known in England at the time he wrote (1842), but he quotes Olivier, who says that the wood of *P. orientalis* is equal to that of any European tree for cabinet-making, and that " it is almost exclusively employed by the Persians for their furniture, doors, windows, etc."

It is largely used in France for a great variety of purposes and to a certain extent in Germany. Under the name of " lacewood " it has been somewhat largely used in America, and American conversions have been sold in England under this name. This description is the produce of the tree cut dead on the quarter, so that a very pronounced " clash " is shown on the face of the board. It can be used to advantage for floorings and

many other purposes for which maple is in demand. The Church of St. Sepulchre, Holborn, had formerly some beautiful panels of plane-wood, dating from the seventeenth century ; one of these is now in the Victoria and Albert Museum, South Kensington. A beautiful example can be seen in the doors of Blake Hall, Ongar, Essex, the residence of Major Capel-Cure. These are faced with plane tree, cut dead on the quarter, and exposure to light and air has changed the colour into a very attractive delicate golden red ; it is interesting to note that the identity of the wood was for many years unknown to the owner.

A fine plane tree can now be seen flourishing by the side of the Grand Junction Canal in London, close to the north gate of Regent's Park leading to Avenue Road. It has an interesting history. In 1874 a barge containing petroleum, while passing up the canal, exploded with a report which was heard ten miles away. The bridge and the keeper's cottage were blown away, the plane tree being apparently destroyed. Thirty years after, the only part of the old trunk remaining was a dead, charred, pointed piece, which could be seen protruding through the new and vigorous growth around it ; this dead piece has now disappeared (1932), and the only sign of the disaster which remains is an opening extending from the ground to about 10 feet from the present top of the tree. This opening is now closing, and it is safe to predict that in a very few years the trunk will no longer bear any evidence of the damage.

An interesting account of the plane tree may be seen in the Rev. C. A. Johns' *British Trees and Shrubs*, referred to elsewhere in this book (SYCAMORE, *q.v.*). He rightly describes the plane as a majestic tree, and refers to the delight which it gave to the early Romans and Greeks. Referring to the pleasure which the great Roman orators and statesmen, Cicero and Hortensius, had in the tree and how they prized it for its shade, he says that, when afterwards they transplanted it into France, they exacted a solarium by way of tribute, on any of the natives who should presume to put his head under it. Johns also refers to the failure to take advantage of the usefulness of the wood in the West, while he mentions that in the Levant and Asia it is employed in carpentry, joinery, and cabinet-making. Had he lived in a later age he could have witnessed how the thrifty Frenchman makes a very complete use of every part of the tree, using the limbs as well as the trunk, down to even six inches in diameter, while the wasteful and extravagant Englishman burns the trees, trunk and all, and pays a high price for imported wood.

The concentric layers are very clearly marked by narrow white lines. The exceedingly numerous and very minute pores are separated at almost exactly regular intervals by a stout, strong medullary ray, which produces the figure referred to on the radial section, while the other section gives a very pretty pattern of exceedingly small interlaced lines.

Pleurostylia Wightii W. & A.

Weight 48 lbs. (Gamble).

Ceylon, Southern India, Mauritius, Madagascar.

VERN—*Chiru-piyari*, Tam.—*Piyari, panaka*, Cingh.

The wood is a light yellow-red brick colour, with thin, darker lines. Its appearance resembles that of Lebanon cedar, but with a harder, firmer, and closer grain. Described by Gamble as a very pretty wood, used in Cuddapah to make combs. While the grain is unusual and a nice surface can be obtained, the expert would not confirm Gamble's view as to its appearance.

The minute pores are exceedingly numerous, plugged, with the finest possible medullary rays, crossed at irregular intervals by light-coloured thin bands, following the concentric layers of growth, wavy and broken.

PLUM. *Prunus domestica* Linn.

Weight 54 lbs. Europe.

There are many wild species of plum, but it is probable that the timber is more or less similar in each, and only differs according to variation of environment.

It is a very handsome wood, which is not valued as highly as its undoubted qualities deserve. It is reddish-brown, with darker and lighter streaks of the same colour, and is occasionally varied by some yellow. It is capable of a very smooth surface from the tool, and has a close, firm, hard texture. For cabinet work, inlay, and turning it would be difficult to surpass. Laslett says it has been used for pipes. It was also one of the decorative woods used in Tunbridge ware. No tree trunk should ever be wasted or burned, a practice too common in this country.

The pores are very small and obscure. The principal medullary rays are very clearly defined and vigorous, interspersed with numerous secondary rays of very varying size. These show in very small and numerous flecks on the radial section.

PODOCARPUS SPP.

South Africa, New Zealand, West Indies, Mexico.

The genus *Podocarpus* is to be found over a great many different parts of the world—according to Record most abundantly in the Southern Hemisphere. " The yellowish or brownish woods are of fine and uniform texture, easy to work, and highly esteemed locally for the same purposes

as white pine (*Pinus Strobus* L.). . . . The common names are : *Cobola* (C.R.) ; *pina blanca* (Pan.) ; *Chaquera pino, pino de pacho* (Col.) ; *pino, pino veti* (Venez.) ; *sabina cimarróna* (Cuba) ; *pinheirinho* (Braz.) ; *pino* (Arg) ; *mañiu* (Chile) "

In East Africa a useful wood from this source is known under the name of yellowwood, African pine, and butterwood. In Tasmania a harder, but somewhat similar wood of the same colour is called celery cedar. According to Gamble, in India and Burma a wood of a similar colour but much closer grain is obtained from *P. neriifolia* (*q.v.*). Record speaks of 100 species, but only two have become well known in commerce—namely, *Podocarpus elongata*, South African yellowwood (*q.v.*), and *Podocarpus*, Australian and Tasmanian (*q.v.*).

PODOCARPUS SPP., AUSTRALIAN and TASMANIAN.

The wood is a yellow colour, with a rather uneven, hard grain, heavier than the African. In other respects the description of African yellowwood applies. Boulger mentions *Podocarpus Thunbergii* Hook., *Rhus rhodanthema*, and *Daphnandra micrantha*. There is no evidence to show from which source the limited shipments seen in commerce have been produced.

Podocarpus elongata.

South and Tropical Africa.

Known as African yellowwood.

A dirty, yellow-coloured wood, with a close grain. The tree yields long lengths and wide widths of sound wood, which is inclined to shrink, also to warp and twist to an unusual degree.

Podocarpus neriifolia Don.

Weight 42 lbs. India, Burma, Andaman Islands.

VERN—*Gunsi*, Nep.—*Dingsableh*, Khasia—*Hinari*, Cachar—*Welimada*, And.—*Thitminpo*, Burm.

This is a soft, light, straw-coloured wood, with a faint lustre after planing. Its vernacular name of " thitmin " means " prince of woods," which is intended to suggest the excellence of its qualities. Gamble says : " It is justly esteemed in Burma, and is of considerable importance in the Andamans. . . . The wood is used in general carpentry, and is excellent to work ; it is employed for oars, spars, masts, and to make tea-boxes. It seasons well and does not warp or shrink."

The medullary rays, though numerous, are so faint as to be scarcely visible under the lens (+ 12).

Poeciloneuron indicum Bedd.

Weight 55 lbs. (Pearson & Brown). India.

VERN—*Puthangkolli*, Mad., Tam.—*Kirballi, ballagi*, Kan.—*Vayila*, Mal. —*Vaiya*, Kader.

Pearson and Brown, in *Commercial Timbers of India*, state that this wood is "dark red with darker heart-wood . . . heavy . . . straight-grained or nearly so, medium coarse-textured . . . durable in open situations and very durable under cover. . . . It has been tried for sleepers."

POHUTUKAWA. *Metrosideros tomentosa* A. Cunn.

Weight 54–64 lbs. New Zealand.

According to the Board of Agriculture, New Zealand, the wood is "deep red in colour, heavy and compact and of great strength, exhibits great power of resistance to the teredo. Procurable in short lengths and up to 24 inches in width. Used for piles, stringers, bridge and wharf planking, and mining-timbers."

POLAK. *Ochroma bicolor* Rowlee.

Weight 13½ lbs. British Honduras.

For a description of this wood in all respects see that of BALSA WOOD, the only exception being that the radial section of polak shows a profuse display of strong medullary ray, of the same character as that which is seen in the plane tree.

Polyalthia cerasoides Benth. & Hook.

Weight 52 lbs. (Gamble). India, Burma.

VERN—*Hoom*, Mar.—*Vubbina*, Kan.—*Gutti, chilka dúdúga*, Tel — *Nakulsi, múlili, nublay*, Tam —*Thabut-thein, gyoban*, Lower Burm.

The colour of the wood is a bright straw-yellow, with a hard, firm, high-class grain, yielding a very smooth surface from the tool. Somewhat resembling haldu but with a stronger grain.

The medullary rays to the naked eye show on the radial section, like those of the finest plane tree.

Polyalthia simiarum Benth. et Hook. f.

Weight 44 lbs. (Pearson & Brown). India, Burma.

Pearson and Brown, in *Commercial Timbers of India*, state that this wood is "pale olive yellow . . . lustrous . . . moderately heavy . . . moderately hard, straight-grained, even and medium fine-textured. . . . Not durable in exposed positions, but is fairly so under cover. . . . On the quarter it presents a handsome silver-grain. . . . It is a fair plank wood."

POPLAR, ENGLISH. *Populus alba*
P. nigra Linn.
Weight 35 lbs. 4 oz. United Kingdom.

This is a valuable timber, which is far too little used or appreciated in this country. The colour ranges from a whitish-yellow to grey; in some cases it is nearly pure white and compares favourably with rock maple. It is capable of a very smooth surface from the tool, and possesses a fine, close, hard, tough texture which especially fits it for a great many important purposes. It is easy to work, and according to Holtzapffel it is "suited for carving, common turnery, and works not exposed to much wear." It has also been used largely by toy-makers, and to a certain extent for cabinet work, and for brake blocks for railway waggons.

The famous "Inlaid room" at Sizergh Castle, Westmorland, which dates from the sixteenth century, is of oak inlaid with poplar and bog oak. The white poplar wood against the contrasting black of the bog oak has a most effective appearance, set as it is in a groundwork of English oak. A reproduction of the room can be seen in the South Kensington Museum.

During and since the war this wood has been used somewhat extensively for the spars and ribs of aeroplanes, and for other purposes in aeronautical construction, one pilot at least considering it as good as, if not better than, any other timber. It has also been used as ply-wood in the same kind of work.

Both pores and medullary rays are so exceedingly fine that they are difficult to see even with the lens (+12).

POPLAR, GREY. *Populus canescens* Sm.
Weight 31 lbs. Europe.

This is a very fine timber of much more value than it is popularly supposed to possess. The colour is a light yellow with some dark streaks. It takes a very smooth surface from the tool and possesses a tough, close texture comparable to the medium varieties of maple. Its uses might be much more general if it were better known. For floorings it should be little inferior to maple, and it is one of the best woods for ply-veneer work. Elwes and Henry quote Smith, *English Flora* (iv. 244): "The wood is much finer than that of any other British poplar, making as good floors as the best Norway fir (pine) in appearance, and having moreover the valuable property that it will not, like any resinous wood, take fire."

The pores are very small and obscure, and the medullary rays exceedingly fine and difficult to detect even with the aid of the lens (+12).

A report appeared in the *Timber Trades Journal* of 5th October 1918 as follows: "At Bitterne, on the banks of the River Itchin, in clearing the ground for extensions to H. J. Beazley's shipyard and engineering

works, an aspen tree was recently cut down. The trunk was over 35 feet high, its girth 13½ feet, and when uprooted the base of it measured over 27 feet round, the tree appearing to be about a century old. It is interesting to note that around the roots were found numerous fragments of Roman pottery and a considerable number of other relics of the Roman occupation, and some coins, including one of the period of Constantine I. in an absolutely perfect condition. Bitterne Manor marks the site of the local walled Roman city of Clansentum [*sic*] [Clausentium], the greater part of which site is now occupied by the timber-yard and wharf of W. W. Howard Bros."

This tree was a grey poplar, but it has often been called "asp" or "aspen" by woodmen.

Although I have been over this site on so many occasions, I regret that I never observed the tree until it was cut down. When this was done I secured a specimen for examination. The concentric layers are very indistinct and confused, and it is impossible to count the rings or gain any knowledge of the life of the tree. The timber is of a pale yellow-grey colour, with a close, tough texture, and, although not so hard, is rather more like maple than any ordinary poplar. In seasoning, the wood has warped somewhat, and would appear liable to this defect.

Populus euphratica Olivier.

Weight 30 lbs. (Pearson & Brown). India, Southern Asia.

VERN—*Bahan*, Sind.—*Bhán, jangli, benti, safedar*, Pb.—*Patki*, Brahui—*Hodung*, Ladak—*Indian poplar*.

Pearson and Brown, in *Commercial Timbers of India*, report this wood to be "reddish, ageing to reddish-brown, with broad dark lines which form ellipses or tortoise-shell figuring in flat-sawn boards; rather lustrous with a silky sheen when first exposed but becoming dull with age . . . straight to more or less irregularly interlocked-grained, medium fine but somewhat uneven-textured. . . . When seasoned it lasts fairly well under cover, but is very liable to insect attack if care is not taken, especially when in a green state. It may be classed as durable in contact with, or in, water. . . . It is . . . a very suitable timber . . . for ply-wood."

Populus trichocarpa Torrey & Grey.

North and Central America.

The "Western balsam" poplar. Elwes says: "This magnificent poplar, the largest of the genus, is a native of the Pacific Coast . . . in Oregon and Washington this timber is used for making staves and woodenware. Jepson states that the wood is light, soft, and straight-grown, but not strong."

It has not been seen in commerce in the United Kingdom, but has been

largely planted as a roadside tree, on the new arterial roads near London, where it is growing well.

PORCUPINE WOOD. *Cocos nucifera* Linn.

Weight 47–70 lbs. (Gamble). South America, India, Burma, Ceylon, North Andaman Island.

VERN—*Narel, nariyal,* Hind.—*Narikel,* Beng.—*Tenna, tenga,* Tam.—*Nari kadam, tenkaia, kobbari,* Tel.—*Thenpinna, kinghena, tengina,* Kan.—*Tenga,* Mal.—*Pol,* Cingh.—*Ôn,* Burm.—*Jadhirdah,* And.

The cocoanut palm. Record says this is the chief cocoanut-producing tree of commerce. The colour is red, with a very hard grain ; the heart-wood is soft to very soft but not hollow. Capable of a very smooth surface from the tool. It is generally used for constructional purposes, spear handles, walking- and umbrella-sticks, and turnery, and is a very attractive wood for inlay decorative furniture work. In common with other palms, it is very liable to attack by large weevils and many other destructive insects.

The pores are large and very sparse. On the vertical section the wood is prettily streaked.

Premna tomentosa Willd.

Weight 40–54 lbs. (Gamble). Ceylon, Peninsular India.

VERN—*Kotokoi,* Sonthal—*Chambara,* Mar.—*Nagal, naoru, naura,* Tel.—*Ije,* Kan —*Kampu gumadu,* Reddi—*Kolukkatti,* Tam —*Bu-séru,* Cingh.—*Mai-sak-hpu, mai-sak-hai,* Burm.

Both in colour and texture this timber closely resembles satinwood (*Chloroxylon Swietenia*), so much so that it would readily pass for it.

Pores very small and numerous. Medullary rays very numerous, exceedingly fine, and showing on radial section as minute flecks.

PRICKLY YELLOW. *Zanthoxylon Microcaspum* Gris.

Honduras.

A greenish-yellow wood with a very smooth surface, rather soft and fine, not unlike the surface of satinwood, but much softer, possessing a slightly glossy lustre. Record does not mention *Z. Microcaspum,* but gives the name of prickly yellow to *Zanthoxylon* sp.

The concentric layers are clearly marked. The pores very numerous and small ; medullary rays irregular and ill-defined.

PRIMA VERA. *Tabebuia Donnell-Smithii* Rose.

Weight 36 lbs. 6 oz. Central America.

VERN—*Prima vera, prima vera mahogany, white mahogany,* Trade—*Prima vera, roble,* Mex.—*Cortez, cortez blanco,* Salv.—*San Juan,* Hond.

This wood is so little known in the United Kingdom that it is practically never mentioned. It has, however, been used very freely in the United

States for furniture, panelling, and general decorative work, and for railway-car trimming. As a result a small supply has come to London and Liverpool, and although apparently not identified, it has been occasionally used in the panels of some railway coaches on the principal railways. It is sometimes known in the United States as " white mahogany," which is perhaps a better name than prima vera, as in everything but colour it resembles mahogany. When first cut, it is of a pale straw appearance, darkening with exposure to light and air, to a warm yellowish-rose, and much resembling satinwood. The wood is generally more or less figured, that is, with a " mottled " or " roey " grain, some being very strongly marked with " splash mottle " of the best description. It stands well under all conditions and takes a high finish from the tool. For a light room prima vera may be said to present, in general tone and colouring, a more artistic effect than satinwood, although the wood itself is not of so fine a grain. The principal defect is that nearly all the logs contain small pin-holes caused by a boring insect. These can, however, be remedied by a competent polisher.

The pores, which are small, are rather obscure, but are marked by a light ring or halo. The medullary rays are fine and not very distinct, showing very faintly and sparsely on the tangential section.

A very similar wood is supplied from the West Coast of Africa, which perhaps is identical with that called in France " white mahogany," the source of which is unknown. There is reason to suppose that a different form of polishing may be necessary, as in the case of all the mahoganies from the West Coast of Africa (see remarks on polishing African mahogany, cherry, and okoumé). In different specimens which present the same general appearance there is a very marked distinction in the construction. Thus in one the pores are small and scarce and the medullary rays clear and defined, while in another the pores are rather large and more numerous, and the medullary rays very obscure and faint. On both, however, they show in very much the same degree on the tangential section.

PRIVET. *Ligustrum lucidum* Aiton.

China.

This is a handsome Chinese shrub often cultivated in India. The wood is a light yellow-brown colour, with a hard, close, and very smooth texture, and even-grained.

The pores are small ; medullary rays fine and numerous.

The European privet is *Ligustrum vulgare* (*q.v.*).

PRIVET. *Ligustrum vulgare.*

Europe, North Africa.

The ordinary observer of the well-known privet hedge which is so common, would hardly believe that it yields a hard, strong wood with a

very smooth surface and a pleasing lustre, which although obtainable only in small sizes, would vie with foreign woods for inlay purposes and decorative furniture work. Indeed, if used in such a manner it is probable that even the expert might mistake it for olive-wood.

The swamp privet (*Forestiera acuminata*) of the southern States of North America yields a similar wood, but it is reported as being difficult to work.

The concentric layers of growth are clearly defined. The pores are very small, numerous, plugged, and open, with fine, delicate medullary rays difficult to observe under the lens, which show minutely on the radial section.

PROSOPIS. *Prosopis spicigera* Linn.

Weight 57–59 lbs. (Gamble). India.

VERN—*Jhand, khár,* Pb.—*Kandı, kundı,* Sınd.—*Chaunkra,* Agra—*Khejra,* Rajputana—*Sangrı,* Pertabgarh—*Semru, hamra,* Guz.—*Shemi, saunder,* Mar—*Shamı,* Beng., Uriya—*Perumbe, vunne, jambu,* Tam.—*Chanı,* Tel.

This wood is of a light yellow straw colour, very hard, and has a close-grained, fine texture. Useful timber, but not suitable for export.

Prunus Puddum Roxb.

Weight 45 lbs. (Pearson & Brown). India, Burma.

VERN—*Chamıárı, amalgúch, pája, pajıa,* Pb.—*Paddam, páya,* Hınd—*Phaja,* Jaunsar—*Payán,* Kumaon, Gharwal—*Pangıa,* Dotıál—*Kongki,* Lepcha.

Pearson and Brown, in *Commercial Timbers of India,* report this wood to be " light red when first exposed, ageing to reddish-brown, somewhat lustrous . . . working smooth . . . moderately heavy . . . moderately hard to hard, straight or rarely wavy-grained, medium-textured. . . . A durable timber, not liable to either fungus or insect attack. . . . It is the class of wood which is extensively used in England in turnery for toys, egg-cups, and similar small articles It might also be used for furniture, such as small tables, chairs, stools, and for writing-table requisites."

Pterocarpus Marsupium Roxb.

Weight average 55 lbs. (Gamble). Central and Southern India, Ceylon.

VERN—*Bıja, bıjasár, bıjasál, piasál,* Hind.—*Byasa, piasál,* Uriya—*Dhorbeula, ásan, bıbla,* Mar.—*Peddeı, bıjo,* Gondı—*Peddagı, yeanga, yegı, yegısa, pedéga, pedéi,* Tel.—*Vengai,* Tam.—*Benga, honné, hond,* Kan.—*Bıjaıra,* Bijeragogarh—*Radat bera,* Bhíl—*Hıtún, híd,* Kól—*Murga,* Sonthal—*Beeya persar,* Kharwar—*Paisar,* Mal Pahari—*Ragat bera, dhorbieula,* Berar—*Vengis,* Khond—*Amé,* Saora—*Vengsha,* Reddi—*Gammala,* Cingh.

The chief native names of this species are vengai and bijasál. The

wood is of a golden-brown colour, with lighter streaks, like a brown-stained satinwood, and it has a satiny lustre. The grain is smooth, firm, and close. Although it has established its reputation in Madras and at the Gun-Carriage Factory at Jubbulpore, where it has been used for gun-carriage wheels, its proper sphere is for employment as a delicate furniture and cabinet wood. Warmer in tone and less obtrusive in character than satinwood, it would appeal with peculiar force to the artistic decorative artist in wood, and it is a matter of surprise that it has never yet been exported on a commercial basis. This is one of the timbers mentioned in Gamble's list as being available in fairly large quantities.

" Pores moderate-sized and large, often subdivided, scanty, resinous, uniformly distributed in pale patches, which are joined by fine, white, wavy, often interrupted concentric lines ; marked on a vertical section. Medullary rays very fine, numerous, short, uniform, and equidistant " (Gamble).

Pterospermum acerifolium Willd.

Weight 45 lbs. India, Burma.

VERN—*Máyeng*, Jaunsar—*Kanakchampa, mús*, Beng.—*Hattipaila*, Nep.—*Numbong*, Lepcha—*Gaik*, Magh—*Machkunda*, Sonthal—*Makchand*, Mal Pahari—*Laider*, Mechi—*Taung-petwun, sinna*, Burm.

The wood, which can be obtained in squares 20 feet by 10 inches by 10 inches, is reddish in colour and moderately hard. It works and polishes well, and is used for planking ; it also makes good matches and match-boxes.

Pterospermum suberifolium Lam.

Weight 47–49 lbs. (Gamble). India, Ceylon.

VERN—*Baelo, bayalo, giringa*, Uriya—*Baili*, Khond—*Lolagu*, Tel.—*Muchucuda*, Mar.—*Taddo, vinanku*, Tam —*Welanga*, Cingh

The wood has an agreeable, dull plum colour, with a fine hard grain, showing figure on the tangential surface, and the medullary ray pronounced in light flecks on the radial. A very attractive wood, suitable for fine cabinet work, inlay, and turnery. Gamble reports it as being tough and used for building carts and other purposes, illustrating another instance of the misuse of a valuable wood for want of knowledge. The concentric layers of growth are marked by broken dark lines.

The small pores are variable in size and position, and are plugged. The medullary rays under the lens are confused, but show prominently on the radial section.

PUKATEA. *Laurelia Novae Zelandiae* A. Cunn. New Zealand.

The Board of Agriculture, New Zealand, reports that this wood is of " a pale brown colour streaked with deeper shades, often very ornamental.

Procurable in long lengths and up to 12 inches in width. Excellent for furniture and also for boat-building."

PUNAH. *Tetramerista glabra* Miq.

Malaya.

The colour of the wood is a dull yellow-brown with a rather coarse grain and uneven texture, yielding a rather rough surface from the tool. The timber has not been seen in commerce in the United Kingdom, but it is reported as being useful for inside building purposes in Malaya, not durable in the ground, readily attacked by white ants, but immune from boring beetles.

The rather large pores are sparse, mostly plugged, with a smaller proportion widely open; innumerable medullary rays fine but rough-edged, which do not show on the radial section.

PURIRI. *Vitex littoralis* Dene.

Weight 62–76 lbs. (Baterden). New Zealand.

This wood, called also New Zealand teak although there is no justification for the name, is of a dark brown colour, very hard, dense, and heavy. Some experimental shipments were made on a small scale many years ago, and efforts to introduce it for general work as a decorative cabinet wood, and especially in pianoforte work, met with little success. It is reported that it is obtainable in lengths up to 20 feet and 15 inches in width It has been stated that it is the strongest and most durable timber produced in New Zealand, and that sleepers, posts, etc., have been known to stand for twenty-five years

PURPLEHEART. *Peltogyne paniculata* Bth.

Weight 64 lbs. 2 oz. (fresh undried sample), 66 lbs. 4 oz. (my dried sample, Demerara) British, French, and Dutch Guiana, Brazil.

VERN—*Purpleheart, purple-wood, violet-wood, amaranth,* Eng.—*Amarante, bois violet,* Fr.—*Amarantholz, violetholz,* Germ—*Purpuurhart,* Dutch—*Legno amaranto, l violetto, l. porpora,* Ital.—*Madera purpurea, palo morado,* Span—*Páo roxo, páo rojo, guarabú roxo, g. branc, g. preto, g. rajado, g. vermelho, guarabussu, barabú, amarante, ellen grypho, roxinho,* Braz.—*Morado,* Boliv.—*Amarante, violet, bois violet, bois bagot ?, bois de coeur, pourpre, bois pourpre,* Fr. G.—*Purperhart, poerprehati, kooroobooelli, kooroo-boovelli, koroborelli, hoepelhout, zeedrat ?,* Sur.—*Purpleheart, saka, sacka, saka-balli, koruburelli, marawineroo,* B.G.—*Purpleheart, sapater, zapatero,* Trin.—*Tannaneo,* Col.—*Nazareno, morado,* Pan.—*Palo morado,* Mex.

This beautiful wood is not sufficiently appreciated in England. It is of dense, close texture, and after planing is very smooth to the touch; it

is brown to salmon-red when cut, but after exposure to air and light it rapidly becomes purple in colour. The Surinam wood produces a more brilliant colour than that from Demerara. It is very strong and durable, and stands exceptionally well under difficult strains. On this account it has been used by French motor-carriage builders for the frames of window-sashes and like purposes. For this it is probably better than any other wood, as it is not injured by damp or the continual washing, while the fine, smooth grain assists the sliding up and down of the windows. It is used for ramrods, marquetry, and inlay and lining work, especially in French furniture, in which connection it bears a variety of names, these including " amaranthe " and " palisandre." A sample piece of this wood, labelled with this latter name, was sent to me for identification, confusion having arisen by the fact that in France the name " palisandre " usually indicates rosewood.

In *Tropical Woods*, No 25, March 1931, Record reports that the trim of a library at Lenox, Massachusetts, has been done in this timber and proved to be expensive.

The pores, which are rather small, are evenly distributed and largely filled with gum. The medullary rays are even and regular, parallel and very distinct. The pores in the Surinam wood are larger and have scarcely any gum filling, but otherwise the structure is similar to the Demerara variety.

PYINKADO. *Xylia dolabriformis* Benth.
Weight 81 lbs. (my specimen); according to Gamble the weight per foot cube ranges from 60 to 83 lbs. Burma.

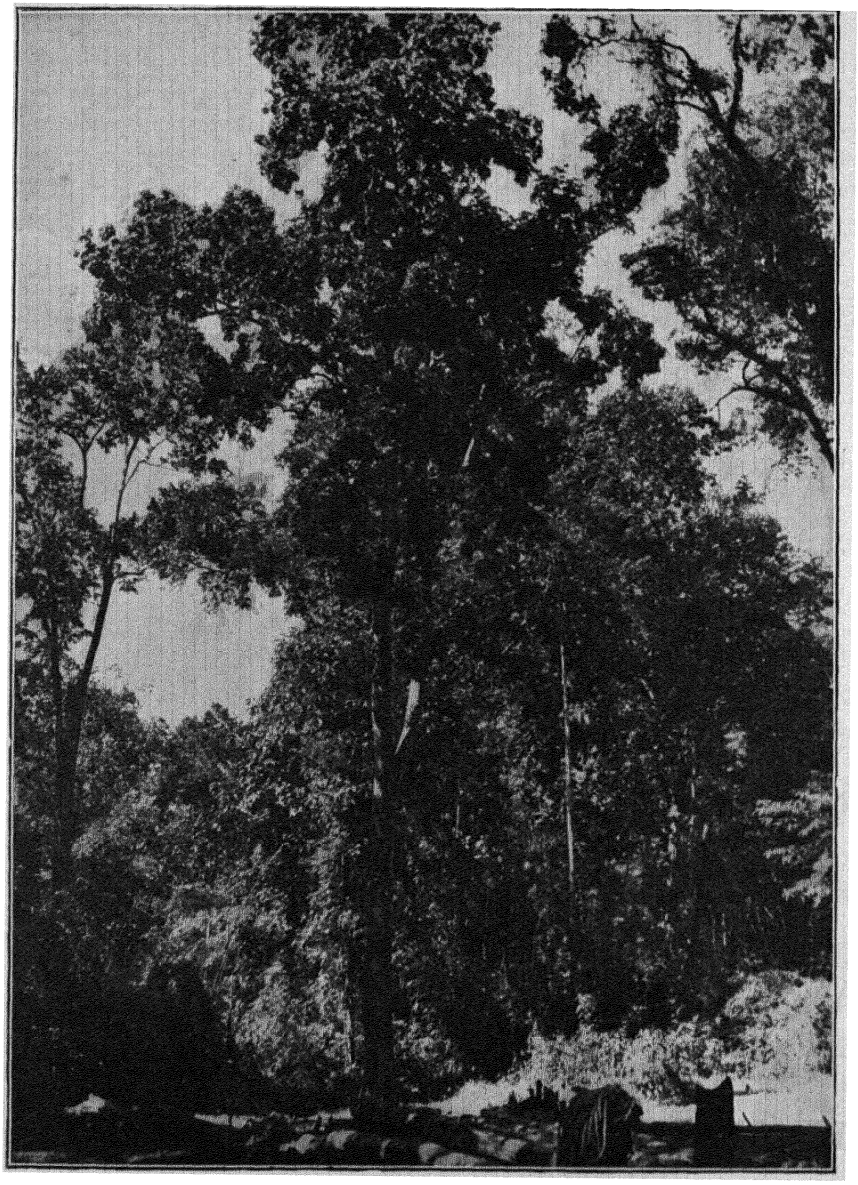
VERN—*Pyingado, pyin*, Burm.

This wood is known as the ironwood of Burma. As the botanists have now decided that the pyinkado of India is a different variety, viz. *Xylia xylocarpa* (*q v.*), the vernacular names quoted by Gamble included it, and are therefore omitted.

The wood is a reddish-brown colour, hard, heavy, tough, very strong and rigid. The pores are filled with a thick, glutinous oily substance, which gives a sticky feeling to the touch, and is still noticeable even after a great many years' exposure to weather.

Gamble says : " After teak the most important timber tree of Burma. . . . The chief use of the wood is for railway sleepers, large numbers of which are now cut in Burma and exported to India. It is the chief wood used on the Burma railways. It is also eminently suited for paving blocks, and has been successfully tried for the purpose in Rangoon. Good blocks were exhibited in Paris in 1900. . . . It is also excellent for telegraph posts. The local uses are for boat-building, agricultural imple-

ments, carts and tool handles. It is a valuable building wood, especially for piles and beams of bridges."



Photograph by J. H. Lace

PYINKADO, LOWER BURMA

Laslett, writing in 1875, quoted a note by Lieut.-Col. H. W. Blake, the Commissioner at Moulmein, who wrote that the wood was " heavier

than water, and more indestructible than iron." He added : " There is a piece of this wood which supported a teak figure of ' Godama,' taken from Rangoon in 1826, standing in a lake near. The teak figure has long since mouldered away into dust, but at the pillar I fired a rifle shot at 20 yards distance, the ball was thrown back, making no penetration whatever. The wood seems hardened by time and exposure, and it is also a fact that the teredo will not touch it. The Burmans do not girdle and kill this tree, as they do the teak, but fell and saw it up at once, and refuse to work it in a dry state."

Gamble was incorrect in stating that pyinkado is immune from teredo attack, since it is now known that the wood has been attacked in the waters of Burma ; nevertheless it is probable that pyinkado is capable of resisting teredo attack better than any other known wood.

Tropical Woods, No. 25, p. 36, reports an important experiment carried out by Dr. Foxworthy and H. W. Woolley. Pieces of wood to the number of 5600, representing twenty-one different kinds of Malayan, and some from other countries, were tested. These were all placed in trenches 15 to 18 inches deep, each piece 2 feet long by 2 inches square, and whenever available, those that were sound and seasoned were chosen. The trenches were then filled up, leaving 3 to 6 inches of the wood projecting, and brush to attract insects was then piled on top. Subjected to this trial, the following woods had *no pieces destroyed during five years of test* : Bebras (Burseraceae) ; Betis (mostly *Madbuca utilis*) ; Belian (*Eusideroxylon Zwageri*) ; Chengal (*Balanocarpus Heimii*) ; Damar Laut Daun Kechil (*Shorea utilis*) ; Giam (*Hopea nutans*) ; Greenheart (*Nectandra Rodioei*) ; Ingyin (*Pentacme siamensis*) ; Jahar (*Cassia siamea*) ; Kumus (*Shorea ciliata*) ; Pyinkado (*Xylia dolabriformis*) ; Sama Rapa (*Shorea* sp.) ; Surian Batu (Meliaceae).

The conclusions arrived at as the result of these important tests were :

1. " Under the conditions of our test, fungus attack is of relatively minor importance, and pieces are usually destroyed mainly by insect attack."
2. " No wood that has been tested is immune to the attacks of termites."
3. " Any wood that lasts for as much as 5 years under the conditions of these tests, may be considered durable."
4. " Pieces containing sap-wood were destroyed more quickly than those that were all heart-wood."
5. " Hardness does not prevent insect attack. Kempas, a very hard wood, is very quickly attacked, and is sometimes destroyed within six months."

The logs are too heavy to float, even after ringing, which makes the

transport difficult and costly. When the tree is fresh cut, the saw or tool will work it, though with some difficulty, but after long exposure it is said to be impossible for any tool to work it. About the year 1910 a shipment of about 100 logs, sawn square, was brought to London in mistake for a parcel of teak which it was intended to ship. This was the first shipment coming to London of any consequence, and the result was that the wood found a ready market. In the year 1920 arrangements were successfully carried out, regular shipments to the United Kingdom resulted, and the demand has continually increased.

Pyinkado possesses in a degree beyond most other timbers, and possibly surpassing all, hardness, strength, and amazing durability. Experiments carried out by Laslett showed that pyinkado, under transverse strain, was nearly twice as strong as English oak, and more than 20 per cent stronger under tensile strain. Mr. Richardson informs me that 480 blows with a 4-ton hammer, delivered on a squared pyinkado pile which was placed on a concrete base, failed to move the pile 2 inches. Pyinkado has been used extensively for wharf piling, planking, camp-sheeting, and decking. It has proved to be one of the most serviceable, if not the best of any, for "dollies" [1] for pile-driving. A church belfry frame was exhibited at the Exhibition of 1924, and a fairly considerable number of belfries have since been fitted with pyinkado girders, being much approved. It was selected for the constructional timber for the floating pier at Tilbury, and a handsome bridge was built throughout of pyinkado at Marsh Lock near Henley. Its resistance to the attack of white ant has been stated by the Malay States Forest Department to be the third highest out of thirty best-known hardwoods the world produces. Pyinkado piles used on the south coast of England are now in as good condition after two and a half years as when placed in position, while all other timbers which have been tried were riddled with holes. An open bridgeway in Westminster requiring a temporary road was planked with 3-inch thickness of pyinkado; the same bridgeway had previously been planked with oak, but the traffic, being exceedingly heavy, destroyed the oak planks within one year, when it was renewed with the 3-inch pyinkado planks referred to above. At the expiration of a year and two months the pyinkado planks were worn down by the traffic to a thickness of 1 inch, and varying up to 1½ inch, thus forming an illustration of the comparative wear of oak and pyinkado under exceptionally hard and trying conditions.

The timber known as jamba or irul, and pyinkado, is the product of *Xylia xylocarpa* and is distinct from the Burmese *X. dolabriformis*.

The pores, which are few in number, are rather small, and are plugged with a bright, shining gum or resin. The medullary rays are numerous, parallel, visible, and very fine.

[1] A "dolly" is the short piece or square of wood between the falling hammer and the pile.

QUALM. *Schizolobium Parahybum* Blake (Vell).

British Honduras.

A soft, whitish-yellow wood, with a slightly blue stain, and a woolly grain, yet capable of a smooth surface from the tool, resembling dhup (*Calophyllum tomentosum*). The wood is not likely to possess any commercial interest.

The concentric layers are clearly distinguished by dark lines, displaying in my specimen rapid growth. The pores are scarce and irregular in size, partially plugged. The medullary rays irregular, and clearly defined on the transverse section, giving an appearance of wood structure, suggesting greater strength than the wood appears to possess.

QUANGDONG, WHITE. *Eloeocarpus grandis* and others.

Weight 28–35 lbs. (Swain). Queensland.

VERN—*Caloon*, Aborig.

Known as blue fig and blueberry ash. Swain states that the colour varies from gleaming white to greyish or brownish tone in some grades, the wood being lighter and stronger than Queensland pine, porous and open-grained. It is a tough softwood of considerable strength, easy to work, cuts cleanly, holds nails well, takes glue and stain.

Having high durability and seasoning well, it is suitable for inside work and stained cabinet work, but should not be used in the ground.

QUASSIA. *Picraena excelsa* Lindl.

Weight 35 lbs. 4 oz. Tropical America.

VERN—*Bitterwood, West Indian bitterwood, Jamaica quassia*, Trade—*Lignum quassia Jamaicense*, Pharm.—*Bitterwood, bitter ash*, B W.I.—*Bois amer, bois de St. Martin, bois de quassia de la Jamaique, quachi, coache, simarouba*, Fr. W.I.—*Kwassiehout, grammam kwassie, bitteresche*, Sur.—*Fresno amargo*, Col.—*Palo amargo, quina brava*, Arg.—*Quassiaholz von Jamaica, bitterholz von Jamaica*, Germ.

This timber is imported in small round logs, yielding boards of 10 to 11 inches in width. It is yellowish-white with a green tint, generally with more or less shade and mottle figure ; the grain is fine, close, and smooth. The wood has an exceedingly bitter taste, but an agreeable scent. Its principal use is for the destruction of insects.

The pores are rather small and not very numerous. The medullary rays are fine and somewhat indistinct.

QUEBRACHO. *Schinopsis* sp.

Weight 70–80 lbs. (Record). Argentina.

VERN—*Quebracho*, Trade—*Quebracho, quebracho colorado, q. negro, q. moro, q. machol, q. chaqueno, q. crespo*, Arg.—*Soto negro*, Boliv.—

Quebracho, matto grosso, Braz.—*Baraúna,* Bahia, Braz.—*Ironwood, red lignum-vitae, quiebra-hacha, break-axe, axe-master,* Misc.

According to Record, " the botanical range of *Schinopsis* extends from Northern Argentina, Western Paraguay, a small portion of Bolivia, and an undetermined area of Brazil, as far north as the interior of the State of Bahia . . . approximately 200,000 square miles." Also, " This genus is the source of the valuable South American tanwood known as quebracho . . . a contraction of the colloquial Spanish and Portuguese term ' quiebra-hacha ' (axe-breaker). . . . There are two kinds of quebracho—the red or ' quebracho colorado ' . . . and the white or ' quebracho blanco ' (the latter) supplied by a species of *Aspidosperma.*"

The wood is very hard and heavy, with an exceedingly dense, close grain, and is a deep red colour. Its principal uses have been for sleepers, and for the extraction of tannin.

Quercus lamellosa Smith.

Weight 61 lbs. (Pearson & Brown). India, Burma.

VERN—*Shalshi, pharat-singhali, budgrat,* Nep.—*Buk,* Lepcha—*Thitè,* Burm., Kc.

Pearson and Brown, in *Commercial Timbers of India,* report this wood as " russet to greyish-brown, frequently with lighter streaks; lustrous (especially on the quarter) when first exposed but becoming dull with age, refractory under tools . . . fairly straight to more or less irregularly grained, medium coarse and uneven-textured (large pores and rays). . . . The timber is durable, unless placed in damp positions. . . . A heavy construction timber and a species worth protecting and cultivating."

QUINCE. *Cydonia vulgaris* Pers.

Weight 46–47 lbs. India.

VERN—*Bihi,* N. Ind.—*Bamtsúnt, bumsútu,* Kashmir.

The wood is yellowish-white in colour with darker streaks, and a very close, compact, hard grain, resembling apple, but harder. Specimens of British-grown trees give the same result.

The numerous, minute pores are hardly discernible under the lens, and similar medullary rays equally difficult to locate.

QUIRA. *Platymiscium polystachyum* Benth.

Weight 45–46 lbs. Central and Northern South America.

VERN—*Quira, sinkra, zrok,* Pan.—*Aceituno montes, granadillo,* Salv.—*Roble,* Trin.—*Roble, roble colorado, roble blanco,* Venez.—*Trebo* Col.—*Panama redwood, vencola,* Trade.

Other SPECIES—*Subinché,* Mex.—*Mulatto, hormigo, ormigo,* Guat. Hond.—*Ñambar bastardo,* Nic.—*Quira,* Pan.—*Macacaúba, macacaúba da varzea, macacaúba da terra firma, moira-caoba,* Braz.

The colour is from a reddish-brown to a rich red, with darker veins

and a lustrous surface, a stripy, contrary grain making it hard to yield a smooth surface.

In Panama the name " quira " is also applied to the product of *P. dubium* Pittier ; the name " macacaúba " is a common name for several species of *Platymiscium* in the Amazon region, where it is fairly abundant in certain districts.

A small consignment of timber came into London from Brazil in 1931, shipped as " Brazilian padauk." Upon examination it proved to be a wood known by the name of " macacaúba " and " quira." The wood was found to agree exactly with that of a $7'' \times 7''$ baulk which was taken out of a building in Woolwich Dockyard, where it had been for upwards of 100 years, and possibly nearly double that time. It is interesting to notice that examination of the wood structure shows an almost complete agreement in every point with the produce of *Adenanthera pavonina* (Ywegyee) from Burma.

A very attractive wood for decorative furniture work. It is liable to attack by a small boring worm (beetle) which discolours the wood in the neighbourhood of the attack.

The pores are moderate to large sized, subdivided, rarely plugged, surrounded by a halo of light tissue, with exceedingly fine-threaded, numerous, medullary rays.

RABUGE. Source unknown.
Weight 69 lbs. Brazil.

The wood has a rich dark red colour, with darker streaks ; it is fine and close-grained, takes a lustrous surface from the tool, and after being polished has an attractive satin-like sheen. There is a faint ripple marking, the medullary rays showing in minute silver grain on radial section, and it is altogether a beautiful wood which should be employed for the best kinds of cabinet-making and decorative art woodwork.

The pores are large and often subdivided ; they are surrounded by a ring of loose tissue. The medullary rays are so fine as only to be discernible under the lens. There are concentric rings of darker coloured wood.

RAIN TREE (The). *Pithecolobium Saman* Benth.
Weight 26–36 lbs. (Gamble).
South America, India, Burma, Ceylon.

VERN—*Rain tree*, Eng.—*Samán*, Venez.—*Campaño*, Col.—*Guango*, Jam. —*Samán, guango*, P.R.—*Algarrobo del pais*, Cuba—*Garreto, cinícero, zorra*, Salv.

This tree was introduced into India from South America by the British, who planted it largely throughout India, Burma, and Ceylon. Gamble says : " The growth is exceedingly fast, but does not answer to expectation as the wood is nearly valueless, either as timber or fuel. . . .

Where the soil and the climate is moist, the Rain Tree is useful for avenues." I do not think Gamble does justice to this beautiful tree. It is very largely planted by roadsides, and grows quickly, affording a great attraction to the traveller, as well as a very much required shade ; its timber might certainly be made much more use of than it is at present.

This tree is not mentioned in Pearson and Brown's new book, *Commercial Timbers of India*. The question arises whether the Forestry Department have yet made sufficient efforts to recognise its value, on the one hand as a shade tree, and on the other as a timber tree, both of which come under the commercial heading, and are worth consideration. At least, as timber it possesses qualities equal to those of the American gum (*Liquidambar styraciflua*), which the Americans have succeeded in making a very valuable property.

The colour of the wood is a warm nut-brown, slightly lighter but resembling koko, with somewhat the same lustre, and with a softer grain, showing contrary hard and soft layers. A wood which, while not durable in India, seems to be quite durable and satisfactory in moderate climates.

The pores are scarce and large, fully open. The medullary rays too fine to be easily seen under the lens (+ 10).

RASPBERRY JAM-WOOD. *Acacia acuminata* Benth.

Weight (at 12 per cent moisture), 62 lbs.

Western Australia.

This wood possesses a rich colour, varying from violet to crimson, with a very hard, close, lustrous grain. It has also been called " violet-wood," probably on account of its very pleasing and strongly persistent scent of violets. From a billet of this wood I turned a small ornamental box nearly forty years ago, and the scent is still apparent on opening the lid. The fragrance also at times resembles that of crushed raspberries, hence the name. It is probable that, when in a fresher condition, the wood possesses a stronger and different scent.

It is a valuable wood for turnery and inlay, and should be more generally known. According to some authorities it is very durable, and has been said to withstand the test of seventy years in the ground as posts, though it is to be regretted that a wood of such value should ever be used for such a purpose.

RATA. *Metrosideros robusta* A. Cunn.

Weight 45 lbs. (Baterden). New Zealand.

The New Zealand Board of Agriculture describes this wood as being red in colour, straight in grain, hard, dense, heavy, and of great strength and durability. It is procurable in long lengths and up to 48 inches in width. Amongst its uses are mentioned wheelwrights' work, the frame-

work of railway waggons and carriages, and also machine beds and bearings.

RED ASH. *Alphitonia excelsa* Reissek.
New South Wales.

An unsuitable name for a wood which only resembles ash in colour, and even then with a red tint. Reports show that there is not a considerable supply, but that the wood assumes a " fiery red " colour, and is " ornamental."

RED BEAN. *Dysoxylon Muelleri* Benth.
New South Wales.

The Forestry Commission, N.S.W., report that the supply is not large. The wood is of a red colour, with a " neat figure." A good furniture wood, and has a " quiet yet handsome figure that looks well under polish."

RED BOMBWAY. *Planchonia andamanica* King.
Weight 61–62 lbs. The Andaman Islands.
VERN—*Lal Bombway*, Hind.

According to Parkinson the local name *Bombway* comes from the Burmese name, *Bambwe*, of *Careya arborea*, a tree somewhat resembling this one, but not found in the Andaman Islands.

The wood is of a brown-red colour, with a medium hard grain, capable of a very smooth surface from the tool. Specimens of the wood were shown at the Exhibition at Holland Park in 1920, and at Wembley in 1924. Supplies have been irregular and not reliable.

The rather numerous pores are arranged in singles and belts, sometimes straight and sometimes curved, very small, surrounded by a halo of light tissue, with fine, numerous, parallel medullary rays, crossed at right angles by very faint dotted white lines.

RED MAHOGANY. *Eucalyptus resinifera* Sm.
Weight 61 lbs. (Baker). New South Wales, Queensland.

The colour is a bright brick-red, rather like karri, but the wood generally proves too hard and heavy and fails to create any demand. The grain is close, hard, and interlocked, bearing very hardly on the saw and the plane, making it very difficult to secure a smooth surface. The Forestry Commission, N.S.W., report it as becoming very hard with age, even as hard or harder than ironbark ; resistant to white ants, and durable. A fairly considerable shipment of this timber, which contained a small proportion of highly figured pieces, that is, showing broken roe and mottle of a rather fine character, was brought to the London market between twenty and forty years ago.

RED SANDERS. *Pterocarpus santalinus* Linn. f.

Weight 75 lbs. (Gamble). The East Indies, Southern India.

VERN—*Lal chandan, rakta chandan, seyapu chandanum,* Tam.—*Erra chandanum,* Tel.—*Honné,* Kan.

This wood, also known as " red sandalwood " and " ruby wood," is not so often seen now as formerly. Gamble says that the wood is " extremely hard ; the sap-wood white, heart-wood dark claret-red to almost black, but always with a deep red tinge, orange-red when first cut." It is imported in small round logs from about 1½ inches to as much as 8 or 9 inches in diameter, with an occasional larger piece, and is used for red dyes, turnery, and inlay. It has a strongly marked contrary grain of hard and soft texture, but is capable of a very smooth surface if thoroughly worked with a sharp tool, and when finished shows a fine, glossy, lustrous surface.

The pores are small, uneven, and generally plugged with resin or gum. The very fine medullary rays are numerous, parallel, and nearly equidistant. They are joined at right angles by very fine white bands in pairs, following the lines of concentric layers.

RED SILKY OAK. *Stenocarpus salignus* R. Br.

Weight 51 lbs. (Baker). New South Wales, Queensland.

Known also as " beefwood."

Baker reports it as " fairly close-grained, and having a very dark red colour."

For description see SILKY OAK, *Grevillea robusta.*

REDWOOD. *Erythroxylon Affini* A. Rich.

British Honduras.

A red mahogany-coloured wood, so similar to the product of some of the African mahoganies as to be indistinguishable.

The peculiar feature is a narrow stripy layer of hard and soft wood, producing a narrow stripe, such as that sought for in Sapeli mahogany. A useful furniture wood.

The pores vary from extremely numerous in some places to a great scarcity in others, mostly plugged, very small. The medullary rays are extremely small, well-defined, close together, and parallel.

RESAK. *Shorea barbata* Brandis.

Malay Peninsula, Borneo, Sumatra.

The common form of resak is *S. barbata.* The colour of the wood is a light yellow brown, with a firm, close texture, yielding a very smooth surface from the tool. A very strong wood of good character, closely

resembling yacal. Kumus, Damar Laut, and Giam are very similar, so that the timber might be classified under one heading ; the wood of Giam being heavier than the others.

The numerous pores are very small and plugged ; with numerous clearly defined, fine medullary rays.

REWA-REWA. *Knightia excelsa* R. Br.
Weight 46–50 lbs. (Stone). New Zealand.

This timber is sometimes known as New Zealand honeysuckle. The Board of Agriculture, New Zealand, reports that it is " deep red in colour, and beautifully mottled in silver grain. Procurable up to 20 feet in length and 15 inches in width. Used for house-blocks, piles, railway sleepers, machine beds, and for ornamental cabinet-making."

Baterden says : " It is often used for mantelpieces owing to its incombustible nature. It is durable when used for interior work, but will not stand exposure to variations of weather. All oily substances should be avoided when polishing New Zealand honeysuckle, as it absorbs grease and oil to the detriment of the finely-marked grain ; and moreover, varnishing is said to be a disadvantage "

My specimen is of a light grey straw colour, with a very lustrous surface. Concentric layers of growth clearly marked by dark lines, with minute pores, connected by very light belts of light tissue, crossed by broad, irregular, rough-edged medullary rays, which appear of a pinkish shade and show in flecks running parallel with the longitudinal grain on the tangential face. The numerous, minute pores are hardly discernible under the lens. Numerous, strongly marked medullary rays irregular in width and position.

RHODODENDRON. *Rhododendron ponticum* Linn.
America, Asia.

The colour of the wood is a rather pale pinkish-white, with a very smooth, rather pretty grain. According to Gamble, it varies from soft to moderately hard, and is liable to warp and shrink.

The medullary rays show strongly in small flecks.

RIMU. *Dacrydium cupressinum* Soland.
Weight 34–40 lbs. (Baterden). New Zealand.

The tree is of straight growth and attains a height of from 80 to 100 feet, with a circumference of from 6 to 9 feet. It varies in shade from light yellow to chestnut-brown, with some streaks of lighter and darker colour, much resembling the so-called satin-walnut (*Liquidambar styraciflua* Linn.), but with a much finer, closer texture. Unlike this wood, it

stands well under all conditions, although it requires a long time to season properly. It is capable of a very smooth surface from the tool, and is excellent for mouldings and carved work, as a fine edge and finish is easily obtained with either hand or machine tool. A large quantity was imported in logs, planks, and boards about twenty years ago (1919), and remained in the docks for a long time, as it was entirely unknown and its merits were not realised. When at last it was used, it was soon appreciated, and subsequently inquired for, but no further shipments have arrived.

Besides its many uses for cabinet and joiners' work, it was found to be one of the best woods for the framing of show-cases for shop-fittings.

The numerous very fine medullary rays are parallel, and hardly discernible under the lens.

RINGAS.

See *Melanorrhoea* Spp.

RIUGAN. *Pametia pinnata* Forst.
Weight 55 lbs. Formosa.

The wood is very heavy, dense, and close-grained, and is largely marked with a wavy grain. It is of a light cherry colour similar to English cherry-wood, and would be a useful timber for many purposes if regular supplies could be maintained, but so far it has not been imported commercially into the United Kingdom.

The pores are fine and glisten with bright spots of gum. The exceedingly numerous medullary rays are very fine and clean-cut ; they are parallel and nearly equidistant.

ROBLE. *Nothofagus* sp.
Weight 34 lbs. Argentina, New Zealand, Tasmania, Australia.

VERN—*Roble, roble de Magellanes, coigue, coyan, guindo, hualle, pellin, rauli,* Chile—*Roble, roble cienego, coihue, cohigue, coyán, lengue, ñire,* Arg.—*Beech, South American beech, Antarctic beech,* Eng.

This wood, which has been called " roble," " Chilian oak," " rauli," " Chilian beech," and " melica," is of a reddish-brown colour, with a very nice, firm, close grain, capable of a very smooth surface ; altogether an exceedingly useful wood, comparable with our beech, but more durable.

Under the above names it has been often introduced for sleepers in many parts of the world ; a wasteful use of a valuable wood.

The concentric layers of growth are clearly marked with even, light-coloured lines, the innumerable, tiny pores, with confused medullary rays hardly discernible under the lens.

ROSEWOOD. *Dalbergia Stevensonii* Standl.
Weight 63 lbs. British Honduras.

While supplies of this wood have undoubtedly been sold in America and Europe under the name of rosewood, it is not the usual rosewood of commerce. Although lighter in colour, with a very hard and heavy grain, it is eminently suitable for all the purposes where rosewood is required, excepting that it will not provide wide enough sections. It has probably been also sold under the name of kingwood.

The exceedingly sparse pores are very variable in size, single and duplicated, well opened, with concentric layers closely marked by dark lines, and the very finest of clear-cut medullary rays, at close intervals.

ROSEWOOD. *Dysoxylon Fraserianum* Benth.
Weight 50 lbs. (Baterden). New South Wales.

The name rosewood is due to the fragrant rose odour when the wood is first cut ; this is another instance of a misleading name as the wood does not in the least resemble the rosewoods so well known on the markets of the world.

The timber, which is also known as Australian mahogany and bog onion, is reported by the Forestry Commission, N.S.W., as being of a red colour, resembling Honduras mahogany. It is said to work splendidly, and is used for a great number of important purposes, including wine casks ; also it is durable, and resistant to white ants.

ROSEWOOD, BAHIA and **RIO.** *Dalbergia* sp and generally *D. nigra.*
Weight 54 lbs. Brazil.

VERN—*Brazilian rosewood, palisander wood, jacaranda wood,* Eng.—*Jacarandaholz, palisanderholz,* Germ.—*Palissandre,* Fr.—*Madero de palisandro,* Sp.—*Palissandro, legno di jacaranda,* Ital.—*Jacarandá* (various kinds), *cabiúna, caviúna, jacarandá cabiúna,* Braz.

According to most authorities the wood is produced from many botanical species. Amongst these Baterden mentions *Dalbergia nigra, Machoerium incorruptibile,* and *M. legale. Brazilian Woods* notes that rosewood is furnished from the three following sorts : *Dalbergia nigra* Fr. Allem., *Machoerium allemani* Benth., and *M. violaceum* Fr. Allem. An entirely distinct wood known in Brazil as rosewood or pao rosa, is the product of *Physocalymma floridum.*

Brazilian rosewood has been familiar as a decorative wood throughout the last century, and its popularity commenced with the Empire period. In the early days of Queen Victoria's reign rosewood, used in the solid and in veneer, was employed in the best quality of decorative cabinet work. It

has been immortalised by Lewis Carroll in *Hiawatha's Photographing* :—

"From his shoulder Hiawatha
Took the camera of rosewood,
Made of sliding, folding rosewood;
Neatly put it all together."

and later in the same :—

"First the Governor, the Father:
He suggested velvet curtains
Looped about a massy pillar;
And the corner of a table,
Of a rosewood dining table."

The wood is so exceedingly well known that it seems almost superfluous to describe it. During the last twenty years its popularity diminished, so that, except in the manufacture of pianos, it has been rarely used, although in France and America the demand has been regular and steady. The trees produce very varying examples of colour and figure, with a very firm, hard, close grain, and an agreeable aromatic scent. The wood is capable of an exceedingly smooth surface, but the colour fades on exposure.

Originally the timber from Bahia was considered the best for quality, while supplies from Rio, although not so well marked or figured, produce larger and wider pieces more free from defect. The quality has more or less deteriorated in the course of the last twenty years, with a growing difficulty of obtaining sound wood of sufficient size to yield good veneers and panels.

The pores are exceedingly irregular both in size and position. They apparently vary both in numbers and size in the different concentric layers. There are irregular belts of darker coloured lines of varying widths which follow the concentric growth. The medullary rays are exceedingly fine and numerous ; they are generally crossed at right angles by somewhat similar fine white lines, thereby forming a network pattern. The radial section presents an exceedingly fine ripple ray.

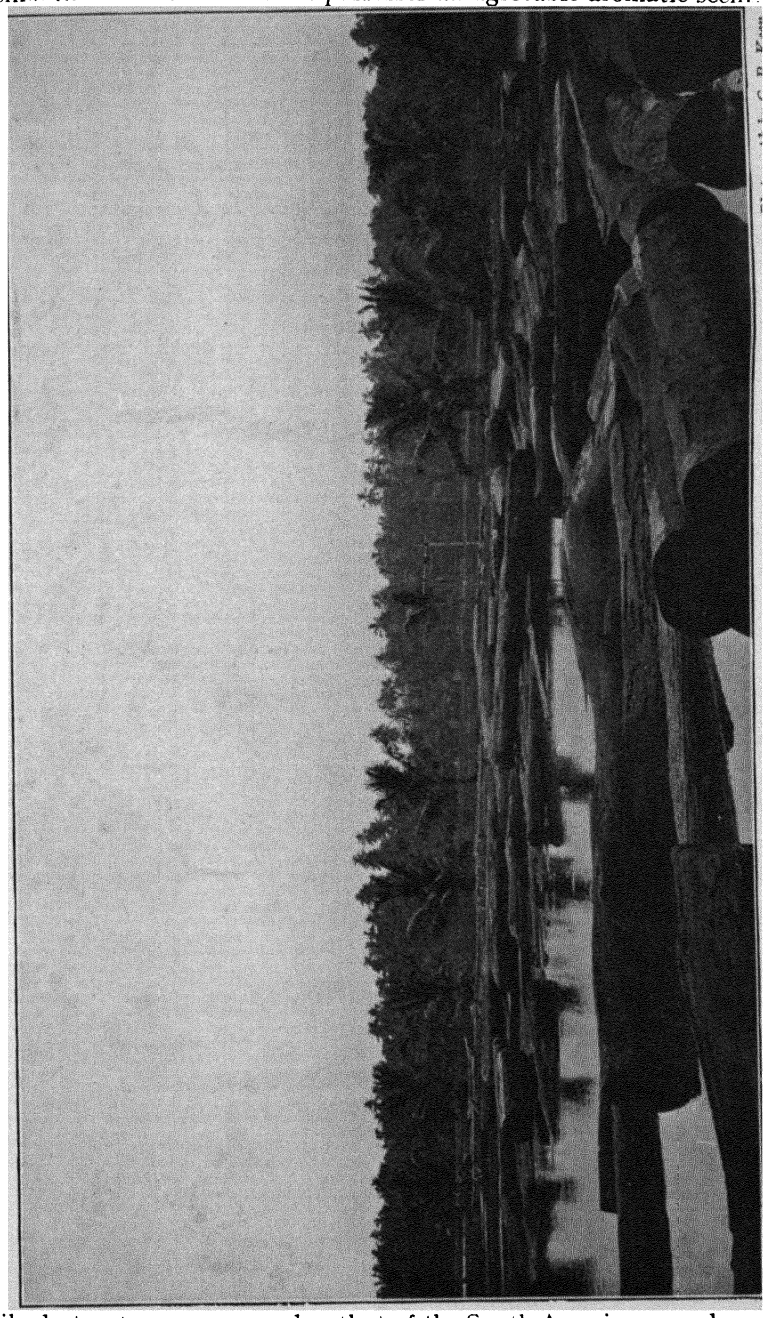
ROSEWOOD, EAST INDIAN. *Dalbergia latifolia* Roxb.

Weight 53-54 lbs. India, Ceylon.

VERN—*Sitsal*, Beng., Nep., Oudh—*Shisham, sisu, kalarukh, bhotbeula, sissúi*, Mar.—*Sissu*, Guz.—*Sirás, sissu, sirsa, sissa*, Mandla—*Sissua*, Uriya—*Iti, eruvadi, thothagatti*, Tam.—*Jitegi, yerugudu, jitangi*, Tel.—*Biti, thodagatti*, Kan.—*Bhotuk*, Bhil—*Serís*, Gondi—*Serisso*, Kurku—*Ruté*, Kól—*Satsiyar*, Sonthal—*Ruzerap*, Mechi—*Iridi*, Palkonda—*Jitiyegishi*, Koya.

This wood, famous throughout Southern India and Ceylon under the name of blackwood, and sometimes incorrectly called shisham, is, after teak, the most important wood which India produces. The colour is a light or dark rose red, with light and dark streaks, very similar in colour to that of the South American rosewood. The texture is close, firm, and hard, generally with a contrary hard and soft grain, requiring rather a sharp tool to secure a

smooth surface. The wood possesses an agreeable aromatic scent, rather



EAST INDIAN ROSEWOOD (*DALBERGIA LATIFOLIA*)

like but not so pronounced as that of the South American wood, and is one of the principal furniture woods in India, with some popularity for the same

purposes in Ceylon and Burma. It is very well known throughout England, America, and all over the Continent, indeed in all the markets of the world, generally under the name of East India, Malabar, or Bombay rosewood.

With the disappearance of the Empire and Victorian styles of furniture in Europe, the then well-known Bahia or Rio rosewood went out of fashion and the East Indian wood suffered in somewhat the same way. Properly exploited, the very valuable qualities and the beautiful appearance of the wood should lead to a far larger and extended use. It stands exceptionally well under all conditions and is highly suitable for first-class decorative woodwork, possessing the necessary strength and quality of grain for

Photograph by G. R. Keen

EAST INDIAN ROSEWOOD LOG

wearing well under every condition, and is an excellent wood for turnery. Throughout Europe, in America, and in England its principal use has always been in the pianoforte trade, where it has been used both in the solid and in veneer. The veneers are sawn or cut generally through the log, but sometimes around it.

Resulting from the Exhibition at Holland Park in 1920 many important works were carried out, notably a handsome hall constructed for Mr. Llewellyn, near Colesborne, Glos. At the Wembley Exhibition a complete shop front, designed and executed by F. Sage & Co., Ltd., two carved eagle-headed armchairs made by W. & T. Lock of Bath, a complete dining-room suite consisting of dining-table, sideboard, dinner-waggon, chairs, and pedestal writing-table, were exhibited, all made by native labour under the direction of a European supervisor, by McKenzies, Ltd.,

of Bombay. In the new India House, Aldwych, the entrance door is furnished in this wood, and in the new Bank of England it is used for flooring. A wide field of usefulness still awaits this, one of the most valuable decorative woods the world produces.

The pores are scarce and irregular, with long fringes of very small pores in wavy lines, at right angles to the numerous exceedingly fine, parallel medullary rays.

SABIA. Source unknown.
Weight 59 lbs. Brazil.

This wood very closely resembles Cuba mahogany in colour and appearance, though the grain is very like that of Cuba cedar (*Cedrela odorata*). The timber is fine, hard, and close, being in every respect equal to Cuba mahogany, and would make a very fine cabinet wood.

The concentric layers are marked by strong rings of large pores. The pores are generally very large for a Brazilian wood; they are irregularly distributed, and are surrounded by patches of loose tissue. The medullary rays are very fine and close.

SABICU. *Lysiloma Sabicu* Benth.
Weight 60 lbs. 10 oz. The West Indies.
VERN—*Sabicú, Cuban sabicú,* Trade—*Jigue, jigue blanco, sabicú, savacú, savicó,* Cuba—*Wild tamarind,* Fla.—*Sabicú, horse-flesh,* Bah.—*Xiaxek,* Mex.—*Sabicuholz,* Germ.

This is imported in hewn square logs in lengths from 8 feet upwards, and from 10 to 36 inches in squares, with occasionally still larger logs. The wood is of a dull brown colour, with a bright lustre, and an exceedingly close, firm, smooth grain. Many logs are very highly figured, containing both straight and broken roe, with mottle and splash mottle, resembling very closely that of Spanish mahogany. It is tough and comparatively strong, although Laslett considered it unsuitable for the beams of heavy guns, lest it should contain some hidden defect, which he refers to as a cross fracture of a very remarkable kind, but shipments during the last twenty years have not confirmed this opinion. This is the cross-break which has more latterly been found to exist so largely in the mahogany from the West Coast of Africa. Sabicu exhibits a peculiarity which is shared by greenheart, in that, when tested for crushing force in the direction of its fibres, it bears the addition of weight after weight without showing any signs of yielding, but when the crushing force is obtained, it gives way suddenly and completely, nothing being left of the pieces but a loose mass of shapeless fibres. It "has very little sap and is a remarkably solid wood; [also] it is characteristic that there is an almost complete absence of the heart-, star-, and cup-shakes. It seasons slowly,

shrinks but little, and does not split, as do most other woods, while undergoing that process. It also bears exposure to the weather without being in any but the slightest degree affected, even if left without either paint or varnish to protect it ; further, it works up well and there is only a trifling loss in its conversion . . . therefore . . . it has much to commend it to the favourable notice of the manufacturer " (Laslett).

Formerly it was much employed in shipbuilding, where its good qualities gained for it a high reputation, and to this may be attributed the fact that it is frequently specified for purposes where other, and possibly less expensive, woods might be equally suitable. It has also been used to a very considerable extent by the Ordnance Department for gun carriages and similar work. Until the outbreak of the European war it was considered to be the best wood for saddle-trees, but supplies then failing, substitutes were perforce employed. Amongst these was padauk, and it is doubtful as to whether that is not the more suitable wood of the two.

Sabicu was used rather extensively in the finest pieces of cabinet work by Sheraton, the brothers Adam, and others of that date, and some of the pieces generally considered to be of mahogany have proved to be of this wood, especially where curls or crotches have been used, and where the figure is plain or splash mottle. The wood presents a beautiful effect, particularly when employed in conjunction with satinwood. It develops a mellow tone and is greatly improved by exposure to light and air.

A cargo, landed at the West India Docks about the year 1919, consisted entirely of square hewn logs, mostly of large size, every log being highly figured. The best of these were sold and transhipped to America.

The pores are scarce and very irregular in size and position ; they generally appear in groups, and some are plugged with a bright shining gum. The medullary rays are exceedingly fine and numerous, parallel and equidistant, and crossed at right angles by thin white lines. All the sections show pretty and delicately marked ripple rays.

SABICU, AFRICAN. ? *Zanthoxylum senegalense* DC.

Weight 46 lbs. West Coast of Africa.

VERN—*Ughahan*, Benin—*Ata*, Lagos—*Artar*, *Pharm. Journ.* (3), xx. p. 163—*Sabicu*. (From *Kew Bulletin*.)

According to the *Kew Bulletin*, 1908, which quotes the vernacular names as above, the source of this wood appears to be *Zanthoxylum senegalense* DC., but there is no definite information that the timber which has been seen in commerce is from this source.

The colour is a golden-brown, with a hard, fine texture rather spoiled by the open pores which show on the tangential surface. The wood bears a strong resemblance to that of the West Indian sabicu (*Lysiloma sabicu*),

and is probably as strong and useful. A large shipment was landed in Liverpool about the year 1900. The logs were hewn well square and were of large size, ranging from about 18 to 40 inches square and from 10 to 30 feet in length, exceedingly sound and free from defect, many showing stripe and broken roe with a little mottle. Difficulty was experienced in finding any purchasers as the wood was one which had not been seen in commerce before, but eventually the whole shipment was disposed of, and on what was considered at the time a remunerative basis. It was generally understood that the timber was used in the Ordnance Department, or for the purposes for which that Department is responsible. Since that date single logs have arrived, mixed in general shipment of mahogany, but there has been no large consignment.

The very sparse pores are large and open, strangely situated in groups, with wavy belts of tiny pores or light lines, crossed at right angles by the finest possible medullary rays, almost undiscernible under the lens, the whole making a strange and rather pretty pattern.

Saccopetalum tomentosum Hook. f. & Th.

Weight 40 lbs. India.

VERN—*Kirna, karri*, Hind.—*Homba*, Melghat—*Hoom*, Bombay—*Wumb, hessare*, Kan.—*Chilkadúdú*, Tel.—*Toska*, Gondi—*Humba*, Kurku—*Omé*, Sonthal—*Heeran*, Mal Pahari—*Umbia, umbi*, Merwara—*Umb*, Jeypore—*Omé, haké húmú*, Kól—*Gonda palasu*, Uriya.

This is a very nice wood, of a light olive-yellow or brown colour, with a very close, firm, hard texture; it takes a smooth surface from the tool. The radial section is covered with tiny flecks of silver grain caused by the medullary rays. It should be a valuable cabinet wood, as it undoubtedly stands well under all conditions. Troup mentions it as used for carving, for which it is eminently suitable.

The pores are exceedingly small; the medullary rays very strong, broad, and numerous, parallel though not equidistant.

Sa-ch'ai.

China.

Professor Record considers this as the produce of *Fraxinus* sp. The specimen submitted by Professor Chung resembles that of Japanese keyaki, *Zelkowa acuminata* (*q.v.*), with a slightly softer grain.

In the early growth the pores are large and open, with much smaller pores in the later growth. Intersected with fine, strong medullary rays, which do not show on the radial section.

SAL. *Shorea robusta* Gaert. f.

Weight 55 lbs. (Gamble). Northern and Central India.

VERN—*Sál, sála, salwa, sákhu, sakher*, Hind.—*Shál, kandár*, Garhwal—*Sakwa*, Nep.—*Teturl, takral*, Lepch.—*Bolsal*, Gáro—*Jargi*, Khond

—*Sarjúm*, Kól—*Sargi*, Bhumij—*Sakwa*, Kharwar—*Sekwa*, Oraon —*Shal*, Beng.—*Salwa, soringhi*, Uriya—*Sarái*, Rewah—*Guggilapu*, Palkonda—*Koroh*, Oudh—*Sarei, rinjal*, C.P.—*Gúgal*, Tel.

This very valuable wood, though little known in England, is in general use in India. The timber is hard and rather cross-grained, of a close texture and light brown colour, with small whitish sap-wood which is not durable. Gamble writes : " The fibres of alternate belts in the wood on a vertical section running in opposite directions, so that when the wood is dressed a very sharp plane is necessary or it will not get smooth ; does not season well." Quoting Brandis, he continues : " The trees attain the

Photograph by A. Rodger

FOREST OF *SHOREA* SP., UPPER BURMA

height of 100 to 150 feet with a clear stem to the first branch of 60 to 80 feet, and a girth of 20 to 25 feet. . . . As a rule it attains to 60 to 80 feet . . . and a girth of 6 to 8 feet." In drying, superficial flaws appear and great care is needed, but when thoroughly seasoned it stands almost without a rival for strength, elasticity, and durability. Great difficulty is experienced in getting the timber out of the forests, as it will not float.

It is largely used in India for all purposes where durability and elasticity are required, and especially for sleepers. Pearson gives the life of a good sal sleeper as 20 years compared with 17 to 28 years for teak (*Tectona grandis*), 20 years for pyinkado (*Xylia dolabriformis*) from Burma, and 8 months to 6½ years for jamba (*Xylia xylocarpa*) from Bombay and

Madras. The rail does not cut into the sal sleepers at all, even after long use, but the spike-holes corrode and the spikes shake loose after continual wear, they also rust, but apparently not more than in the case of teak sleepers, though worse than jarrah. Sal holds the spikes longer and better than others The wood somewhat resembles the so-called camphor-wood of Borneo (*Dryobalanops aromatica*), but it is harder and heavier, and would give more satisfactory results for strength and durability. It would be a very useful constructional wood in England, and if it could be obtained in regular supplies at a moderate cost its use should be encouraged.

Photo.-Mechl. Dept. Thomason College, Roorkee

SAL FOREST OF GOOD QUALITY, BENGAL

The pores are of moderate size and are plugged with gum ; they often appear in patches. The medullary rays are very fine and clear-cut, parallel, and joined at irregular intervals at right angles by faint white lines.

Salix tetrasperma Roxb.

Weight 26–27 lbs. India, Burma.

VERN—*Bed, bent, baishi*, Hind.—*Laila, bains*, N.W. India—*Bis, beis, bitsa, bin, bidu, bakshel, magsher, safedar, badha*, Pb.—*Yir, bins*, Kashmir—*Bed, jalmála*, Dehra Dún—*Garbains*, Garhwal—*Bhanish*, Kumaon—*Bilsa, bhúsa*, Oudh—*Bhesh*, Gáro—*Bhi*, Ass.

—*Wallunj, bacha,* Bombay—*Bocha, bitasa,* Mar.—*Nachal,* Kól—*Cheúr,* Kharwar—*Baigay,* Badaga—*Bes,* Monghyr—*Niranji,* Kan.—*Momaka, yethabye, yene,* Burm.—*Pani jama,* Beng.—*Indian willow.*

The wood is of a pale red colour, with a soft, porous, even grain. Gamble reports it as used for posts, planks, and yokes ; and Troup (*Forest Memoirs*) suggests its use for matches, but an examination of the wood does not confirm his view as to its suitability.

The irregular concentric layers of growth are very clearly marked by thin dark lines, with pronounced, thin layers of open pores, larger than the pores in the spring and autumn wood, which are of moderate size and rather sparse. The numerous, very close medullary rays are confused and hardly discernible under the lens.

SALM WOOD. *Cordia alliodora* R. & P. Cham.
Weight 23–25 lbs. British Honduras, Brazil.
VERN—*Loro negro, peterebí,* Brazil.

This is a beautiful wood, reminiscent of but superior to Japanese kiri, *Paulownia imperialis.* The colour is a dull golden brown. The wood has a smooth grain and is very light in weight, but gives indication of being relatively strong, and standing well.

The medullary rays show prominently on the radial section. Concentric layers are marked by strong broken lines ; making a very pretty pattern on the transverse section, with numerous small pores, mostly plugged ; broken and lighter lines marking the concentric layers. The medullary rays are exceedingly strong. The sap-wood is liable to pin worm-holes.

SAMBA.
See OBECHI.

SANDALEEN.
See *Excoecaria* sp.

SANDALWOOD. *Santalum album* Linn.
S. cygnorum Miq.
Weight 55 lbs. India, Western Australia.
VERN—*Chandan, chandal, sandal,* Hind.—*Gandha, gandada,* Kan.—*Srigandam,* Tam.—*Santagu,* Burm.

The wood is of a dull yellow colour, which, exposed to light and air, darkens almost to brown. It has a very close, firm texture, and a sticky feeling to the touch. The fragrant aromatic and persistent scent is well known, being familiar in the ornamental wood-work which has for a long time been imported from India. Troup says that this is " the most

valuable wood in India, which grows as a parasite on the roots of other plants. [It is] commonest in the native State of Mysore. The value lies in the scented oil contained in the heart-wood. . . . There is a considerable industry in the distillation of sandalwood oil from raspings of the heart-wood." He adds that it is a beautiful wood for ornamental turnery.

In Australia the extraction of sandalwood is a very important industry. At present the wood is chiefly obtained from the roots of trees which, many years ago, were destroyed by forest fires. The Hon. J. D. Connolly, then Agent-General for Western Australia, wrote in 1911 : " The export of sandalwood to the Far East, where it is used for carving images and for ornamental work, has long been a substantial industry, and in the early days the sandalwood getter was the pioneer of civilisation in many districts." Dealing with the year 1910–11, he adds that sandalwood of a value of £69,141 was exported.

The pores are exceedingly small and very numerous. The medullary rays also are very fine, and both pores and medullary rays are difficult to distinguish even with the lens (+ 12).

SANDALWOOD, WEST INDIAN.

See AMYRIS.

SANDAN. *Ougeinia dalbergioides* Benth.

Weight 55 lbs. (Troup). India.

VERN—*Sandan, asainda, tinnas, timsa,* Hind.—*Shánjan, pánan,* Oudh—*Sandan pipli,* Nep.—*Bandhona,* Uriya—*Kala palás, tewas,* Mar.—*Tewas, ruthu,* Melghât—*Panan,* Monghyr—*Ruta,* Kól—*Rót,* Sonthal—*Pannan,* Koderma—*Jaru,* Khond—*Eru,* Koya—*Chichera,* Reddi—*Sér, shermana, tinsai,* Gondi—*Dargu, tella, motku,* Tel.—*Kari mutal,* Kan.—*Tewsa,* Bhíl—*Rutok, ruthu,* Kurku—*Tunnia,* Banswara—*Telus,* Khandésh.

The wood is grey-brown and is often mottled. It is of a hard, close texture and smooth grain, and takes a good polish. It is durable and tough. Gamble says : " This very pretty and useful tree is a valuable one in India. . . . It makes excellent furniture. Roxburgh mentions that the pillars of Maharaja Sindhia's palace at Oojein are made of it."

The pores are very regular, and form a pretty pattern. The medullary rays are exceedingly fine, well-defined, very numerous, parallel, and equidistant.

SANTA MARIA. *Calophyllum Calaba* Jacq.

Weight 53 lbs.

Central America, Northern South America, West Indies.

VERN—*Santa maria, chijole mahogany,* Trade—*Marias, palo de maria,* P.R.—*Ocuje,* Cuba—*Baria, varilla, maria, santa maria,* S.D.—*Galba, galpa, galopa, aceito de maria, crabwood,* Trin.—*Maria,*

Venez.—*Aceite, aceite de maría,* Col.—*Santa maría, calaba,* Pan.—*María,* C.R.—*Santa maría, krassa,* Nic.—*María, santa maría, palo maría, limoncillo de cordóba,* Mex.

The wood of Santa María resembles that of the poon tree in India (*Calophyllum Inophyllum*), so closely that it would be impossible for the expert to distinguish between the two in finished work; thus providing a further interesting example of the remarkable similarity of woods in the East and West Indies. The description given by Laslett is so good that I think that it should be quoted complete. "The wood is of a pale reddish colour, moderately hard, has a clean fine straight grain, and is a little porous. It is generally free from injurious heart- or star-shake, has few knots, does not shrink much, and scarcely splits at all in seasoning. It is easily worked, and may therefore be considered a very fair substitute for the plainest Honduras or Mexican mahogany. Some few years since (1875) several cargoes of Santa María timber were brought to the royal dockyards, and employed there for beams, planking, etc., in ships; and although it would seem never to have been much in favour as a building wood, there is good reason to think that in the absence of Mahogany it might very well be used for cabin fitments, for furniture, and many other purposes. This wood stands exposure to the weather remarkably well, and is, I think, durable, since a parcel of about 150 loads which I inspected after it had been left in the open in a moist country for about ten years, showed scarcely any signs of deterioration either at the centre or at any other part, and had but few shakes on the external surfaces."

The pores are moderate in both size and quantity and are plugged. The fine medullary rays are hardly discernible under the lens.

SAPAN or **SAPPAN WOOD.** *Caesalpinia sapan*

Siam, East Indies.

The colour is a brilliant orange red, with a very fine, close, tight grain, very lustrous. Holtzapffel says it was imported as a dye-wood, greatly inferior to Brazil-wood, *C. echinata* (*q v.*), and too unsound for turning.

If this wood can be obtained in straight pieces of any sufficient size, it should be a good substitute for Brazil-wood for violin bows, etc.

The concentric layers are clearly marked by darker and lighter lines. The pores are rather small, evenly distributed, numerous, and open, surrounded by a half halo of light tissue The medullary rays are exceedingly fine, very distinct, and parallel.

Sapindus emarginatus Vahl.

Weight 62 lbs. (Gamble). Ceylon, India.

VERN—*Ritha,* Hind.—*Bara-ritha,* Beng.—*Mukta maya,* Uriya—*Rita,* Mar.—*Konkúdú,* Tel.—*Pounanga, puvandi, neykoddan, panalai,*

Tam.—*Thalay marathu, aratala, antawála,* Kan.—*Areeta,* Mal.—*Chána, shothali, nithá vanji,* Trav. Hills—*Puvella, penela,* Cingh.

The "soapnut" tree. The colour of the wood is a bright gamboge yellow, with variable streaks of lighter and darker colour. The grain is close and the wood hard, and it requires a very sharp tool to make a smooth surface. Gamble reports it as very little used, only occasionally for carts and in building, which is another instance of the wasteful use of a valuable decorative wood, suitable for cabinet work and turnery.

The transverse section displays a very pretty pattern, the small pores being arranged in belts or bands, joined by thin, light lines of tissue crossed by finest but clear medullary rays, very numerous and regular.

SAPOCARANA. Source unknown.
Weight 49 lbs. Brazil.

In Colonel Gamble's notes on Brazilian timber he says that this wood is not so good as *sapucaia de pilao,* and adds that it resists white ant. To compare these two woods at all appears to me to be rather perplexing, for there is such a marked contrast between them. Sapocarana is a bright yellowish-coloured wood, while the other is a deep brick-red, and their structure is different.

Sapocarana, while it is not of such good quality or so heavy as satinwood, would make a good substitute for that wood.

The pores are very small and numerous; they are irregularly distributed and are often joined. The medullary rays are fine and numerous. The concentric layers are marked by belts of more numerous pores.

SAPODILLA. *Achras Zapota* L.
Weight 78 lbs. British Honduras, Central America, Southern Mexico.

VERN—*Sapodilla, naseberry, neesberry, nisberry,* B.W.I.—*Níspero,* Sp. Am. gen.—*Zapote, sapote,* Cuba—*Sapotier, sapotille, sapotiller,* Fr. W.I.—*Mispel, mispelboom,* D.W.I.—*Chico, zapote chico, chicozapote,* Mex., Guat.—*Tzicozapotl, ya,* Mex.—*Níspero quitense,* Ec.—*Muyozapot,* Salv.—*Korób,* C.R.—*Ibán,* Nic.—*Muy, sapodilla, chicle,* Guat.—*Sapotilla,* Braz.—*Breiapfel, sapotillbaum,* Germ.—*Chicle tree, chewing-gum tree,* Misc.

This tree would seem to be more important for the gum it exudes—which is made into chewing gum—than for its timber properties. It is a deep dark plum colour with a hard, close grain, like beefwood, which it closely resembles.

The exceedingly small pores can hardly be discerned under the lens; nor can the separate, numerous fine medullary rays, which do not show on the radial section.

SAPUCAIA. *Lecythis* sp.

Weight 69 lbs. Brazil.

VERN—*Sapucaia, sapacaia, sapucaya, sapucaia grande,* Braz.—*Monkey-pot, cream-nut tree, sapucaia-nut tree,* Eng.

This specimen, which is marked *Lecythis Sapucaia,* shows heart-wood and sap-wood. The heart-wood is of a reddish-brown colour, and has a close, firm texture, which takes a good smooth surface from the tool. The sap-wood is a light yellow, and is perforated with worm-holes which do not penetrate the heart-wood.

Brazilian Woods mentions sapucaia as the produce of *Lecythis ollaria* Vell.; it also gives sapucaia-mirim (*L. minor,* Vell.). The former is said to be an excellent wood for building and naval architecture. This tree bears a fruit known as "marmite de singe," and it is under the English equivalent ("*monkey-pot*") that the wood has been reported upon by several authorities. Henry Walter Bates in *The Naturalist on the Amazons* mentions that in the forests of the Para district he saw a quantity of large empty wooden vessels which had fallen from the sapucaia tree. He goes on to say: "They are called 'Monkeys' drinking cups' (*Cuyas de Macaco*), and are the capsules which contain the nuts sold under the name just mentioned, in Covent Garden Market. At the top of the vessel is a circular hole, in which a natural lid fits neatly. When the nuts are ripe this lid becomes loosened, and the capsule falls with a crash, scattering the nuts over the ground. The tree which yields the nut (*Lecythis ollaria*) is of immense height. It is closely allied to the Brazil-nut tree (*Bertholletia excelsa*), whose seeds are also enclosed in large woody vessels; but these have no lid and fall entire to the ground. This is the reason why the one kind of nut is so much dearer than the other. The sapucaya is not less abundant probably than the *Bertholletia,* but its nuts in falling are scattered about and eaten by wild animals; whilst the full capsules of Brazil-nuts are collected entire by the natives."

Stone speaks of kakeralli as the produce of *Lecythis ollaria* Linn., and gives as alternative names: *sapucaia nut* (British Guiana), *sapucaia-pilao* (Rio de Janeiro), and *barklak* (Dutch Guiana). Yet while Stone's micro-photograph of the structure of kakeralli agrees perfectly with my specimen, he states that the colour of the wood is reddish- or greyish-brown, and that this is not sharply defined from the light brown sap-wood; on the other hand my specimen shows a sharp line of demarcation between the reddish-brown heart-wood and the whitish-yellow sap-wood. It is, however, possible that my specimen is the allied species *L. grandiflora,*[1] which is also known as sapucaia, and this Stone describes as having a light-red heart-wood defined from the lighter sap-wood. Altogether this seems to be a very valuable timber which should be better known and appreciated.

[1] Not in Record.

The pores are rather scarce and are plugged. The medullary rays are very fine and numerous, and are crossed by lighter wavy lines of loose tissue.

SAPUCAIA DE PILAO. *Lecythis pisonis.*
Weight 79 lbs. Brazil.

This is closely allied to the foregoing. Colonel Gamble describes it as a first-class wood and says that it is used for piles and in civil and naval architecture ; and that it resists white ant. He gives the height of the tree as 80 feet, with a diameter of over 6 feet 6 inches. To use such a wood as this for works of construction appears strange, for it is much more suitable for decorative art furniture than for any other purposes. It is of a brick-red or mahogany colour, and has a fine smooth grain taking a beautiful surface from the tool. Indeed in many respects it presents the qualities of the best Spanish mahogany, even to the peculiarity of the white chalky marks, which show in the open pores on the tangential surface.

The pores are very scarce and small and are partially plugged. The exceedingly fine medullary rays are intersected at right angles by equally fine concentric lines which thus divide the field into countless minute squares. The rays show in tiny silvery flecks on the radial section.

Sarcocephalus cordatus Miq.
Weight 35 lbs. India, Burma, Ceylon.
VERN—*Vammi*, Tam.—*Bakmi*, Cingh —*Ma-u, ma-u-lettanshe, ma-u-kadon, ma-u-lèlan, ma-u-gyi*, Burm.

The wood is of a light grey-brown, with a soft punky grain. It could not be recommended for works of any importance.

The pores, which are not large, are numerous and regular in size and position. The medullary rays are not visible with the lens (+ 12).

SASSAFRAS, TASMANIAN. *Atherosperma Moschata* Labill.
Weight 42 lbs. Australia, Tasmania.

An attractive, dark grey-coloured wood, with dark streaks, and a close, firm grain resembling magnolia. An effective decorative wood for panelling and all cabinet work. Baker says : " The cabinet softwoods Sassafras *Doryphora sassafras* and *Atherosperma moschata* are both well known."

The lines of concentric growth are clearly visible to the naked eye.

The pores are very numerous, exceedingly minute, uniform in size, largely plugged, with irregular, ill-defined medullary rays which show on the radial section, making a ripple-like pattern.

SASSWOOD. *Erythrophloem guineense* G. Don.

Nigeria.

VERN—*Brun, mwavi, ordeal tree, sasswood.*

A hard and very durable timber, used in constructional work where great strength and durability are required, and for wheelwrights' work.

SATINEE. Perhaps *Ferolia guianensis* Aubl. or *F. variegata* Lam.

Weight 54 lbs. French Guiana.

This valuable highly decorative wood is insufficiently known or appreciated in England, although it was mentioned by Laslett in 1875. In France, however, it has been extensively used, and is highly valued for its unusual qualities. The colour is light red, which bleaches a little and assumes a very bright lustre or sheen, especially when treated with a thin transparent polish in the attractive manner peculiar to the French artist. There is no other wood comparable to it for work in the French Empire style. The nearest approach is, perhaps, the San Domingo abey (*Poeppigia excelsa*) or the Malayan keranji (*Dialium* sp.), although the keranji, while displaying a most brilliant lustre, is rather lighter in colour. There is always a slightly marked, very narrow shade or roe (caused by the contrary soft and hard grain), which when laid alternate ways adds greatly to the appearance of the panel or cabinet.

The pores are irregular in size and position. The medullary rays, which are very fine, are exceedingly numerous and sharply defined.

SATINWOOD, AFRICAN.

West Coast of Africa.

Under the above name, or the names of "yellowwood" or "greenheart," there have been imported from several ports on the West Coast of Africa a number of logs of varying sizes up to 3 feet square. As to the source of the wood I am incompletely informed. Mr. J. J. Richardson submitted specimen leaves and wood of the tree to the authorities at Kew, who attributed them to a species of *Acacia*. Mr. Richardson was unacquainted with the native name of the tree.

The wood is greenish-yellow in colour and has a hard, smooth surface. Some is beautifully figured, so that it is valuable for furniture, cabinet work, panelling, brush backs, and the like. The timber should also be useful where strength and a certain amount of elasticity are required. Mr. George Miller has furnished and panelled a handsome room with this wood, at Newberries, Radlett, Herts. The statement has been made that it endangers the health of those who work it, but up to the present (1919) only one case of illness that could be possibly associated with this timber has been reported, and even in this instance the connection is doubtful.

The concentric layers are marked by indistinct dark lines. The pores

are regularly distributed, both singly and in pairs. The medullary rays are very fine and close, parallel and irregular ; they show on the tangential section.

SATINWOOD, ANDAMAN. *Murraya exotica* Linn.

Weight 62 lbs. South and West India, Burma, The Andaman Islands.

VERN—*Marchula, juti, atal,* Hind.—*Marchi,* Kumaon—*Juti mersolo,* Garhwal—*Bilgar,* Dehra Dún—*Kamini,* Beng.—*Naga golunga,* Tel —*Kunti,* Bombay—*Raket-berár,* Gondi—*Simali,* Nep.—*Shit-zem,* Lepcha—*Thanatka, môksongayôk,* Burm.—*Machalla,* And. —*Etteriya,* Cingh.

The wood is light yellow, with occasionally greyish streaks. It has been compared to boxwood, but my specimen is quite dissimilar, lacking as it does the even regularity of the colour in that wood. It is sometimes prettily figured, would be suitable for cabinet work and for walking-sticks, and would be appreciated if it became known in this country. Gamble says that it has been tried for wood-engraving, for which it seems suitable if well seasoned.

" Pores very small, sometimes in short radial lines of 2 or 3. Medullary rays very fine, very numerous. Sharp, white, concentric lines, which frequently run into each other, unevenly spaced, roughly about 40 to 50 per inch " (Gamble).

SATINWOOD, EAST INDIAN. *Chloroxylon Swietenia* DC.

Weight 59 lbs. 8 oz. Ceylon and India.

VERN—*Behra, girya, behru, bihri,* C.P.—*Bhirra, girya,* Berar—*Bhira,* Gondi —*Bhirwa,* Baigas—*Bella,* Paklonda—*Halda, bheria, billu,* Mar.— *Múdúdad, mutirai, burús, purúsh,* Tam.—*Billu, bilgu,* Tel.— *Sengel, sali,* Kól—*Bharhul,* Kharwar—*Behru,* Uriya—*Huragalu,* Mysore—*Buruta,* Cingh.

Although occasionally shipments of satinwood have been made from Southern India and Bengal, by far the bulk of the supplies have come from Ceylon. Large-sized trees have been seen in India, and one of good size was cut down in the Botanical Gardens at Calcutta a few years since, but generally only small timber has been available, in sizes from 5 inches to 8 inches in diameter. R. S. Troup, in a private note, mentions that the tree is very common in parts of the Indian Peninsula, the largest out-turn being from the Godaveri district of Madras.

A continuous and important trade has been conducted with Ceylon for many years, the logs shipped ranging in size from 12 inches up to 3 feet 6 inches in diameter, and from 6 to 25 feet or even longer. The logs are very liable to cup-shakes and gum-rings, which show on the butt ends in thin lines following the layer of annual growth, sometimes parallel, some-

times completely round the tree. They are also subject to the borings of large grubs, which leave holes from ¼ inch to 1 inch in diameter. These generally occur on the outside of the tree, under the bark, rarely beyond the sap-wood, but often reduce the proportion of convertible wood. Nearly all the timber is more or less figured, a plain log being exceptional. The figure ranges from a plain light- and dark-coloured stripe, or a broken stripe or roe, to the finest broken roe with splash mottle figure. During the last few years, until the early part of 1930, a vigorous demand grew up on the Continent and in America, without similar interest in the United Kingdom. The greatly enhanced prices which resulted produced a very large supply, which included a high-class quality of magnificently figured

Photograph by G. R. Keen

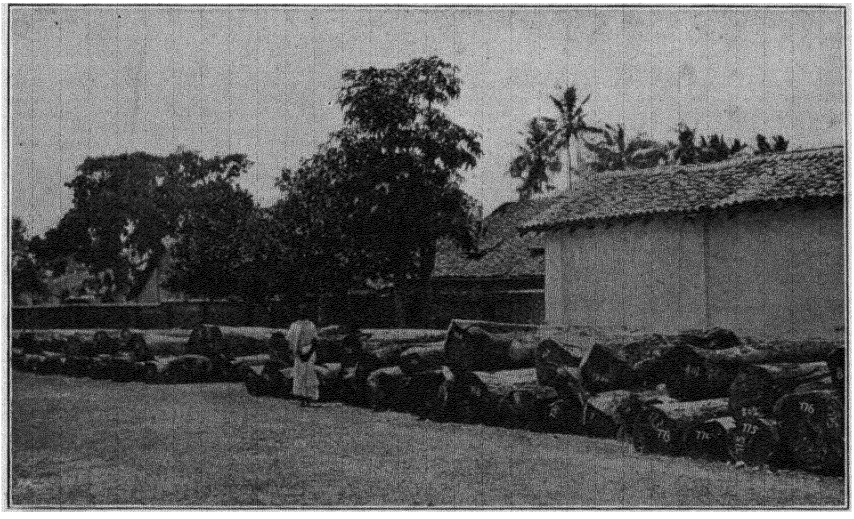
EAST INDIAN SATINWOOD LOGS, CEYLON

wood, superior to anything which had previously been seen, and the figures paid for the fine logs ran very high. With the world-wide trade depression a reaction was experienced, the supplies largely exceeding the demand, until satinwood claimed little interest in commercial circles. In India the wood has been used for many purposes, including wharf piling, agricultural implements, brush backs, carving and turnery, naves and felloes of wheels, and a great variety of different work. The bridge at Peradeniya, near Kandy, Ceylon, was constructed almost entirely of this wood. It contained a single arch of over 200-feet span, which has lately been taken down. In England its uses have been confined to brush and mirror backs, small and large cabinets, also furniture and panelling. A very handsome example of fine East Indian satinwood panelling can be seen at Lyons' Popular Restaurant, Piccadilly. In many of the fine

examples of satinwood furniture East Indian wood has been used for linings and cross bandings. It varies in colour more than the West Indian, being of all shades from a bright yellow to a dark brown.

The concentric layers show in a similar manner to the West Indian (*Zanthoxylum*), except that there is a greater variety in the lighter and darker streaks.

The pores are very regular and evenly distributed and the medullary rays clearly defined, parallel, and joined at irregular intervals by similar white lines running at right angles. In all respects, except colouring, it



EAST INDIAN SATINWOOD

is remarkably similar to, and has all the characteristics of, the West Indian wood.

SATINWOOD, WEST INDIAN. *Zanthoxylum* sp.

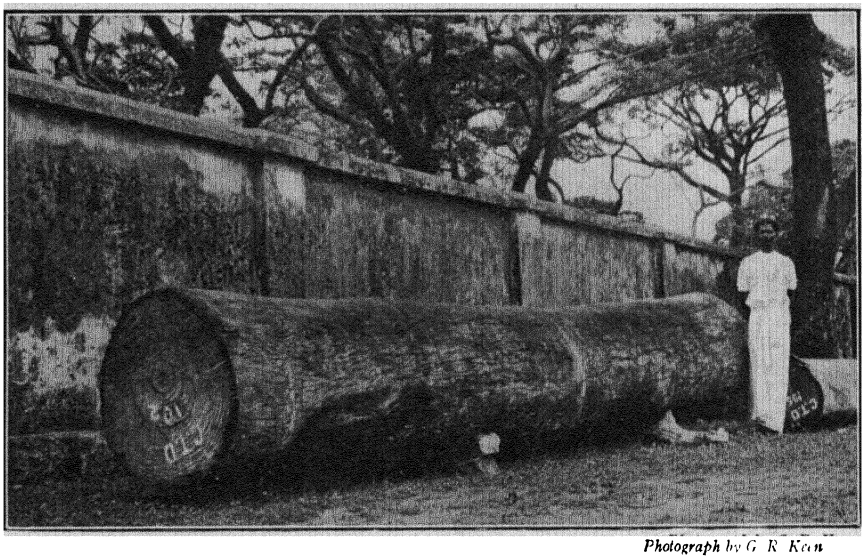
Weight 51 lbs. 13 oz. The West Indies.

The finest satinwood, both in quality and colour, has been imported from Porto Rico, but supplies of good-sized logs have almost ceased, and most of the best wood of late has come from San Domingo. A small number of logs of good quality and colour came from another island, *circa* 1906 to 1910, the origin being kept secret for trade reasons. Small-sized wood of good quality and colour has been obtained from Jamaica in limited quantities.

This very beautiful, decorative cabinet wood was appreciated at an early date by the most artistic furniture designers and makers, who have left to posterity a great many magnificent specimens of their art executed mostly, if not wholly, in West Indian satinwood. The brothers Adam,

Sheraton, and Hepplewhite have all stamped this wood with their art, and their art with this wood. The work has sometimes been varied by the use of bandings or linings, and, in a few instances, with whole panels, of other decorative woods. Satinwood and sabicu produce a happy combination of colour which particularly suits this type of furniture. Probably even these great artists never imagined that the colour of the wood that they used would mature to such a lovely tint as that assumed by satinwood after 100 or 150 years. This is a golden yellow colour with a bright, satiny sheen which cannot be obtained by any artificial means, or equalled by any other wood.

The logs range in size from about 7 inches to 24 inches in diameter, and

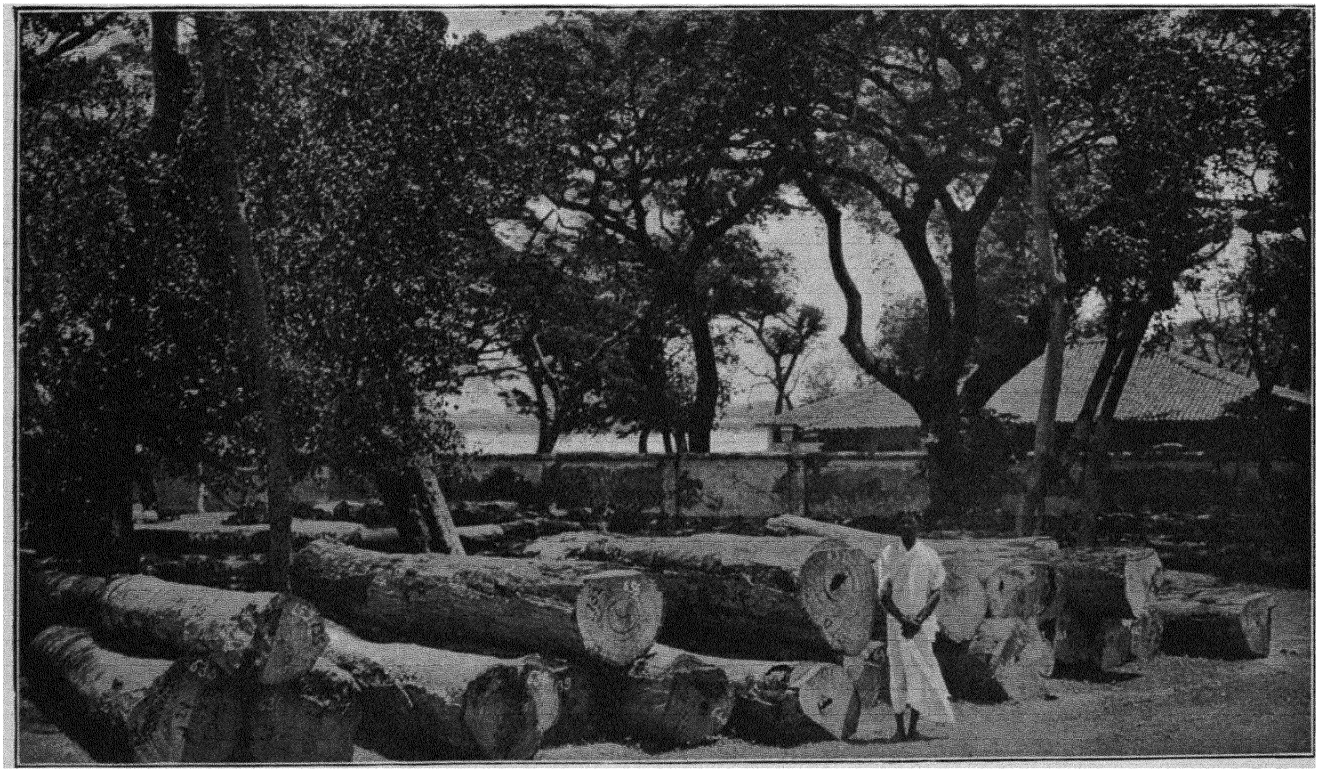


Photograph by G. R. Kean

A VERY FINE LOG OF FIGURED EAST INDIAN SATINWOOD, 18 FEET BY 9 FEET IN GIRTH

The figure can be clearly seen on the butt end

are generally manufactured in oblong pieces with nearly square edges. Occasionally some are found even larger, but anything over 18 inches is now very rare. I have a beautifully figured piece composing a table top, which measures 28½ inches wide by 4 feet long, and is all cut on the quarter, entirely free from heart. This was probably from a log grown all on one side, but which even then must have been fully 4 feet in diameter and probably more. The plainer logs are used for such work as sides, rails, styles, and mouldings, and for legs of cabinets; while a very small number of figured logs are also used for ornamental brush and mirror backs. Nearly all the figured wood is converted into veneers for highly decorative furniture and panelling. Such logs command very high prices



SATINWOOD LOGS, CEYLON

Photograph by G. R. Keen

indeed, the record being about £18 per foot cube for a squared log, and £150 per ton for a root of Porto Rico wood. A considerable number of roots of trees were brought from Porto Rico in 1920, most of which were used for ornamental brush and mirror backs; a few, however, have provided some magnificently figured specimens of veneers, about 20 to 30 inches long, and ranging from about 8 inches in the narrower, to 15 inches in the broader parts. These irregularly shaped pieces, when matched up, form very handsome table tops and panels.

The colour of the Porto Rico wood is generally richer than that of other varieties, although some of the logs imported from an unknown source have equalled the best Porto Rico wood. Generally, however, all other varieties are of a paler shade. The colour continues to deepen and improve with exposure. There is a strong and pleasant scent in the wood which somewhat resembles that of cocoanut oil. Logs kept for a considerable time are liable to split with heavy side-shakes, but when converted this risk disappears, and in this respect the wood shows a marked superiority over East Indian satinwood (*Chloroxylon Swietenia*).

The medullary rays are strongly marked, and are uneven and irregular, showing slightly on the radial section as in sycamore. They are joined at right angles by somewhat similar white lines, making an uneven oblong pattern of various sizes. The pores are scattered, numerous, and fairly regular; they are generally filled with gum.

The produce of *Zanthoxylum* sp. is also obtainable from the East Indies, the common name being somewhat confused because the East Indian satinwood is *Chloroxylon Swietenia*, the Andamans satinwood *Murraya exotica*, while two varieties not known in commerce or under the name of satinwood are to be found in India. They are: *Zanthoxylon Rhetsa* DC., a wood described by Pearson and Brown in *Commercial Timbers of India* as "light greyish-yellow to yellowish-grey" colour, and used in Southern India as planking, rafters, scantlings, axe handles, legs of bedsteads, chair-making, etc.; *Zanthoxylon Budrunga* Wall, described by Pearson and Brown as "canary-yellow . . . fading to pale yellowish-grey," and their further description suggests that the wood is of a satinwood character.

Schima Wallichii Choisy.

Weight 44 lbs. India, Burma.

VERN—*Chilauni, goechassi*, Nep.—*Makusal*, Hind.—*Sumbrong, súngsúng*, Lepcha—*Gugera*, Goalpara—*Makriah chilauni, makusal, nogakat, nogabé*, Ass.—*Dingan*, Khasia—*Boldak, gugera*, Gáro—*Jam*, Cachar—*Gogra, phulgogra*, Mechi—*Sangraban*, Magh—*Sambaw*, Arr.—*Mukru*, Manipur—*Laukya, thityah*, Burm.

This is a reddish wood, fairly hard and tough, durable but apt to shrink and split unless carefully seasoned. The tree is rather common, and

a good quantity of timber can be obtained in squares 25 feet by 10 inches by 10 inches. It is suitable for such work as bridges, building, and planking.

Schrebera Swietenioides Roxb.

Weight 57 lbs. (Gamble). India.

VERN—*Moka, góki, ghant, gantha,* Hind.—*Patali, ghanta parali,* Bandelkhand—*Jantia, nemiburo,* Uriya—*Makkam, mokob, mokalapu, galla,* Tel.—*Mogalinga,* Tam.—*Ghattár,* Baigas—*Karindi, mokha, dhakka,* Gondi—*Jhán,* Kurku—*Mokkak,* Bhíl—*Kalgante,* Coorg—*Kasira,* Sonthal—*Guntera,* Mal Pahari—*Gaterh,* Koderma—*Ghato,* Ovaon—*Ghanto,* Kharwar—*Jarjo, sundapsing,* Kól—*Moko,* Khond—*Moké,* Koya—*Mokapa,* Reddi—*Thitswèlè,* Burm.

This wood is described by Troup as " brownish-grey, hard, close-grained, no definite heart-wood, but irregular masses of purple or claret-coloured wood in the centre, and scattered throughout the tree ; durable and of good quality. Used for ploughs, weavers' looms, utensils ; possible substitute for boxwood for engraving." My specimen, taken from a trunk sent over specially, is a uniform yellowish-brown colour, like a rather dull satinwood (*Chloroxylon Swietenia*). There is no trace in the log of any other colour. The wood is smooth and close-grained, but, according to the specimen to which I have referred, is not suitable for engraving, as Troup suggests. It should rather be employed for cabinet and decorative work, for which its artistic appearance would recommend it.

The pores are regular and small. The medullary rays are also regular, parallel, and unusually thick, showing plainly to the naked eye on the transverse section.

Semecarpus Anacardium Linn.

Weight 33–44 lbs. India, Burma.

VERN—*Bhilawa, bheyla,* Hind.—*Bhalai,* Nep.—*Bhela, bhelatuki,* Beng.—*Bhallia,* Uriya—*Kongki,* Lepcha—*Bawaroe,* Gáro—*Soso,* Sonthal, Kól—*Bhilwa,* Baigas—*Shidi,* Palkonda—*Choso,* Melghát—*Kokha, biba,* Gondi—*Shaing, shayrang, shengkotta, thembarai,* Tam.—*Jiri, jidi, nella-jedi,* Tel.—*Bibha, bibu,* Mar.—*Gheru, kari gheru, ger,* Kan.—*Sambiri,* Trav. Hills—*Bibwa, bibu,* Mar.

Gamble reports this as the " marking-nut " tree, yielding a kind of marking-ink.

The colour of the wood is a dirty greyish-brown, with a rather rough, straight grain, of poor quality, and little interest.

The pores, which are medium-sized, parallel, plugged, are regular in position, with numerous rough, confused medullary rays, which show in a pronounced manner on the radial section.

SEPETIR. *Sindora* spp.

Malaya.

VERN—*Saputi, sepetah.*

The colour of the wood is yellow-brown, with dark streaks, and slightly lustrous surface, and a very close, compact grain, yielding a smooth surface under the tool. It has not been seen in commerce in the United Kingdom, but Foxworthy reports it as standing well; he also states that *S. coriacea* is much the commonest.

The concentric layers are marked by dark and light lines. The very tiny, very scarce pores are almost invariably plugged, with numerous but fine medullary rays forming irregular lines, crossed at right angles at irregular intervals by thin layers of light tissue.

SEQUOIA. *Sequoia sempervirens* Endl.

Weight 25 lbs. 5 oz.

Southern Oregon to Central California.

This timber is called "sequoia" in England and "redwood" in America. It should not be confounded with the timber of the Big Tree (*Sequoia gigantea*) which is not generally known in commerce. The colour is a dull brick-red, deepening in tone with age and exposure, similar in its style of marking to that of most pines, but occasionally trees are found to contain curly and wavy figure, and sometimes burrs. When immersed in water some of the colour washes out, as with African padauk, and Gibson says: "This colouring matter, when washed out in large amounts in the process of paper-making, has been manufactured into fuel gas."

Although the grain is rather soft and the timber dulls the edge of the tool, a fine, smooth surface can be easily secured. It is used in America for shingles, all kinds of joinery work and trim, sleepers, and paving blocks. Gibson reports the wood as so strong and durable that when the ties are worn out they are gathered up by thousands and used for fence-posts. It has been extensively used in the United Kingdom for shipbuilding, fittings of all kinds, and pattern-making. The late Mr. Wilberforce Bryant had a much admired room at Stoke Poges panelled with sequoia.

It is very deceptive in regard to its seasoning qualities, as however long it may have been drying, the wood when cut appears to be unseasoned, yet with less than the usual period allowed for drying other woods, it has been found to stand well when others fail, and in a particular place the wood withstood the trying conditions imposed by a mantelpiece and overmantel of a fireplace. As it is not liable to heavy shrinking, and is obtainable in very wide widths, it is most suitable for sign-boards and panels of all kinds.

Reference has been made elsewhere to the mistaken idea, prevalent throughout the United Kingdom, that all timbers should be french polished, and perhaps no wood gives more evidence of this error than sequoia, which should be treated in quite a different manner.

The trees are of immense size, yielding exceedingly wide planks, up to and possibly over 6 feet in width, free from defect.

The annual rings are clearly marked by a dark band of stronger grain, and are very irregular. The tree generally makes large growth in early life, growing more slowly at a later period; the annual growth in both early and later life varying considerably from year to year. The medullary rays are clearly marked, and are parallel on the transverse section. They stand out from the soft grain, giving, with the concentric layer, somewhat the appearance of a miniature honeycomb. When cut on the quarter, these concentric rings appear like thin red stripes, much darker than the general colour, and the medullary rays are strongly marked, as in the plane tree.

SERAYA, SERAYAH, or **SERIAH.** *Shorea* sp., *Shorea Curtisii* Dyer.
Weight 22 lbs. 2 oz. Malay Peninsula, Borneo.

VERN—*Meranti seraya, bohoi.*

Foxworthy, who in his earlier publication ascribes this wood to *Hopea* sp., does not refer it to this source in his later work; he ascribes the whole produce to *Shorea* sp., and says: "The Merantis are the trees which dominate and give character to our lowland forests. . . . A number of species of *Shorea*, perhaps as many as twenty, produce this, our most abundant timber tree. . . . The different Merantis are usually known in Singapore as Seriah (more correctly Seraya)."

The product of this tree has been imported from the Malay Peninsula, Borneo, and Singapore, mostly in sawn square planks and boards, and a few logs hewn square. The converted pieces have been cut out free from all defect, and the wood has been called by a variety of names, such as East Indian mahogany and East Indian cedar, as well as by its proper name of serayah. It is light in weight, and so similar in colour and appearance to Gaboon mahogany (*Boswellia Klaineana*) that individual pieces when planed can hardly be distinguished from it by the naked eye. The end section shows some degree of difference. A considerable variation in texture, quality, and weight has been found in different shipments, but it is all very liable to warp and twist, and this timber should never be used in any position where it is not fixed and tied down. It is a good substitute for mahogany in cheap work, or for cheap cigar-boxes, but the grain is of a woolly, spongy nature, and it is difficult and costly to

obtain a smooth finish from the tool. The following are the best known species :

Meranti Tembaga (*Shorea leprosula* Miq.).
Nemesu (Meranti Pa'ang) (*Shorea bracteolata* Dyer).
Melantai (*Shorea macroptera* Dyer).
Meranti Rambai Daun (*Shorea acuminata* Dyer).
Meranti Sarang Punai (*Shorea parvifolia* Dyer).
Kepong (*Shorea sericea* Dyer).

The annual layers are strongly defined, the pores are irregularly placed and uneven in size. The medullary rays are confused and ill-defined, but show very strongly on the radial section as in sycamore and beech.

SERVICEBERRY, WESTERN. *Amelanchier alnifolia* Nutt.

Canada, United States.

A heavy, hard, close-grained wood, of a light brown colour.

SERVICE TREE, WILD. *Pyrus torminalis* Ehrh.

Weight 39 lbs. 13 oz. Europe, North America.

The wood is hard and close-grained, with a smooth texture, and is of a yellowish-red with lighter coloured streaks. Elwes and Henry say it " is unknown as a timber tree in the trade, owing to its scarcity. Evelyn says that ' the timber of the sorb is useful to the joiner, of which I have seen a room curiously wainscotted ; also to the engraver of woodcuts, and for most that the wild pear tree serves.' "

The numerous pores, which are very small, are quite regular. The medullary rays are hardly discernible even with the aid of the magnifying lens (+ 12).

Sha.

China.

A wood resembling Canadian red pine, but with a much softer grain.

Professor Chung's specimen says it is the produce of *Cunninghamii lanceolata*, and Professor Record confirms that the wood is undoubtedly *Cunninghamii* sp.

Sha-chu. (See WALNUT, *Juglans regia.*)

China.

Professor Chung's specimens were all numbered, and No. 40 is marked Sha-chu. On the list provided to Professor Record for his identification, No. 40 is a specimen of *Cinnamomum Camphora*, but the No. 40 in Professor Chung's specimens sent to Kew is of true walnut, *Juglans regia*, as above.

The wood is similar in grain, colour, weight, and all other respects, to the European variety of this species.

Shan-t'ao. Source unknown.

China.

This is a specimen of a common wood, much disfigured by worm-holes. It is possibly a plum, and of little account.

The very numerous pores are minute and invariably plugged, with the finest possible numerous medullary rays crossed irregularly at right angles by faint white lines, marking the concentric layers.

Sh-êng-ch'ai.

China.

Professor Record says this is *Chamaecypris* sp. The wood is sweet-scented, aromatic, of a light straw colour with a golden brown, in all but colour resembling Japanese hinoki.

The lines of concentric layers are marked with dark golden brown, shading to a lighter colour.

SHEE OAK. *Casuarina Fraseriana* Miq.

Weight 42 lbs. Western Australia.

Also called sheoak and she-oak. According to Baker the shee oaks (Casuarineae) derive their names from the sound of the wind when passing through the branches. The colour of this wood is a light reddish-yellow ; it has a smooth, hard texture which is somewhat comparable with live oak. The medullary rays show strongly in a series of large-sized flecks or splashes. It is a handsome wood for decorative cabinet work, and was so used rather extensively in this country during the latter part of the nineteenth century. For many years there has been no import on a commercial basis. The Forestry Commission, New South Wales, says : " She-oaks vary so much in depth of tint and distribution of the blotchy grain to which the wood owes so much of its beauty, that it is difficult to describe by any brief general description. Used for shingles, staves . . . ornamental turnery work . . . cabinet work . . . generally in veneers . . . and good screws of hand screws."

Shih-kun. Source unknown.

China.

A very hard, close-grained, nut-brown coloured wood, resembling English-grown apple in grain and hardness, and the pear tree in colour. The specimen is cut from a very small tree and continues to split.

Shorea assamica Dyer.

Weight 36 lbs. (Pearson & Brown). India, Burma.

VERN—*Makai*, Ass.

Pearson and Brown, in *Commercial Timbers of India*, report this wood as " light tawny grey to light brown . . . fairly straight-grained, even and coarse-textured. . . . The timber lasts fairly well under cover . . . it is used for construction, bridge planks, dugouts, canoes and furniture."

Shorea talura Roxb.

Weight 65–70 lbs. (Gamble). Southern India.

VERN—*Talura, talári*, Tam.—*Jaláru*, Tel.—*Jálá*, Coorg—*Jalaranda*, Kan.

This wood is much like *Shorea obtusa* but milder-grained, rather shorter, and less liable to warp. Has not been seen in commerce.

Pores minute to rather small, mostly open, with rather rough-edged medullary rays parallel, not equidistant.

Shui-li. Source unknown.

China.

This wood resembles American poplar (*Liriodendron tulipifera*) and Japanese katsura (*Cercidiphyllum japonicum*), or half-way between these two woods. Record says it is magnolia.

The pores and medullary rays are so fine as to be hardly discernible under the lens, but the medullary rays show as tiny flecks on the radial section.

Sideroxylon tomentosum Roxb.

Weight 51 lbs. (Pearson & Brown). India, Burma.

VERN—*Kanta bohul, kontaboro*, Uriya—*Palei, mul-makil*, Tam.—*Holay*, Badaga—*Hudigolla, kumpoli*, Kan.—*Kumbul, kanta kumla*, Bombay.

Pearson and Brown, in *Commercial Timbers of India*, report this wood as being " light yellowish-brown, turning to light brown with age, without markings, heart-wood not distinct . . . straight-grained, very fine-textured. . . . It is said to be durable if used under cover, but to be affected by dry rot if exposed to damp."

SILKY OAK. *Grevillea robusta, Orites excelsa, Cardwellia sublimis.*

Weight 37 lbs. Australia.

The colour of the wood is pinkish-red, rather like American red oak (*Quercus rubra*), with a fairly hard, close grain, yielding a smooth surface from the tool. It has a kind of mottled appearance, a pink-red ground with dark splashes on the tangential surface, and a strong clash figure caused by broken-up patches of the medullary rays on the radial cut, as in oak. There is a certain silky or lustrous surface, hence the name.

Throughout Australia it has been recognised as one of the best native decorative woods, and has consequently commanded a fair price. In Europe, where a wider choice of decorative woods is available, silky oak has not hitherto received much attention ; but in the course of the last year (1931), as a result of the Empire preference phase, a considerable increase in the demand has been experienced. In Australia it has a high reputation for seasoning and standing well, but it has not been used sufficiently in the United Kingdom for any opinion to be given. The tree has been largely introduced into India and Ceylon, and the traveller there finds it everywhere, especially as a shade tree on tea plantations. A specimen cut from a tree grown in Ceylon produces a wood slightly softer in the grain, but otherwise equal in quality to the Australian-grown timber.

Swain states that it is strong, tough, holds nails tightly, and is easy to handle and work ; can be carved, veneered, bent, glued, and stained equally well. It makes high-class ply-wood, stands exposure to weather but is not durable in the ground, and has an all-round excellence for cabinet-making.

The pores are sparse, open, and plugged, about half and half. As would be expected, the feature of the transverse section is in the wide, rough-edged, exceedingly strong medullary rays, which, in wavy belts, cause the unusual marking of clash on the radial section.

SILKWOOD, BOLLY. *Cryptocarya oblata.*
Weight 34 lbs. (Swain). Queensland.

Also known as Tarzali silkwood, Macquarie maple, or Mazlin's beech. Swain reports that the colour is " pale mauvish-pink . . . it is a firm softwood of egg-shell lustre, lighter, softer, and weaker than Maple Silkwood . . . easy to work and mortice, dresses cleanly, and takes a bright polish."

Useful for cabinet work, joinery, and turnery, and might be used in ply-wood and veneer. A very good substitute for maple silkwood, but is not so strong and tough.

SILLY YOUNG. *Lucuma belizensis* Standl.
British Honduras.

A plain wood of a straw colour, with no interesting characteristics. Not attractive enough for decorative woodwork.

Concentric layers marked by fine darker coloured lines, numerous and extremely small pores almost entirely plugged, with extremely fine medullary rays.

SILVERBALLI, BROWN. *Ocotea* sp. or *Nectandra* sp.
Weight 33–34 lbs. British and Dutch Guiana.

The wood is reported from the Forestry Department, British Guiana,

as weighing 49½–56¾ lbs., but my specimen sent from there, when dried, is found to weigh as stated above.

The source of the silverballis is still uncertain. The Forestry Department in British Guiana report them as *Nectandra* sp. Record gives the identification as *Ocotea* sp. for brown silverballi, stating as his authority the Royal Botanic Gardens, Kew.

The colour is a dark walnut brown with a lustrous sheen, and a hard, close grain, which does not yield a very fine surface from the tool. An attractive, decorative wood which, if regular supplies of fair widths and lengths could be obtained, would be in great demand. The wood is easy to work, and although light in weight is comparatively strong.

The concentric layers are marked by dark rings, with rather numerous pores, varying from small to rather large, both open and plugged, with fine, irregular medullary rays which show on the radial section in small flecks.

SILVERBALLI, KERITI. *Ocotea* aff. *fasciculata* Mez.
Nectandra Pichurim Mez.
Weight 27–28 lbs. British Guiana.

The colour is a dirty greyish-brown with darker streaks, a fairly hard-grained wood, yielding a smooth surface from the tool, with a lustrous sheen. Resembling angélique, but softer.

The pores are rather small to medium in size, generally open, with coarse, rough-edged medullary rays, which show on the radial section in the tiniest flecks.

SILVERBALLI, YELLOW. *Aniba Jenmani* Mez.
Persea aff. *nivea* Mez.
Weight 37 lbs. British Guiana.

The wood is similar to the Keriti in colour, appearance, and grain, but heavier and harder.

The very small pores are scarce, mostly surrounded by a halo of light tissue, and frequently plugged. The medullary rays are very numerous, parallel, sharp, and clearly defined.

Simaruba amara Aubl.
Weight 28 lbs. (Record). Brazil, The Guianas.

VERN—*Simaruba, simarupa, maruba, aruba,* B.G.—*Soemaroepa, walkara, adoonsidero,* Sur.—*Simarouba, acajou blanc, bois blanc, bois de Cayan,* Fr. W.I.—*Marupá, marupaúba, marubá,* Braz.—*Simarruba,* Col.—*Brazilian white pine.*

A dirty, yellow-white coloured wood, with a straight, rather rough grain, of poor quality. Liable to the attack of worm (beetle) and not

suitable for export. It should not be confused with quassia, although containing some similar qualities.

It is reported upon by Record, who also mentions " Other species, *parahyba, páo parahyba, paraiba, pé de perdiz, caixêta, caixêta branca, malacacheta, marupá-rana, caju-rana, pitombeura de Marajo* (Braz.); *paradise tree, bitterwood* (Fla.); *bitter damson, bitter dan, mountain damson, stavewood* (Jam.); *palo blanco, simaruba* (Cuba); *olivo* (Pan.); *simaruba* (C.R.); *acietuno negrito* (Nic.); *acietuno, jucumico* (Salv.); *xpaxakil* (Mex.)."

The pores are very scarce, variable in size and position, joined by faint lines with numerous, irregularly placed, rather coarse medullary rays.

SISSOO. *Dalbergia sissoo* Roxb.

Weight 48 lbs. India.

VERN—*Shisham, sissu, sissai*, Hind.—*Shewa*, Pushtu—*Táli, safedar, shín, nelkar*, Pb.—*Sissái*, Oudh—*Yette*, Tam.

The timber of sissoo is probably unknown to any but those possessing an intimate knowledge of India and its forest wealth. Yet sissoo is one of the most valuable of timbers, and in its qualities practically unique. The grain is so remarkable that the native craftsman can work the most delicate and intricate carving, to a depth which the European would hardly believe to be possible of achievement in any wood. The native princes in India possess works of this character which would astonish the craftsmen of this country who have not previously been familiar with the wood and the native workmanship.

The colour is a rich warm brown, sometimes having golden or deeper brown streaks, and darkening on exposure. The texture is firm, hard, and compact. It is very strong and durable, and seasons well without warping, twisting, or splitting, while it takes a beautiful polish. It is extensively used in India for a variety of purposes. Gamble states: " As a furniture wood and for carving, it is probably the finest wood in India; while with regard to its durability and strength as a wood for wheels, Clifford says: ' The wheels of our ordnance carriages have never failed, however arduous or lengthened the service has been on which they have been employed, of which no more striking example can be furnished than the campaign in Afghanistan, about the most trying country in the world for wheels. Some of our batteries served throughout the campaign, went to Bameean and even to the Hindoo Koosh, and came back again to India without a breakdown, while Royal Artillery wheels, built of the very best materials Woolwich could produce, specially for Indian service, almost fell to pieces after a few months' exposure and service on the plains of India.' " Sissoo gives a very handsome appearance when used for parquet flooring. If a

regular supply of this timber were obtainable it would become an assured success.

The pores are scarce, the larger connecting with a ring of smaller, and making a handsome ripple pattern on the transverse grain. The medullary rays are very fine, numerous, and parallel, and are crossed at right angles by similar white lines.

SNAKEWOOD. *Brosimum Aubletii* Sw.
Piratinera guianensis Aubl.
Weight 77–83 lbs. (Stone & Freeman). British Guiana.

VERN—*Letterwood, snakewood, leopard wood, speckled wood, tortoiseshell wood,* Eng.—*Bois de lettres, bois de lettres de Chine, bois de lettre moucheté, bois d'amourette moucheté,* Fr.—*Letterholz, buchstabenholz, schlangenholz, muskatholz, tigerholz,* Germ.—*Letterhout, letterhoudt,* Dutch—*Legno tigre, legno serpente,* Ital.—*Burokoro, burracura, bourracourra, boutous, cangica paira, tibikushi, tibicusi,* B.G.—*Letterhout, man letterhout, roode letterhout, gespikkeld letterhout, letri, manletri, kapeweri letri, basra letri, poevinga, paulétoe, bepaulétoe, moejepauletoe, kolero, koelero, koereroe, belekoro, boelekolle, sokoné biberoe, paida, wekere paida, tianalin wéwé, tokoro apolli merie,* Sur.—*Bois de lettre moucheté, bois de lettre gris, piratiner, piratininere,* Fr.G.—*Bois lezard,* Leeward Is.—*Muirapinima, muirapenima, moira pinima, mururé, gatia, gateado, gamalleira preta, páo rainha de listras, páo tartarugo, páo vermelho, barrueh, oitimirimayra,* Braz.—*Guaimaro, casique care,* Pan.—*Lignum literatum.*

This wood is imported in short round logs from about 3 to 6 feet long and about 3 to 7 inches in diameter with the sap-wood cut off. It is very hard, dense, and close-grained, and is rather brittle, generally of a faulty description ; supplies are growing more scarce. The colour of the heartwood is a deep bright red, which darkens on exposure, and is more or less marked with dark or black rings and spots, which, resembling the marking of a snake, account for its name. It is principally valued for walking-sticks, well-marked pieces suitable for this purpose realising, especially in Paris and New York, very high prices. It is also used for handles of umbrellas and parasols, for inlay work, bows for archery, and fiddle bows. The sap-wood is of a bright light yellow colour, and Stone (*Timbers of Commerce,* p. 203) suggests that it might be used as a substitute for boxwood. So far, however, the sap-wood has not been imported.

The pores are very scarce and exceedingly small. The medullary rays are numerous and variable ; some which are very sharp and prominent have fine, small secondary rays running between them.

SNAKEWOOD, INDIAN. *Strychnos colubrina* Linn.
S. nux vomica Linn.
India.

This wood is not important, and is not encountered in ordinary commerce in the United Kingdom.

SNEEZEWOOD. *Pteroxylon utile* Eck. & Z.
Weight 65–75 lbs. South Africa.

This wood, valuable as it is for its great durability, is so fully appreciated and utilised in its native country that it is unlikely ever to have much commercial importance in the United Kingdom. In common with some other timbers, though in sneezewood probably in a greater degree than any others, the dust from the wood causes sneezing.

SNOWDROP TREE. *Halesia Carolina* Linn.
Weight 39–40 lbs. South Carolina, Florida.

The colour is salmon pink, with a close, firm, hard grain resembling that of Canadian birch in both respects, but with a marking somewhat like satin walnut. It provides a rather attractive wood for decorative cabinet work, assuming an agreeable colour on exposure to light.

The rather scarce pores are exceedingly small, and irregular in position, with fine, ill-defined, thin, short medullary rays.

Sonneratia apetala Ham.
British India, Burma, Ceylon.

VERN—*Keowra*, Beng.—*Kylanki*, Tel.—*Marama*, Tam.—*Kanbala, labé*, Burm.

A dull reddish-brown coloured wood with a close, even grain, resembling several South American woods very closely. Foxworthy says that it is moderately hard, and used for house-building, packing-cases, planks, and fuel.

SOPHORA. *Sophora japonica* Linn.
China and Japan.

The wood is known in Japan as yen-ju or en-ju, and is of a golden-greenish-brown colour, with a lustrous sheen, capable of a very smooth surface from the tool, resembling laburnum, but lighter in colour and more lustrous. It is tough and durable, though light and coarse-grained, and is used in Japan for the pillars and frames of the wooden houses.

The concentric layers are marked by lines of dark and light growth, with very prominent single lines of pores in each concentric layer, the remaining portion being dotted with the finest possible unopen pores. The medullary ray is very fine and irregular, showing on the radial section in tiny flecks.

Soymida febrifuga Adr. Juss.

Weight 74 lbs. (Gamble). Central and Southern India.

VERN—*Rohan*, Hind.—*Rohina*, Beng.—*Rohan, rohini, pohora*, Berar.—*Shem, wond*, Tam.—*Sumi*, Tel.—*Sohan, suam*, Uriya—*Soimi*, Gondi—*Royta*, Bhil—*Somangi*, Khond—*Soymide*, Palkonda—*Palara*, Mar.

According to Gamble this wood is called " Indian redwood," but the name is not suitable, as the colour of the wood is half-way between that of American black walnut and rosewood, and should be described as blackish-brown. It has a beautiful, close, compact grain, giving a fine surface from the tool, and is a valuable and attractive decorative furniture wood ; for all high-class purposes comparing well, in this respect, with Spanish mahogany.

SPINDLE TREE. *Euonymus europoeus* Linn.

Europe, North Africa, Siberia.

Also known as European prickwood. The colour is white, with a very compact, even, smooth grain and texture, like Venezuelan boxwood. It is light, tough, and said to be easily cut and difficult to split. It is used for spindles, turnery, and when carbonised for making crayons, and in the manufacture of gunpowder.

Spondias mangifera Pers.

Weight 26 lbs. India, Burma, Ceylon, Andaman Islands.

VERN—*Amra, amara, ambodha*, Hind.—*Ambar*, Oudh—*Amara*, Nep., Ass.—*Amna*, Beng —*Ronchiling*, Lepcha—*Tongrong, adai*, Garo —*Kat maa, ampallai*, Tam.—*Aravi mamadi, amatum*, Tel —*Kat ambolam*, Mal.—*Amb*, Mar.—*Amte, amati, gwoddan*, Kan.—*Hamara*, Gondi—*Ambera*, Kurku—*Ambota*, Uriya—*Ambeti, leina*, Khond—*Ambada*, Mar.—*Katamba, kekda*, Berar—*Ambalam*, Mal. —*Ambayam, mampuli*, Trav. Hills—*Embarella*, Cingh.—*Puli ille*, Kader—*Gwè, pwebaung*, Burm.

The hog plum. This is a soft and spongy greyish-white wood. The timber is of little, if any, commercial value.

The pores are large, numerous, and often subdivided. Medullary rays fine, and moderately broad, irregular, white, prominent, distinctly marked as long narrow plates in the silver grain.

SPRUCE. *Picea excelsa* Link.

Weight 36 lbs. 6 oz. Europe, Canada, United States.

This timber, if imported from the Baltic, is called " white fir," " white deal," or " white," but if from Canada or the United States, the name " spruce " is used. It would be preferable to use the correct term " spruce " for the produce of all these countries.

The wood is white, and straight and even in the grain ; it is tough, elastic, and light, and more difficult to work than pine, chiefly owing to the excessive hardness of the small knots which are frequently found in it. These are generally blackish, or they are surrounded by a black ring, and often form the only means of distinguishing the wood from the so-called " yellow-deal " (*Pinus sylvestris*). The Baltic spruce is milder and easier to work than the Canadian or American ; some of the latter is exceedingly tough and hard to saw and plane. When cut into deals it is somewhat disposed to warp, unless it is carefully stacked in the places where it is stored during the process of seasoning. The shrinkage is inconsiderable, and the sap-wood, though generally only of moderate thickness, is rarely noticeable, while if it is distinguishable, the timber has been allowed to get rain-wet before drying.

The trees are generally straight, and being strong as well as elastic they are admirably suited for making the small spars required for ships and boats. They are also in great request for ladders and scaffold poles. The timber is useful for all kinds of interior joiners' work, and in the simpler forms of furniture and articles of domestic offices, such as cupboards and tables. For these purposes the only objection is that, notwithstanding the use of the best varnish or paint, the mark of the hand or machine-plane shows through more than in the yellow deal or other similar woods. For timbering work indoors its life is probably slightly less than that of yellow deal. In this connection it may be remarked that it is strange that whereas architects and engineers will not allow its use for this work in London or the South of England, it is common to specify and use it in Liverpool, the North-West districts, and in Scotland and Ireland. For constructional work out of doors, however, or where strength is required, it should not be used, as when exposed to the variations of the weather it soon decays ; and on one occasion the collapse of a large staging constructed in this wood, and formed for people to witness a ceremony, resulted in considerable casualties.

Used for sleepers, spruce has proved to be quite satisfactory. A letter from Mr. E. Trench, of the London & North-Western Railway, dated 23rd July 1919, reads: ". . . the sleepers . . . were laid in the Ingleton [1] Branch in 1886 and 1887, and the great majority of them are still on the road. These sleepers were invoiced as 'spruce,' and probably many of them were spruce, but I am not in a position to say that they all were, and it is difficult now to identify the timber. They were purchased from the Duke of Buccleuch, and were grown in Dumfriesshire."

The concentric layers are clearly marked by a dark ring, It is impossible to see the medullary rays under the lens (+12), but the rays show very finely as faint flecks on the radial section.

[1] Yorkshire.

SPRUCE, BLACK. *Picea mariana* B.

Canada, Northern United States.

The colour is pale yellowish-white ; the wood is soft and light, not strong. Used for paper pulp.

SPRUCE, ENGELMANN. *Picea Engelmanni* Engelm.

British Columbia, Western United States.

In colour this wood is pale yellow tinged with red, very little sap-wood ; it is close-grained, light, and soft, not strong. Manufactured into lumber and used extensively for building purposes, also for fuel and charcoal.

SPRUCE, HEMLOCK. *Tsuga canadensis* Carr.

Weight 36 lbs. Eastern North America.

Gibson describes the wood as follows : " The wood of hemlock is soft, light, not strong, coarse and crooked grained, difficult to work, liable to wind-shake, splinters badly, not durable. The colour of hemlock heart-wood is light brown, tinged with red, often nearly white. The sap-wood is darker. . . . The physical characteristics of hemlock are nearly all unfavourable, yet it has become a useful and widely used wood. It is largely manufactured into coarse lumber and used for outside work—railway ties, joists, rafters, laths, etc. It is rarely used for inside finishing owing to its brittle and splintery character. Clean boards made into panels or similar work, and finished in the natural colour, often present a very handsome appearance, owing to the peculiar pinkish tint of the wood ripening and improving with age. With the growing scarcity of white and Norway pine, hemlock has become the natural substitute for these woods for many purposes. . . . In 1910 hemlock lumber was cut in twenty-one States, the total output exceeding 2,500,000,000 feet.

" Hemlock possesses remarkable holding power on nails and spikes, and that is one reason for its large use for railway ties. It does not easily split, and there is no likelihood that spikes will work loose ; but the wood decays quickly in damp situations, and unless given preservative treatment hemlock ties do not last long. Manufacturers of boxes and crates use much hemlock. The wood is also employed by car builders, manufacturers of refrigerators and farm implements, but the largest demand comes from those who use the rough lumber.

" The summer wood of the wood of the annual ring is conspicuous, and the thin medullary rays are numerous."

SPRUCE, HIMALAYAN. *Picea Morinda* Link.

Weight 31 lbs. India.

VERN—*Wesha, bajúr,* Afg.—*Kachal, ré, rıar, kachan,* Hazara, Kashmir—*Rewarı, ban lúdar, sangal, salla, sarei, káulı, roı, rág, ráo, bang re krok,* Pb., Himalaya—*Tos,* Ravı—*Rau, raıang, re, ryang,* Sutlej—*Raı,* Jaunsar—*Kandre, re, rhái, ráo, khutrau, rıálla, rágha, morında, kaıl, kılu,* Garhwal, Kumaon—*Sehshıng,* Bhutia.

The wood of this tree greatly resembles that of the European spruce, and contains the same well-known black knots. Whıle its commercial value is not at the present time very great, yet the Indian supplies fill an ımportant place in the reserves for the future needs of the Empire.

The concentric layers form a grain which is comparable with that of the cedar, though this wood ıs probably of a mılder nature.

SPRUCE, JAPANESE. *Abies Mariesii* Mast.
Picea ajanensıs Fısch.

Japan.

Included in shipments of oak, ash, etc., from Japan, there has been a fairly consıderable quantity under the name of Japanese spruce. As the supplies were not unıform and regular, an inquiry was made and it was dıscovered that the shipments were said to contain two quite different species, namely " Todo matsu " (*Abies Mariesii* Mast.) and " Yezo matsu " (*Pıcea ajanensıs* Fisch.). Both of these were regarded by the shippers as spruce, and of a quality corresponding with the well-known European spruce. A more careful examınatıon of these shipments dısclosed that in addition to the two species named above there was also included timber which bore a dıstınct resemblance to the Baltıc red pine (*Pinus sylvestris*), and which might possibly have been the Japanese red pine (*Pinus densiflora*). The confusion arising from these mıxed shipments, supplemented by a definite opinion from the shipper that no red pine was included, has made it impossible to make any definite statement.

It is estimated that there is an annual supply of 750,000 tons of this Japanese spruce ; that is, 500,000 tons of " Todo matsu " and 250,000 tons of " Yezo matsu."

SPRUCE, SITKA or **SILVER.** *Pıcea sıtchensis* Carr.

Western Canada, United States.

This timber is produced from enormous trees of great length and girth, which rank high amongst the giants of the forest, comparing even with the lofty eucalypts of Australia. Notwithstanding the fact that the

timber is close-grained, remarkably free from knots, and, relatively to its weight, stronger than any other timber procurable, yet before the European war it was scarcely known outside its own country. Indeed the only use to which it was put in the United Kingdom was the limited quantity purchased annually by the Navy for making long oars, a purpose which required a timber of this character free from knots. During the war a dramatic change occurred, for, owing to the sudden demand for great quantities in the manufacture of aircraft, the value suddenly rose ten times, or even more, than that of its pre-war price. The demand for timber which would serve this purpose was so great that the woods of the following species were admitted as approved substitutes :

Quebec spruce (*Picea alba* and *P. ingra* Link.).
White Sea white deal (*P. excelsa* Link.).
White Sea red deal (*Pinus sylvestris* Linn.).
West Virginia spruce (*Picea rubens* Sarg.).
Port Orford cedar (*Chamaecyparis Lawsoniana* Murr.).
New Zealand kauri (*Agathis* [*Dammará*] *Australis* Salisb).
Canadian white pine (*Pinus strobus* Linn.).
Oregon pine (*Pseudotsuga Douglasii* Carr.).

The establishment of the British Engineering Standards Association subsequently cancelled the foregoing rule, and laid down that in future only the produce of *Picea sitchensis* should be employed, and a specification was issued by them regulating the quality. The use of silver spruce in aeroplane construction brought to light the incidence of spiral growth in Sitka spruce, and indeed in trees in general. The aircraft manufacturer quickly discovered that 50 per cent of the produce as it came from the forest had spiral growth and proved unfit for the strain to which it was put. The discovery resulted in a very severe inspection of all the timber proposed for use in aircraft, and moreover a considerable amount of research and inquiry as to the cause of spiral growth of trees, and what measures might be taken to prevent it. One American authority propounded the theory that the probable cause was heredity, while others have claimed that it is due to situation and climatic conditions. The silver spruce (*Picea sitchensis*) is peculiarly liable to this fault, in its wake closely followed by sweet chestnut (*Castanea vulgaris*), horse chestnut (*Aesculus Hippocastanum*), and common thorns (*Crataegus spp.*).

Resulting from the popularity of this tree, occasioned by the immense financial interests created, many landowners, including the Government, have planted considerable areas of silver spruce in this country. The tree thrives well, grows rapidly, and in the opinion of more than one expert seems likely to be a more profitable investment (certainly in many positions) than any other tree that can be planted.

Stephegyne diversifolia Hook f.

Weight 41 lbs. (Pearson & Brown).

India, Burma, Andamans.

VERN—*Binga*, Burm.

Pearson and Brown, in *Commercial Timbers of India*, state that this wood is " Creamy white when first exposed, ageing to pale yellowish-brown . . . in general straight but somewhat uneven-grained or broadly wavy-grained in the radial plane, fine and quite even-textured. . . . It is very fairly durable when not in contact with the ground. . . . It is used in Burma for building and packing-cases."

Stephegyne parvifolia Korth.

Weight 45 lbs. India, Burma, Ceylon.

VERN—*Kulm*, Kashmir—*Kaddam, kallam, keim, kangei*, Hind.—*Phaldu*, Kumaon—*Mundi*, Gondi, Baigas—*Kutebi*, Kurku—*Gúri*, Koderma, Palamow—*Gúi, kómba*, Kól—*Goure karam*, Sonthal—*Goli karam*, Mal Pahari—*Kadiála*, Coorg—*Mundi-mundi*, Uriya—*Pajakiru*, Khond—*Kámba*, Palkonda—*Sima bandaru*, Reddi—*Chinna kadambu, chélampai, nir kadampa, buta-kadambe*, Tam.—*Nir-kadambe, karmi, bataganapu*, Tel.—*Congú, hedu, yetega, kadwar, kadani, kanu, bata kadapu, attaka*, Kan.—*Kadamb, karamb, kalam*, Mar.—*Sira kadamba*, Mal.—*Kambli*, Trav. Hills—*Tamák*, Bhíl—*Kumra*, Banswara—*Tein, teinthe*, Burm.

Gamble reports this wood as being a light pinkish-brown, hard, and even-grained, and very similar to *Adina cordifolia*. In India it is used for building and furniture, but it has not yet been seen in European commerce.

Stephegyne tubulosa Hk.

Weight 42 lbs. (Gamble). Ceylon, Cochin.

VERN—*Helamba*, Cingh.

This wood is a salmon-pink colour, with a very close, compact grain, yielding an exceedingly smooth surface from the tool. Comparable with boxwood, which it closely resembles, except in colour. A valuable timber.

The pores are very small and generally plugged. The medullary rays even, regular, very fine.

Sterculia fœtida Linn.

Weight 26–45 lbs. (Gamble). West Coast of India, Burma, Ceylon.

VERN—*Jangli-badam*, Hind.—*Pinári*, Tam.—*Gurapu-badam*, Tel.—*Letkop*, Burm.—*Telambu*, Cingh.

The colour is a reddish-brown, with a close, compact grain which does not yield a smooth surface from the tool, and shows on both radial and tangential sections a flecked appearance of the medullary rays, in a somewhat unusual manner.

Gamble reports it as spongy, soft, and of no value, but my Ceylon specimen does not confirm this opinion, as it displays a wood likely to be of use for a decorative woodwork of various sorts, although without sufficient characteristics to warrant any export.

The pores are scarce, and irregular in size and position. The medullary rays are broad, rough with cross-bars, and showing strongly on the radial section.

Stereospermum chelonoides DC.

Weight 40–59 lbs. India, Ceylon.

VERN—*Pader, padri, parral,* Hind.—*Parari,* Nep.—*Singyen,* Lepcha—*Sirpang,* Mechi—*Bolzel,* Gáro—*Paroli,* Ass.—*Pareya-auwal,* Cachar—*Dharmara, atcapali,* Beng.—*Tsaingtsa,* Magh—*Padri, pon-padira, pathiri, pumbathri, padri, vela-padri,* Tam.—*Tagada, thagu, kala goru, moka-yapa, pisul,* Tel.—*Taitu,* Berar—*Pamphunia,* Uriya—*Kirsel, tuatuka, padul, paral,* Mar.—*Patoli,* Khond—*Kandior,* Kol—*Padurni,* Bhíl—*Nai-udi, mallali,* Coorg—*Kall-udi,* Kan—*Kuring kura,* Mal.—*Lúnú-madala, dunu-madala,* Cingh.—*Thakutpo, singwe, thandè,* Burm.

This is a hard wood of a grey colour, though it has been described as an orange yellow. It is moderately durable, elastic, and easy to work, and is suitable for furniture.

" Pores moderately sized and large, joined by narrow, irregular, wavy, interrupted belts and lines of soft tissue. Pores frequently filled with a white substance of a resinous nature, which is prominent on a vertical section. Medullary rays short, wavy, moderately broad, numerous, prominent on a radial section as long, narrow, horizontal bands " (Gamble).

Stereospermum suaveolens DC.

Weight 42 lbs. (Pearson & Brown). India, Burma.

VERN—*Paral, padal, padiála, padaria, parur,* Hind—*Phallai,* Kashmir—*Tumri,* Kumaon—*Pandri,* C.P.—*Phalgataitu,* Melghát—*Pararı,* Nep.—*Singyen,* Lepcha—*Parúl,* Beng.—*Patúli,* Uriya—*Parer,* Sonthal—*Paroli,* Mal Paharı—*Pandri,* Kharwar—*Parar,* Monghyr—*Kandior,* Kól—*Padri,* Tam.—*Kala-goru, kuberakashi, padari, parali,* Tel.—*Hooday, billa,* Kan.—*Unt katar, padar,* Gondi—*Padar,* Kurku—*Pandan,* Bhíl—*Parúl, kalagari, patala,* Mar.—*Palol, ela palol,* Cingh.

Pearson and Brown, in *Commercial Timbers of India,* refer to this wood as " yellowish-brown, often handsomely mottled with narrow darker streaks which yield a very handsome figure on the quarter ; quite lustrous when first exposed, with somewhat rough feel . . . straight-grained, coarse and uneven-textured. . . . It may be classed as fairly durable, or durable, according to the position in which the timber is placed . . . it is rarely subject to insect attack. . . . It works easily and takes a good polish, finishing to a smooth surface . . . may be classed as a valuable

timber for construction . . . would certainly make up into attractive furniture. . . . A species to be encouraged."

Stereospermum xylocarpum Wight.

Weight 36–47 lbs. (Gamble). India.

VERN—*Kharsing, bersinge,* Mar.—*Jai-mangal, sondar-padal,* Mandla—*Dhóta mara, dhotte,* Gondi—*Teto,* Kurku—*Vadencarni, malei uthi,* Tam.—*Ghansing, hoodav,* Kan —*Udi, udé,* Coorg—*Pathiri, vedang-konnan, edang korna,* Mal.

The colour of the wood is nut-brown with a glint of orange in it. The grain is close and firm. It would be suitable for decorative and cabinet work. Gamble says : " The wood is good and handsome ; it is tough and elastic and takes a good polish . . . and deserves to be better known, and to be in more general use."

The pores are regular and numerous. The medullary rays are very fine, regular, parallel, and equidistant.

STINKWOOD. *Ocotea bullata* E. Mey.

South Africa.

Has not been seen in commerce in the United Kingdom, but is considered to be the best South African wood for making furniture : very scarce. Of a reddish-brown colour, more inclined to brown than red.

STRINGY-BARK. *Eucalyptus obliqua* L'Herit.
E. gigantea.

Weight 46 lbs. Tasmania, New South Wales.

Known as Tasmanian oak, and messmate.

This timber is of a light brown straw colour resembling English oak. It is strong and durable, and will take a good surface from the tool. Great difficulty is experienced in driving nails, and it is more economical to bore the holes first. It is difficult to season, and shrinks unevenly, the wood of the inner growth contracting disproportionately with the outer growth ; for example, a plank sawn to an exact thickness of $2\frac{1}{4}$ inches by 10 inches wide, when dried, was found to be $\frac{1}{8}$ inch less on one edge than on the other.

K. C. Richardson, in his *Report on Tasmanian Timbers,* p. 10, quoting W. H. Forsyth, says : " After twenty-six years' experience I have found Stringy Bark to be admirably adapted for piles, some of which have been in the wharves for 30 years, and are in very fair condition." Further, quoting J. Finchman, M.Inst.C.E., he continues : " Tasmanian Blue Gum and Stringy Bark are the Standard Timbers for all Government Works ; Blue Gum is the heavier and stronger, but Stringy Bark is generally preferred, as being more free in working and more easily obtainable."

Another authority states : " The usual life of this timber in bridges is

from twenty to twenty-five years; sleepers average about fourteen years, and none of the Government Railway buildings—some of which were built twenty-seven years ago, chiefly of this timber—have yet been renewed. . . . Especially suited for wood-paving. It is preferable to Jarrah, being quite as durable, gives a better surface, and is also lighter in weight. Given equal conditions, Stringy Bark blocks will wear out two sets of the Deal or Beech blocks which are largely used in European cities. . . . Stringy Bark blocks do not polish under traffic, but give a good foothold for horses . . . paving of the roadways of the Hobart Market building, laid in 1853, are still doing duty" (1903). This opinion that stringy-bark is preferable to jarrah for paving-blocks cannot be upheld, as far as experience shows in this country, as proof of the superiority of jarrah for these purposes has been overwhelming.

Between forty and fifty years ago (1932) an effort was made to popularise this timber throughout the whole of the United Kingdom under its own name of stringy-bark, and a fairly considerable quantity was imported. It was used for a close park fence, posts and rails, and after thirty-three years was found to be sound above ground, and in better condition perhaps than would have been the case if English oak had been used. The wood was actually harder than when fresh; but that portion of the posts which was in the ground was found to be decayed, and in general experience it does not appear to be a timber that remains durable under ground.

A further quantity of this consignment was used for the constructional timbers in a very large building in the East End of London. Upon this building being taken down in 1930, the timbers were found to be harder than when they were first used, and in perfect condition, showing no signs of decay or deterioration.

Reference is made under the heading of blue gum to the disastrous fire which occurred in the West India Docks in 1903, and a photograph taken of the shed can here be seen. I may state that, during a period of fifty years, in only two serious fires where timber has been consumed, have I ever seen such fire-resisting qualities. First, the stringy-bark and blue gum in the fire mentioned above, and second, this year (1932) when some of the same consignment which had been used in the stable buildings at Crown Wharf, Canning Town, was burned. In both cases the stringy-bark was charred to a depth of not exceeding about a $\frac{1}{4}$ of an inch all round the beam or plank, the timber underneath being still as bright and sound as if there had been no fire. I think that there must be some quality which these timbers possess (either the smoke which is engendered or some other property) which especially acts as a fire preventative. In most cases of really serious large timber fires every particle of the wood, even to the dust itself, is consumed. In the case of the stable

buildings the occupant had wrongfully stored a large number of jute mats, and a quantity of tallow, yet, although the building was fully alight, no sooner had the stringy-bark charred on the outside than the fire began to die down.

While little success attended the first effort to popularise the stringy-barks, since the 1924 Exhibition at Wembley the produce of *Eucalyptus obliqua* and *E. Delegatensis* has been exported in very large quantities

Photograph by permission of Messrs J Bartram & Son, Melbourne

PHOTOGRAPH OF THE TIMBER SHEDS, WEST INDIA DOCKS, ON SEPTEMBER 1903

Showing the stacks of Tasmanian Hardwoods *ex* "Runic," after the disastrous fire there that destroyed eleven acres of stacked timber. These hardwoods were the only woods that resisted the fire. The view shows them lying in the ashes of other timbers.

under the trade name of "Tasmanian oak," and a considerable demand has resulted. Among many public and private buildings in which it has been employed are the floorings for the new Lloyds building in Leadenhall Street, and the Commercial Union Assurance Co., Cornhill.

The pores are variable in size, and are arranged in groups; some are plugged with gum. The medullary rays are exceedingly fine, parallel and close together, generally equidistant; they are irregularly joined at right angles by very faint lines of a similar character.

In Western Australia there are two important varieties of Eucalyptus

known as tingle-tingle, but as the forests are rather isolated, delay has been experienced in exploitation. Both of these are called stringy-bark by Baker.

STRINGY-BARK, WHITE. *Eucalyptus eugenioides.*
Weight 54–57 lbs. (Swain). New South Wales, Queensland.

Known as pink blackbutt in Queensland and white stringy-bark in New South Wales. The wood structure is very similar to that of *E. obliqua*, with pores more uniform in size and arranged in more pronounced groups, with wavy belts forming almost squares in some cases, mostly plugged with gum ; the medullary rays are extremely fine, parallel, close together, somewhat obscure under the lens.

SUCUPIRA. *Bowdichia* sp.
Weight 54 lbs. Brazil, Northern South America.
VERN—*Sucupira, sapipira* or *sebipira* (various other spellings), *sucupira-assú, s. doce, s. mirim, s. d'agua, s. preta, s. roxa, sipipin*, Braz.—*Alcornoque*, Venez.

The colour is light brown with lighter coloured streaks, rather lustrous ; a very dense, hard, and heavy wood with a wavy grain and coarse texture ; difficult to work, very tough, strong, and durable. According to Mr. Curran, sucupira is preferred above all other woods in Brazil for making hubs and felloes for wheels. He also says : " Another kind of sucupira known as sucupira-assú has been introduced into the market, but is considered inferior."

Sucupira closely resembles acapu (*Vouacapaoua*) ; the chief difference lies in the larger sized pores, closer vessel lines, and finer rays of the sucupira.

Record states : " What is believed to be the genuine sucupira does not have ripple marks."

It is used for shipbuilding, cabinet work and turnery, flooring, scaffolding, and work exposed to the weather. *Brazilian Timber* reports that it " makes sleepers of first-class quality, lasting eleven years."

The not very numerous pores, invariably plugged, are arranged in wavy groups, with wavy, inconspicuous medullary rays.

SUCUPIRA AMARELLA. *Bowdichia nitida* Spr.
Ferreirea spectabilis Fr. Allem.
Brazil.
VERN—*Sucupira, sucupira amarella, marachyba*, Braz.

Record says that trees of this species yield a hard, heavy, strong timber, highly durable. It is splintery, and difficult to work ; takes a high polish, the surface feeling as though it had been waxed.

When fresh cut the colour is brownish-yellow, becoming darker upon exposure; rather streaky, looks waxy. Sap-wood pale yellow, and thin.

SUGI. *Cryptomeria japonica* Don.
Weight 30 lbs. Japan, Formosa.

This is a strong, reliable timber, having the characteristic marking found in Oregon pine, pitch pine, cypress, and sequoia, of which timbers it most resembles the last named—though it is much harder and firmer in the grain, and of a dull nut-brown colour. The dark and light streaks of brown and yellow form a wavy pattern, and the bright spots of gum sparkle and give the wood a slightly lustrous gloss. Goto mentions an exhibition specimen from an old tree, which was found buried and had undergone carbonification, making it a beautiful dark colour. It possesses all the qualities requisite for making good and durable furniture, but it has not yet been imported into the United Kingdom on a commercial basis.

The concentric layers are strongly marked by light and dark rings, the growth being very slow and layers small. The medullary rays are very fine but clearly marked.

SUMACH. *Rhus typhina* L.
Canada, North-Eastern United States.

The extravagant Englishman, who demands a standard of woodwork far in excess of that asked by others, consistently refuses to recognise the value of timber produced by trees growing outside his front door, while paying high prices for less ornamental timber which is brought from far overseas. Among the many illustrations is that of the sumach tree, which can be found growing in gardens throughout London and elsewhere.

The timber is not produced in sizes large enough to use in important works, but it can be used in an attractive manner for inlay and fine cabinet work. Being olive green in colour, with rather a lustrous sheen, it would be a good substitute for green ebony, although the grain, otherwise very much resembling that of the wych elm, is perhaps a little soft.

The concentric layers are marked by pronounced rings of hard and soft layers. Pores exceedingly small and irregular, in belts. Medullary rays exceedingly fine, hardly discernible under the lens.

SUNDRI.
See *Heritiera Fomes*.

Sung-pê. Source unknown.

China.

A reddish-coloured pine, resembling pitch pine, but softer, comparable in this respect with Canadian red pine.

The wide layers of concentric growth are strongly marked by a rich brown, sometimes almost black, layer of resinous growth.

Swietenia macrophylla.

See MAHOGANY, HONDURAS.

SYCAMORE. *Acer Pseudoplatanus* Linn.

Weight 38 lbs. 9 oz. Europe.

The Rev. C. A. Johns, in *The Trees and Shrubs of Great Britain*, says: "The name *acer*, given to it by the Romans, is derived from *acer, acris*, sharp or hard, on account of the hardness of the wood, which was used for making spears and other sharp-pointed instruments. . . . Its specific name, *Pseudo-platanus*, means *mock plane*, being given to it in consequence of the resemblance borne by its leaves to those of the plane tree. The name Sycamore was given to it by the older botanists, who erroneously believed it to be identical with the Sycamore, or Mulberry fig of Palestine, which it somewhat resembles in the size and form of its leaves."

Johns found that even botanists could make a mistake. But the surprising thing is that the mistake has not been corrected, as in wood, bark, leaves, and fruit, it bears no resemblance to the plane tree. Sargent says: "*Acer* is the classical name of the Maple tree, and *Platanus* is the name of the plane tree." In America *all* the timbers of the *Acer* sp. are termed maple, and all the *Platanus*, sycamore. In Scotland the produce of *Acer Pseudoplatanus* is called plane. It is unnecessary to point out the resulting confusion, and it would seem a simple matter to set it right with a definite pronouncement, by giving the name "maple" to all products of *Acer* sp. So far as the timber of these different woods is concerned, the alteration is very necessary, as, although the product of nearly all the different species of *Acer* is much alike (varying only in degrees of hardness and colour), it shows a marked difference from the timber of all the *Platanus* species. If Johns is correct when he says that the name sycamore was given to it by the older botanists, who earnestly believed it to be identical with the sycamore or mulberry fig of Palestine, it seems that it would be quite possible that the tree which these botanists were looking at was the plane (*Platanus* sp.) and not the maple (*Acer* sp.).

It is easy to understand that the Romans, seeing the plane tree in Southern Europe, might give it the name of sycamore on account of the resemblance between its leaves and those of the fig tree. In a garden in London two trees can be seen, one a fig and the other a London plane tree,

and the resemblance is noticeable. Again, the preponderance of plane trees over a wide belt of country, including the lordly stretch of graceful and majestic " Cheenar " trees in Persia, could not fail to attract the attention of any new-comers ; while the *Acer* species, which the older botanists termed *Acer pseudoplatanus*, could hardly have been sufficient in numbers to cause remark.

The following interesting quotation is from Johns : " ' Trees,' says the Roman naturalist Pliny, ' afforded the first inducement to the barbarous tribes of Gaul to cross the Alps, and spread themselves over Italy. A certain Swiss once came to Rome to learn the art of a smith, and on his return took with him raisins, dried figs, oil, and wine ; the taste of which incited his countrymen to invade Italy with a hostile army. But who would have thought it possible that a tree should have been brought from a remote region of the world for the sake of its shade only ? yet such was the case : the plane was first carried across the Ionian Sea to shade the tomb of Diomede, who was buried in one of the small islands off the coast of Apulia ; thence it was introduced into Sicily ; from Sicily it was brought to Rhegium in Italy by the tyrant Dionysius ; and has now extended so far, that the Morini (people of Calais) are taxed for its shade. Dionysius held it in high honour, and since his time it has so much increased in estimation, that its roots are nourished with wine instead of water.'

"Diomede was a Grecian hero, and to honour his tomb the tree was planted which had of old been venerated in Greece, and even in Asia. Herodotus informs us that when Xerxes was about to invade Europe with his mighty army, and had arrived at Lydia, in Asia Minor, he fell in with the plane tree, which, on account of its excessive beauty, he decorated with golden ornaments, and left behind him a warrior selected from the Immortal Band to take care of it. ' Aelian and other authors tell us,' says Evelyn, ' he made halt, and stopped his prodigious army of 170,000 soldiers, which even covered the sea, exhausted rivers, and thrust Mount Athos from the continent, to admire the pulchritude and procerity of one of them.' "

He also quotes the Earl Sandwich, who in 1739 saw the great plane of the Island of Stanchio, and says " among the curiosities of this city is a Sycamore tree, which is, without doubt, the largest in the known world."

In later years there have arisen from time to time others like Dionysius, who by their initiative and energy have transported trees from one continent and established them in others, so that throughout India and Burma hundreds of miles of rain trees from America were planted by the British for shade, and at a later date vast areas in India and Africa have been covered with eucalypts. The unfortunate thing is that no Government has yet existed in this country which will recognise the national importance of initiating such a policy.

Although perhaps it may be said that every kind of tree has its proper

time for being felled, and no other is so good, this is specially applicable to sycamore, the reason being that the colour is of such great importance, and it is only possible to obtain the desired result by felling when the sap has ceased to flow ; it is also essential that the tree should be converted as soon as possible. An occasional tree can be found highly figured, with mottle, splash mottle, and broken roe, and of late years (1930) a large demand has been made for such trees, for America.

The wood, which has a close, firm, tough grain, is a pale whitish-yellow. After exposure to air it becomes whiter, and when this exposure is continued, the wood again inclines to its original yellow shade. Although its qualities would have recommended it for more general use, yet it has of late years been chiefly in demand for veneers. Some of these have been made of the wood in its natural condition, especially when the tree has displayed a figury nature. More generally, however, the wood has been stained a silver-grey colour, by the process described in the article on artificial harewood (*q.v.*).

Another important use for sycamore is for the manufacture of large rollers for washing and other machines of various kinds. It has also been effectively used for flooring. The main gangway on His late Majesty King Edward's steam yacht, which was used by the King and Queen on State occasions, was made of sycamore. It was much used in marquetry in the sixteenth and seventeenth centuries.

It has also been used for violin backs, table-tops, panels and decorative woodwork in ships, yachts, and railway carriages. Some handsome pillars, probably generally mistaken for marble, can be seen in Simpson's Restaurant, in the Strand, London.

The pores are fairly numerous, and irregularly placed. The medullary rays show as distinct white lines. The concentric circles are clearly visible to the naked eye.

SYCAMORE, SATIN. *Geissois* spp.

Weight 37–45 lbs. (Swain). Queensland.

Known as blood-in-the-bark. According to Swain the wood is Indian pink in colour, with a silken sheen, and fine, even texture. It is tough and strong, glues and stains well, and is especially suitable for cabinet work and other furniture ; also used for general building, it makes a handsome polished floor when back-sawn, but is not durable in the ground.

TAINGBÔK. Source unknown.

Weight 59 lbs. Malay Peninsula, Burma, The Andamans.

A few logs of hewn square timber arrived in the London Docks, of a wood with this name. The colour is greyish-brown, with a hard, smooth,

compact grain. A quite attractive wood, suitable for high-class cabinet and joinery work.

Every effort to trace the wood, and identify it with any known species, has failed.

A tree named taung-bôk, the produce of *Ternstroemia penangiana* Choisy, is mentioned by both Gamble and Brandis, but no information is forthcoming, nor does the description given indicate that it is the same as the wood referred to above.

The pores are scarce, small to medium and open ; medullary rays not discernible under the lens.

TALIPOT PALM. *Corypha umbraculifera* Linn.

The Andamans, Ceylon, Burma.

VERN—*Conda-pani*, Tam.—*Sidalum*, Tel.—*Kodapana*, Mal.—*Bine, tali, shri-tali*, Kan.—*Tala*, Cingh.—*Pelin*, Burm.

Mr. H. W. Cave says in relation to this palm : " The botanical world offers no more beautiful sight. . . . The period when it may be enjoyed is, however, quite uncertain, as the flower bursts forth only once in the lifetime of the tree, when it is approaching its hundredth year. It occasionally happens that scores of trees are in flower at one time . . . its leaves are much used in the construction of camps for the officers of the Survey Department. . . . They become what the natives term ' ola ' or paper. On these strips the history of the people and their religious systems have been handed down to us. I have seen manuscripts of this material more than a thousand years old, and yet in perfect condition, with the characters so clear and distinct that it is difficult to realise their vast age. . . . The uses to which the leaves are put are computed by the natives at eight hundred and one."

As a visitor to the Peradeniya Gardens, Kandy, in 1924, I had the unique opportunity of seeing some of these palms in the well-known avenue in full flower, an occasion of which I took full advantage, securing photographs.

The colour of the wood is a streaked black and white, with an exceedingly hard grain, requiring the sharpest tool to prepare the surface. So hard, indeed, that the adze striking the wood produces a clear, ringing note, almost as though it had struck steel.

In its native country the wood has been used for various purposes, and in Europe, including England, for inlaid work in fine cabinets, but only to a very limited extent.

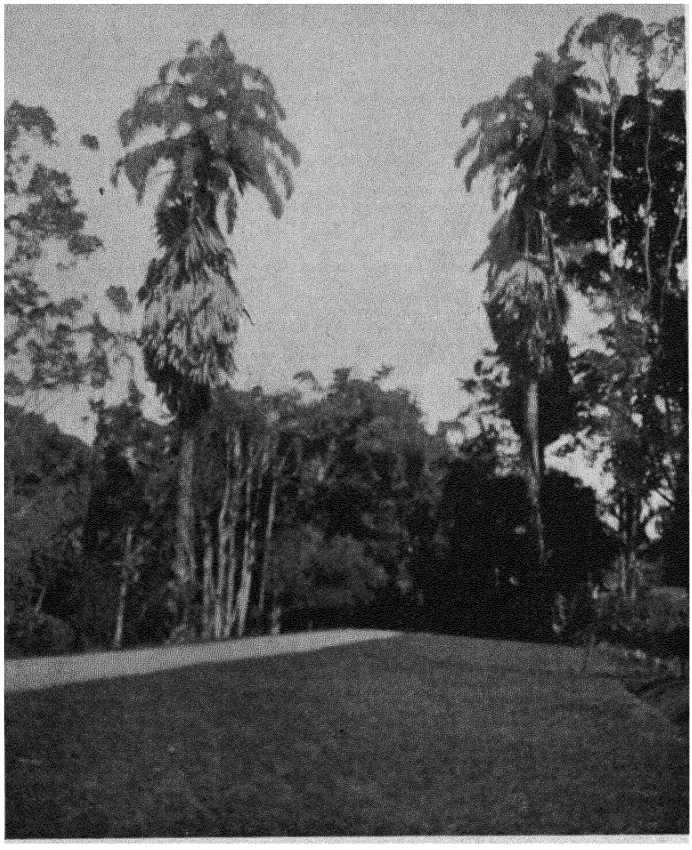
TALLOW WOOD. *Eucalyptus microrys* F. v. M.

Weight 60 lbs. New South Wales, Queensland.

The colour is pale brown, the wood strong, hard, durable, and of a greasy nature. In this country it is exceedingly difficult to season, when

it is very liable to split and crack, producing fractures across the grain which do not close, and during the process it displays uneven shrinkage, inclining to twist, so that the surface will have hollow places where one part of the grain has shrunk more than another.

The use of the wood in London for paving proved unsatisfactory. In grain, hardness, and weight, the blocks were found too irregular, but it has been reported upon as being eminently satisfactory for this purpose in



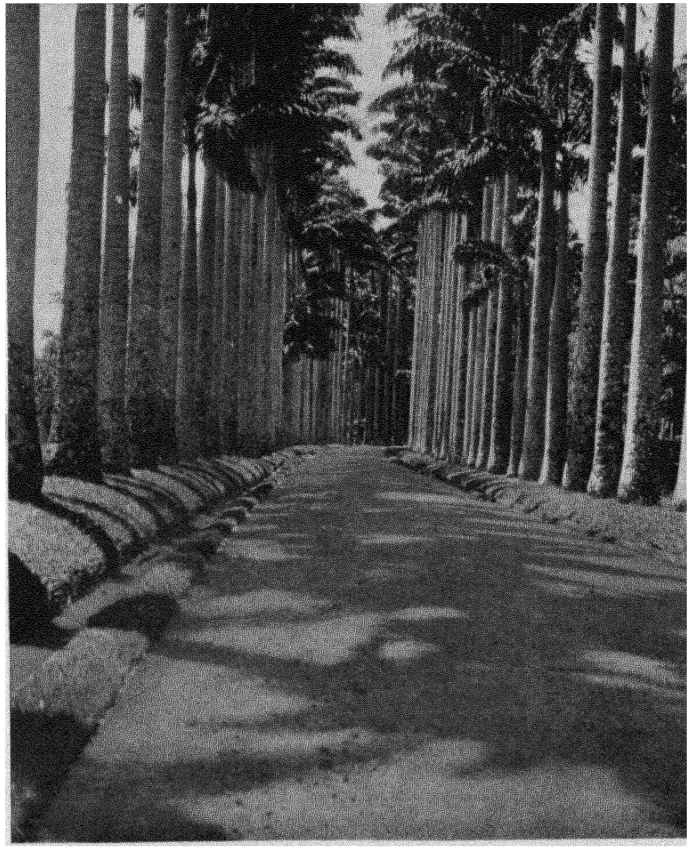
TALIPOT PALM IN FLOWER IN PERADENIYA GARDENS, KANDY

Australia. The Forestry Commission, N.S.W., report it as "after iron-bark . . . probably the most valuable of our hardwoods. . . . Used for flooring, particularly in ball-rooms . . . on account of its greasy nature. . . . For sleepers, decking, hand-railing, girders . . . bridges. . . . It makes admirable posts and rails, lasting an indefinite period."

The pores vary from small to large, partly plugged and open, generally surrounded by layers of light tissue. The very numerous fine medullary rays are hardly discernible under the lens.

TAMARACK. *Larix americana* Mich.
Weight 38 lbs. (Hough). North America.

This American larch somewhat resembles the European wood in colour and texture, though it is perhaps tougher and harder. It is used in America for much the same purposes as those for which European larch is valued here.



AVENUE OF TALIPOT PALMS IN PERADENIYA GARDENS, KANDY

Hough describes the wood as being of a light orange-brown colour, with thin, lighter sap-wood, and says that it is valued for railway ties, posts, planks, and lumber for inferior finishing. In addition to these uses, Gibson mentions that " boat-builders use tamarack for floors, keels, stringers, and knees. Fence-posts and telegraph poles come in large numbers from tamarack forests. . . . [The wood is] also made into boxes, pails, tanks, tubs, and windmills."

TALLOW WOOD—NEW SOUTH WALES

By kind permission of the High Commissioner for Australia

TAMARIND. *Pithecolobium arboreum* (L.) Urb.
Weight 46 lbs. *Trinidad, The Antilles, Mexico.*

VERN—*Bahama sabicú,* Trade—*Wild tamarind,* Jam.—*Cojoba, cojóbana,* P.R.—*Moruro, moruro prieto, tengue,* Cuba—*Coralillo, frijolillo,* Mex.—*Conchido, loro, lorito,* C.R.—*Cola de marano, cola de mico, quebracho* ? Guat., Hond.

A mahogany-like, mahogany-coloured wood having a close, firm, compact grain, with a hard bottom, to which the name of Bahama sabicu has also been applied—a name not well chosen, as, although the wood contains some of the qualities of sabicu, it far more resembles Spanish mahogany, but without the white chalky grain. This provides an illustration of how the quality and appearance of a wood can be produced by a wholly different species, since an expert could be excused for mistaking the produce of *P. arboreum* for mahogany.

The open pores vary in size, and are rather numerous ; the medullary rays so fine as hardly to be discernible under the lens, and not showing on the radial section.

TAMARISK. *Tamarix anglica.*
India.

This is a light straw yellow-coloured wood with a very hard grain. Showing a medullary ray like sycamore.

TAMBAIBA. *Enterolobium Timbouva* Mart.
Weight 20–30 lbs. (Zon & Sparhawk). Brazil.

VERN—*Timbó, timboúba.*

The wood is light brown, open-grained, and not strong. Record reports that " because of its softness and ease of working is used as cheap substitute for cedar, and is sometimes known as *timbó cedro.*" It is also used to take the place of pine for general construction, doors, and boxes.

Reported to be a poisonous wood.

T'ao-jen. Source unknown.
China.

The wood has a firm, hard grain, is of a dark brown to brick-red colour, and of medium weight, comparable to that of a hard African mahogany.

Neither Professor Record nor I have been able to identify it with any known species.

The pores are very numerous, exceedingly small, and hardly discernible under the lens (+10). The medullary rays are indistinguishable.

TAPANG. *Koompassia excelsa* (Becc.) Taub.
Weight 76 lbs. 14 oz. Borneo, Malay Peninsula.
VERN—*Tualang*, Malay.

This is a very dense, hard, heavy wood, strong but brittle. The colour ranges from bright to dark red, becoming almost black with age, and exposure to light and air. It is often marked with a dark and light grain with some mottle, and shows the medullary rays on the tangential section as in beech, but finer. In Borneo the large pieces are used in solid planks of from 2 to 2½ inches thick for tables and bedsteads, and the smaller sizes for paddles, and pans for washing gold. Beccari, in *Wanderings in the Great Forests of Borneo*, p. 269, writes : " The most valuable things in this house were immense planks of beautiful wood used for squatting on by chiefs holding councils, and also as beds. They were of a very hard, close-grained wood of a deep red colour, taking a beautiful polish, and to my thinking, finer and superior in quality to the best mahogany. The plank on which I laid my ' tilang ' or bedding was over 2 inches thick, 8 feet in length, and 6 in width." These huge planks—he also quotes Mr. St. John as speaking of two planks 10 feet 6 inches by 6 feet 6 inches, and 15 feet by 9 feet—are hewn out with axes, without the use of any saws, from the huge buttresses of these enormous trees, which, in a fluted manner, or, as Beccari describes it, in " great laminar projections," soar upwards from the butt. They are hewn out of the trunk as if it were a rock, without cutting the tree down, and apparently without doing it any injury. Dr. Hose brought back from Borneo many such tapang planks, and some which had been shaped by the natives, with the axe only, and brought to such a beautiful smooth polished surface that the European can hardly believe they have been worked with no other tool.

This handsome wood has, till recently, been unknown commercially in England. Violin bows of tapang have been made with fairly satisfactory results.

The pores are scarce, rather large, and plugged with a bright glistening gum. The medullary rays are clear and fine, but very irregular and unusually rounded. They are joined at right angles by somewhat similar light lines strongly defined, and giving, especially on the tangential surface, a marked likeness to a spider's web. There is also a beautiful ripple mark on all sections, which, coupled with the somewhat metallic lustre of the wood, gives, when finely worked, a very good appearance.

TAPINHOAN. *Silvia navalium* Fr. Allem.
Weight 55 lbs. Brazil.

This is a light straw-coloured wood, with a firm, hard, even texture and close grain. It bears resemblance to a similar wood called canella

tapinhoan, also from Brazil, but of an inferior quality. It is reported as being used in Brazil for building canoes and boats, for cooperage, naval and civil construction, and is good for under-water construction.

The wood yields a pleasing, fragrant, aromatic perfume which is very persistent.

The pores are numerous but very small. Medullary rays very obscure, and only discernible under the lens (+12).

TARAIRE. *Beilschmiedia Tarairi* Benth. & Hook.
New Zealand.

The New Zealand Board of Agriculture describes this as of a " reddish-brown colour, remarkably straight in the grain, close, but rather brittle. Procurable in long lengths, and up to 12 inches in width. Used for ships' blocks, and for cheap furniture."

TARIMAN. Source unknown.
Weight 49 lbs. Brazil.

This is an attractive and valuable furniture wood. It has a pleasing silver-grey colour, midway between that of stained sycamore and old oak. The grain is very smooth, close, and firm. If regular supplies in fair lengths and widths are available, so that the wood could be used for decorative art furniture work or panelling, it would command attention and prove to be of high value.

The small pores are surrounded by loose tissue, and lie between the numerous, rather prominent, medullary rays.

TAWHAI. *Fagus fusca* Hook. f.
Weight 53 lbs. New Zealand.

This timber, which is also known as black birch, is, according to the Board of Agriculture, New Zealand, " red in colour, straight, even, compact in grain, tough and durable in all situations. Procurable in long lengths, and up to 24 inches in width. Used for piles, stringers, bridge and wharf planking, and mining-timbers."

Baterden says that this wood " was the only timber used for a stiffened suspension bridge, spanning Chasm Creek Gorge."

TEAK. *Tectona grandis* Linn.
Weight 45 lbs. India, Burma, Siam, Java.

VERN—*Sáj*, Arab.—*Sáj, sál*, Pers.—*Ságun*, Hind.—*Singuru*, Uriya—*Ság, ságwan*, Mar.—*Sipna*, Melghat—*Teka*, Gondi—*Ság*, Bhíl—*Tekku, tek*, Tam.—*Teku*, Tel.—*Jádi, sagwani, téga*, Kan.—*Tekka*, Cingh.—*Djati*, Malay—*Kyun*, Burm.

The supplies of this timber are shipped from Moulmein and Rangoon in Burma, Malabar in India, Bangkok in Siam, and from the Island of

Java. Mr. McKinlay says that he found one patch of true teak (*Tectona grandis*) in the Philippine Islands, where the trees appeared to be about forty years old, and were growing in close forests as though they had been planted.

The wood varies from yellow or straw colour to a rich brown when first cut, darkening on exposure; sometimes it has dark and almost black streaks or veins, this last feature being more often found in the Java wood, and in that from some parts of the Indian Peninsula. Troup speaks of the so-called "Godaveri teak" as being particularly handsome in this respect.

Teak works with an oily surface, and when first cut has a sticky feeling to the hand. It is moderately hard and strong, clean, even and straight in the grain, and is easily worked. It shrinks very little in seasoning, and the logs do not side-shake.

According to Laslett (1875): "Teak wood contains a resinous oil which clogs its pores and resists the action of water, and it often oozes into and congeals in the shakes which radiate from the pith, forming there a hard concrete substance, which no edge-tool can touch without losing its keenness. The oil acts as a preventive against rust when iron is in contact with it, and for this reason it is preferred to all other known woods for the backing to the armour plates of iron-clad ships of war."

All my life I have heard that teak contained an essential oil. Reference to this term can be found in numerous publications, and holding the same opinion as Laslett as to the "hard concrete substance, which no edge-tool can touch without losing its keenness," and accepting Laslett's statement as to the prevention of rust by the use of teak against iron, I expressed the same opinion in my first edition, using the term "essential oil" instead of that of "resinous oil" used by Laslett. This statement as applied to teak was criticised by an authority, whereupon I appealed to Dr. Chandler, who kindly made inquiry, the result of which would seem to show that neither "essential oil" nor "resinous oil" as applied to the particular nature of the substance referrred to in teak is correct. In other respects Laslett's description is accurate. Dr. Chandler points out that when teak is exposed to destructive distillation the following products are obtained:

	Per cent
Heavy tar	10·6
Watery distillate	36·0
Light oil (tar oil)	3·4
Charcoal	35·0
Uncondensed	15·0
	100·0

"The tar contains the crystalline substance in considerable quantity; it may be extracted by adding an excess of caustic soda, when much heat is evolved and the substance is precipitated as a curdy mass which soon

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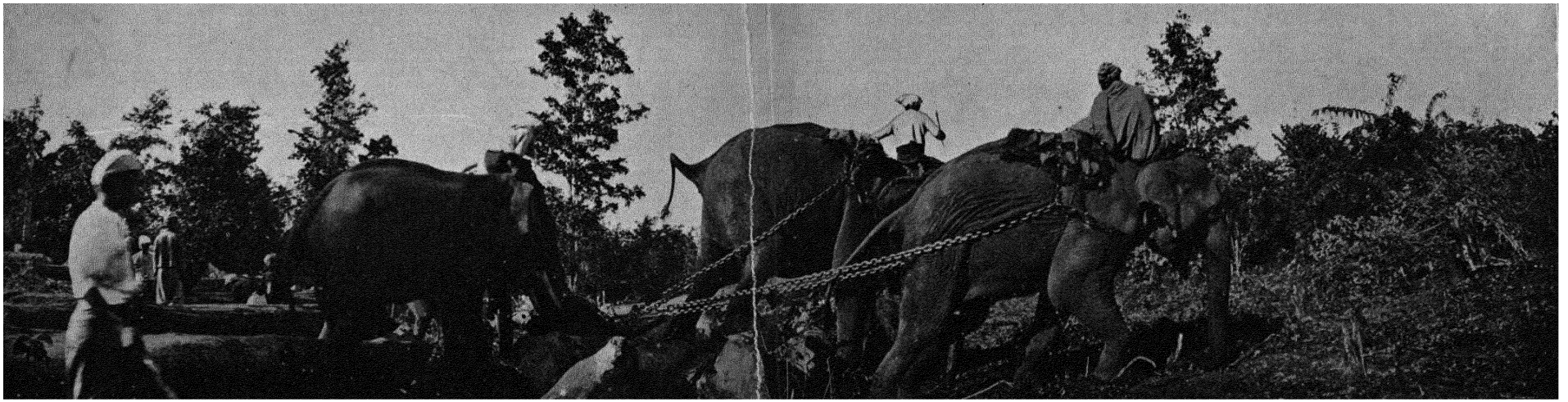
Photograph by A. Rodger

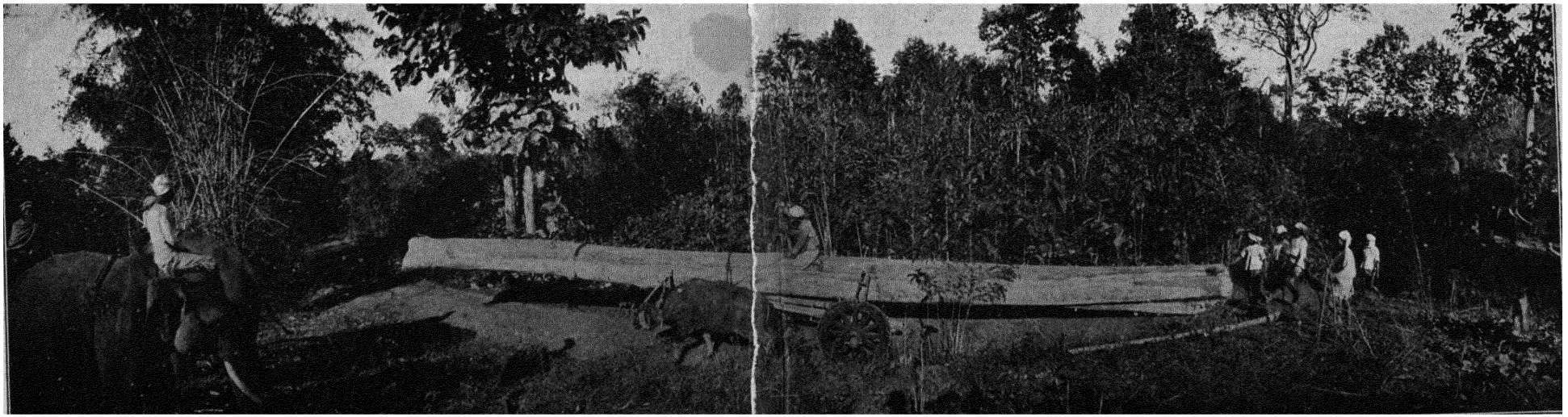
ONE OF THE OLDEST TEAK PLANTATIONS IN BURMA, MADE IN 1864

211



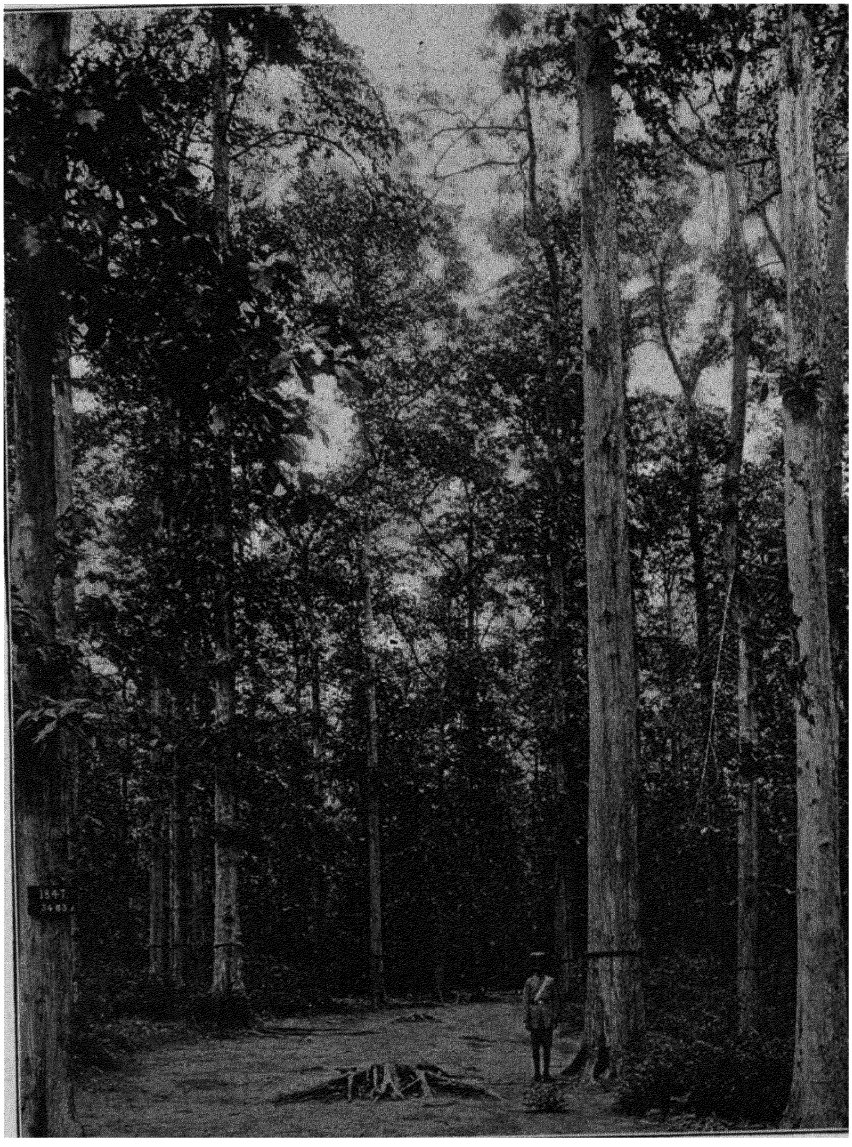
Photograph by A. Boyd

ELEPHANTS MOVING TEAK LOGS



Photograph by A. Boyd

TEAK LOG BEING EXTRACTED IN A BUFFALO CART



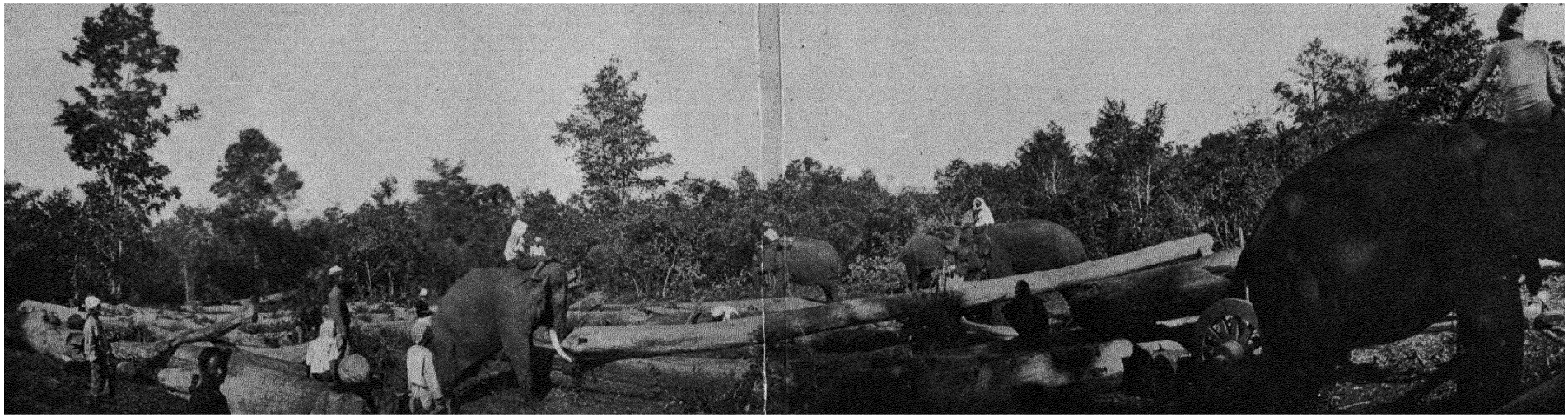
Photograph by R. S. Troup

NILAMBUR TEAK PLANTATIONS

Tree with man at base, 7 feet 8 inches in girth

Photograph by A. Rodger

YOUNG TEAK TREES, LOWER BURMA



Photograph by A. Boyd

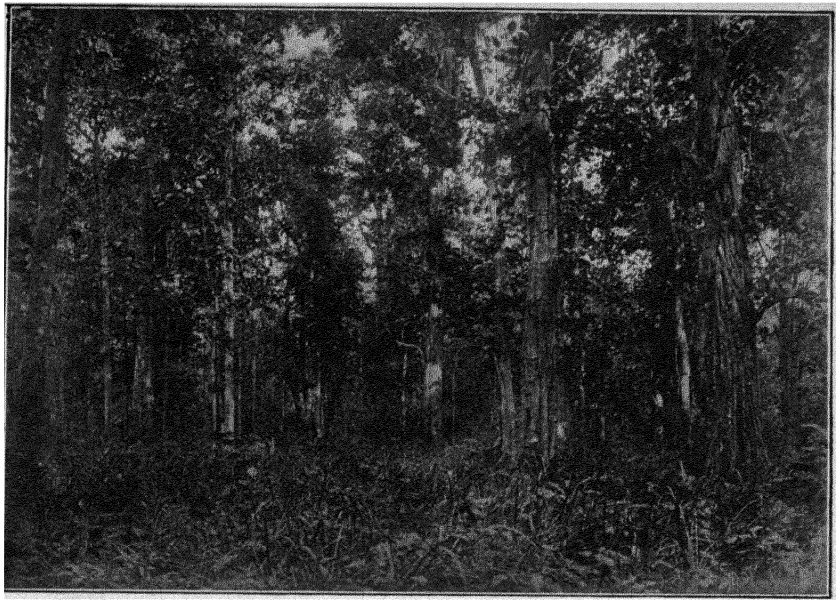
ELEPHANTS LOADING TEAK

Photograph by A. Boyd

TEAK TIMBER IN THE FOREST

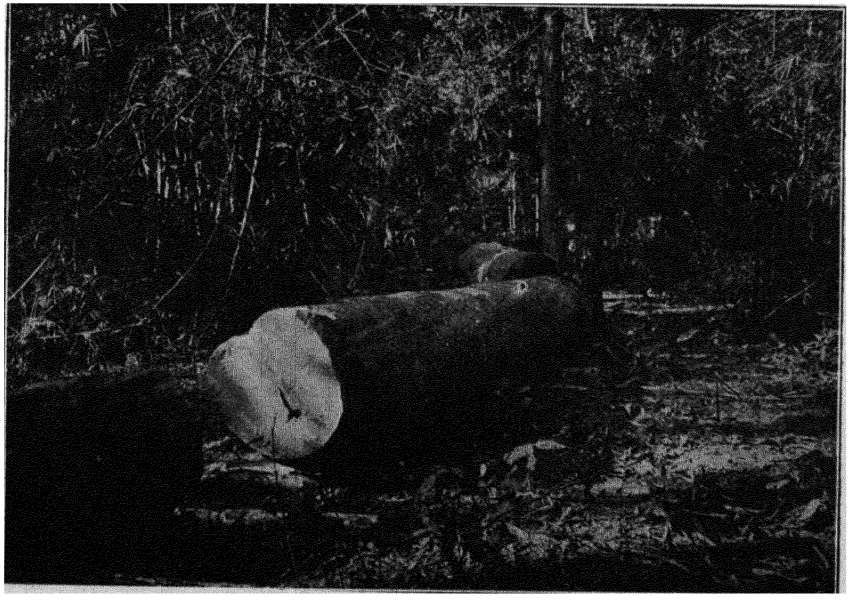
Photograph by A. Rodger

YOUNG TEAK SPRINGING UP IN A BAMBOO-FLOWERED AREA



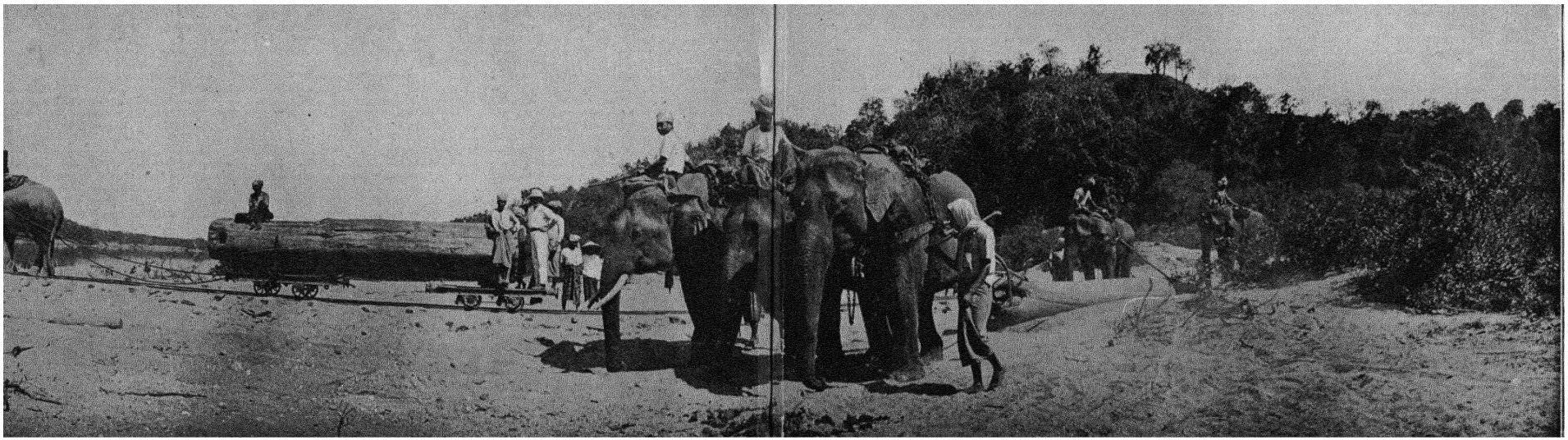
Photograph by A. Rodger

TYPICAL TEAK FOREST, UPPER BURMA



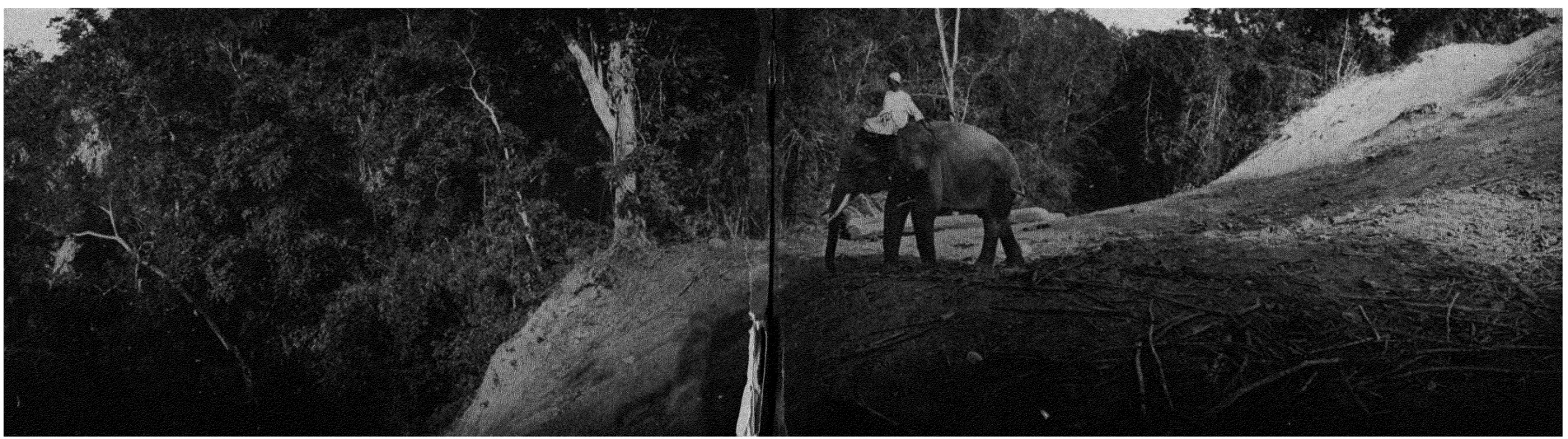
Photograph by R S Troup

TEAK LOGS ON DRAGGING-PATH, PREPARED WITH CROSS-BILLETS, KONTHA, PYINMANA, BURMA

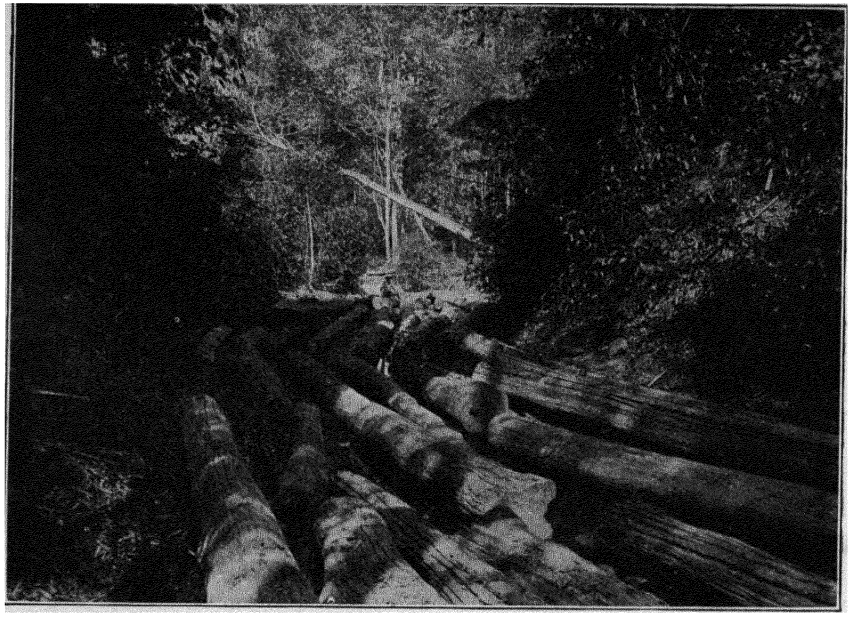


ELEPHANTS TAKING TEAK LOGS ON TRAMWAY TO THE IRRAWADDY RIVER

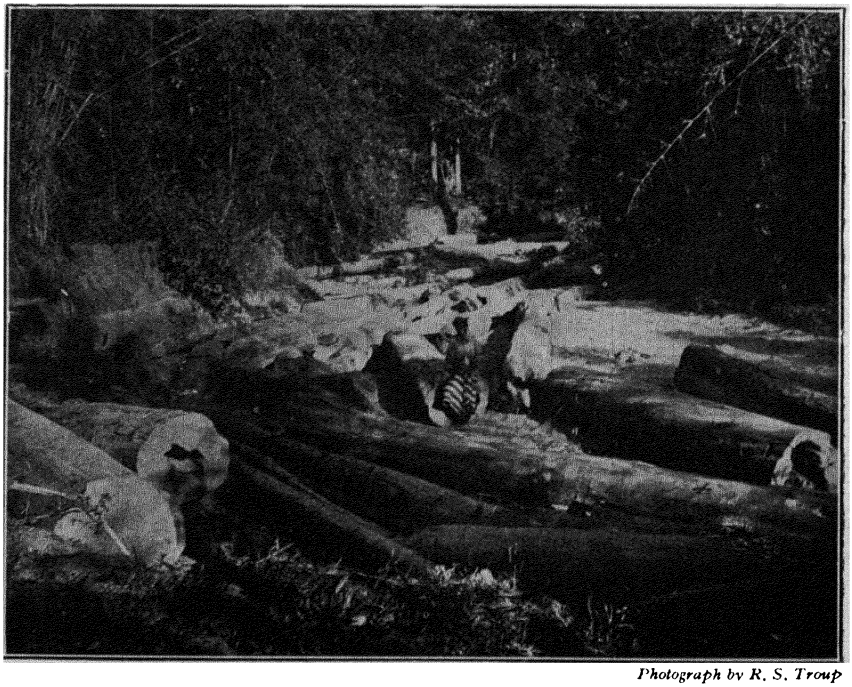
Photograph by A Boyd



TEAK LOGS BEING PUSHED OVER A BANK TO THE IRRAWADDY—A

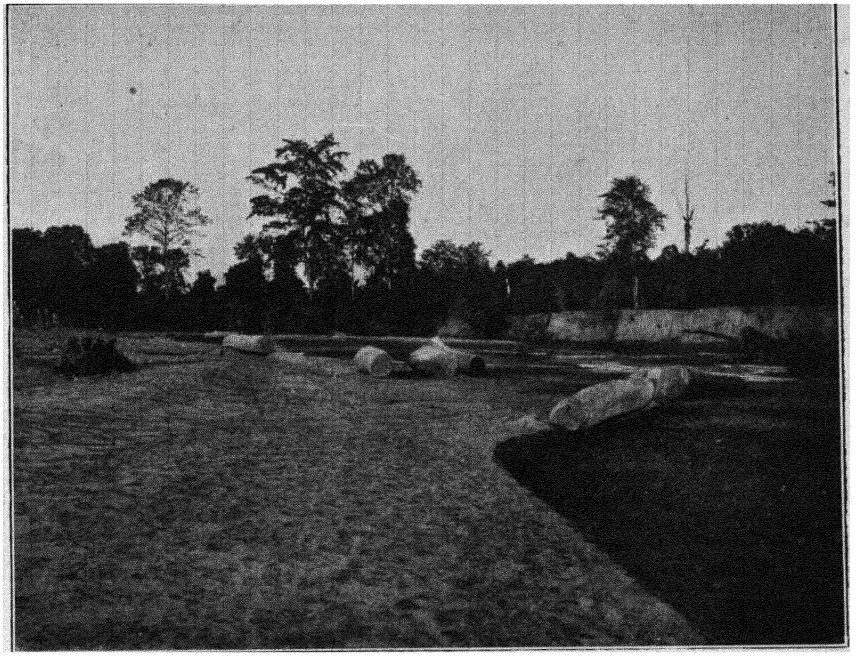


TEAK LOGS LYING WAITING FOR THE RISE WITH THE RAINS



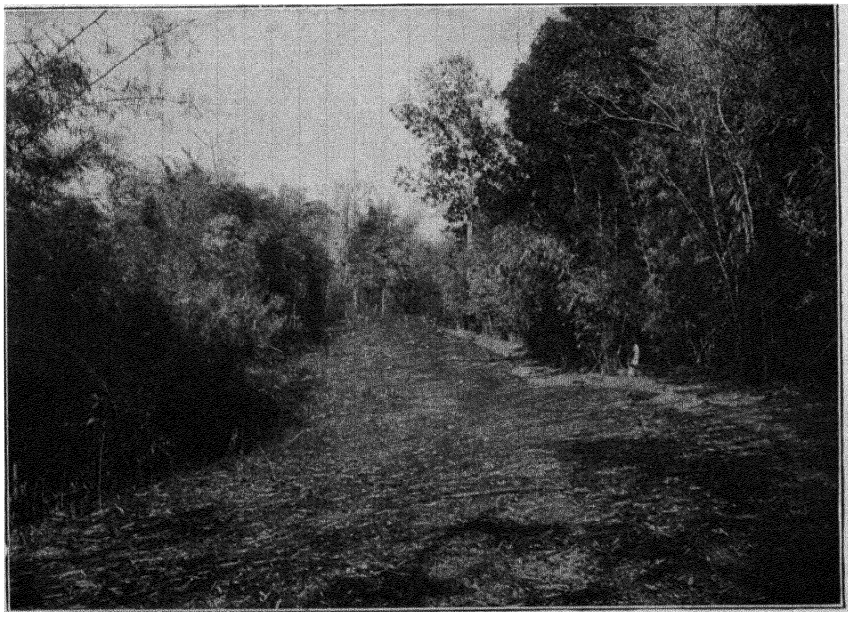
Photograph by R. S. Troup

TEAK LOGS PLACED IN UPPER REACHES OF FLOATING STREAM READY FOR FLOOD, KONTHA, PYINMANA, BURMA



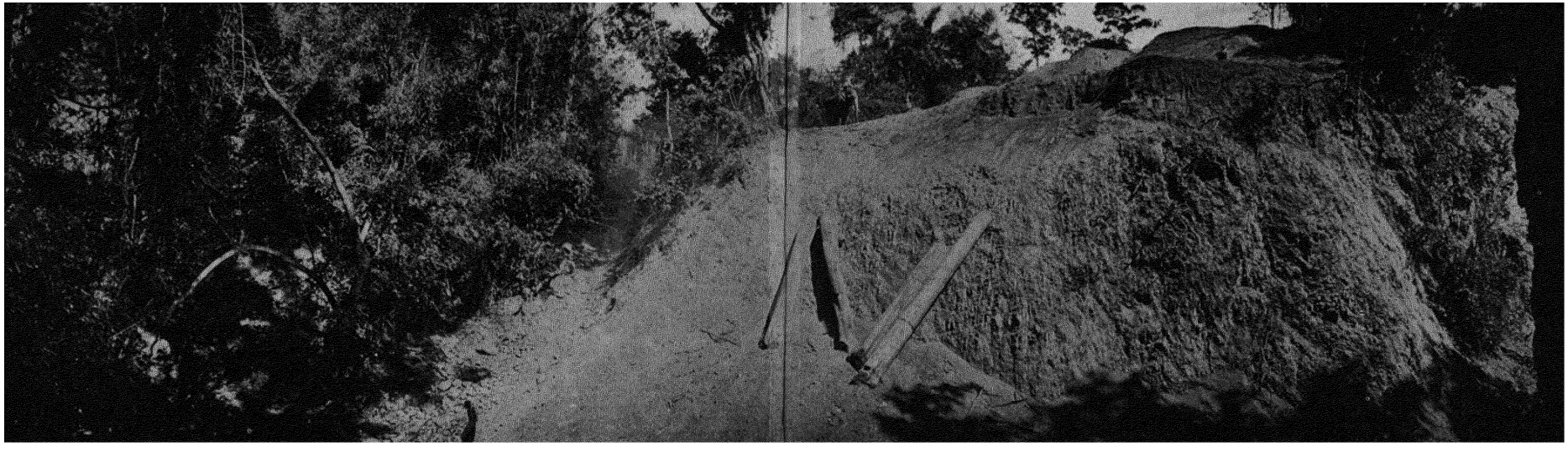
Photograph by R. S. Troup

TEAK LOGS, UPPER BURMA



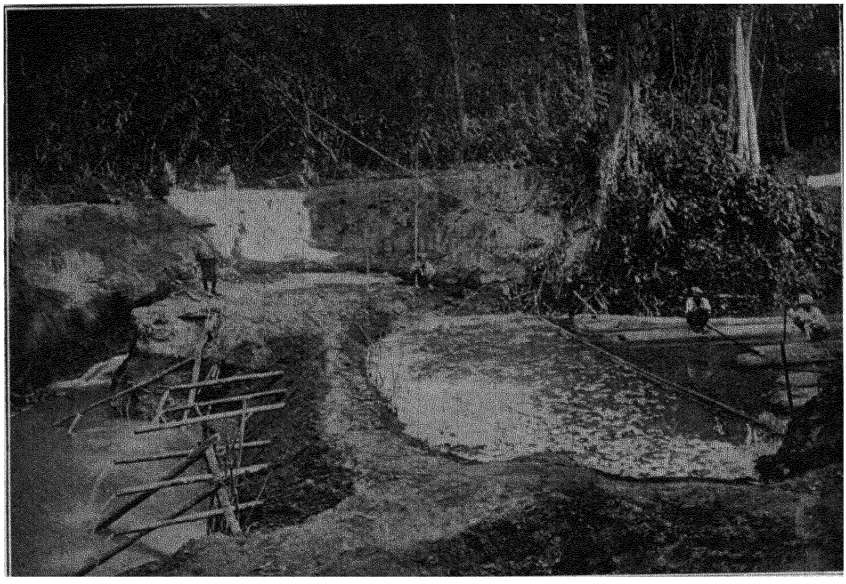
Photograph by A. Rodger

THE FIRE LINE IN THE THAYETMYO FORESTS



TEAK LOGS BEING PUSHED OVER A BANK TO THE IRRAWADDY—B

TEAK LOGS BEING PUSHED OVER A BANK TO THE IRRAWADDY—C



Photograph by A. Rodger

TEAK FLOATING IN LOWER BURMA IN THE DRY WEATHER

(1) A dam ready to be broken

Photograph by A. Rodger

TEAK FLOATING IN LOWER BURMA IN THE DRY WEATHER

(2) The dam after the first rush of water has subsided

becomes crystalline. This crystalline compound is quinone $C_{18}H_{16}O_2$." And he quotes Sir George Watt in the *Dictionary of the Economic Products of India* (1893, vol. vi. part iv. p. 10) as stating: "Teak wood has been examined by Dymock, who states that it yields on distillation an opalescent distillate impregnated with resinous matter, but no trace of essential oil could be obtained." And further: "Teak owes its value chiefly to its great durability, ascribed to the fact that it contains a large quantity of fluid resinous matter which fills up the pores and resists the action of water."

Dr. Chandler thinks that the material which blunts the tools may be the dried resin deprived of its oily constituent, or more probably the resin which has become hardened as a result of oxidation. He adds: "There is, of course, also the possibility of deposition in the wood cells and crevices of mineral substances derived from the sap; such is well known to occur occasionally in other species of timber."

With regard to the claim made by Laslett that "the oil acts as a preventive against rust when iron is in contact with it," this claim can no longer be sustained. At the time he wrote, his supplies came from South India, and the trees were felled without ringing. To-day by far the largest proportion, if not all, of the teak which is marketed is ringed before felling, the result of which is that corrosion now does occur when the timber is in contact with iron, as also is the case with other woods.

Teak often contains a white deposit. This was analysed in an experiment made in 1862 by Professor Abel, which is quoted by Gamble, with the following result:

	Per cent.
Lime	34·04
Magnesia	1·86
Ammonia	1·12
Phosphoric acid	43·35
Water and organic matter	19·54
Carbonic acid	0·09

The trees in the forests are girdled; that is, they are ringed completely round to the heart-wood three years before they are intended to be cut down. The trees then soon die, when they become light enough to be floated down the rivers. If felled without ringing the timber will sink. Thirty years ago the supplies reached England about a year from the time of felling, but now more often a period of three to seven years elapses. At that time many of the forests worked were comparatively close to the seaport, but now the trees often have to float down the rivers a distance of from 1000 to 1500 miles.

Mr. Andrews says that throughout the whole of Burma at that time it was possible to cut 75 per cent of prime clean timber from the trees free from fault, while now they have difficulty in getting more than 10 per

cent. The hauling is done by elephants, and the increased cost and difficulties of the log extraction can be understood when we know that formerly the cost of an elephant was about £100, while in 1914 it was from £300 to £450 ; and while an elephant was then able to haul 120 trees in a year, now, on account of the greater obstacles, it can only deal with from 30 to 40. The immensity of the necessary organisation can be illustrated by the fact that in 1913–14 the Bombay Burma Trading Company employed 2500 elephants and 6000 buffaloes to carry on the work of transport. The round trunks, arriving at the port of shipment, are sawn into square logs, planks, boards, and scantlings, and also into blocks for railway-carriage wheels and keys for railway chairs.

Mature teak trees are often found to be hollow in the middle, and it has been thought possible that fire may be a partial cause of this. Those that are hollow are converted into large-sized flitches, which are very valuable on account of their size, and freedom from heart or fault. Drastic measures were adopted by the Government, about fifty years ago, to check the ravages of these fires, and fire-zones were cut, which in certain districts had the desired effect. Troup, however, remarks that " in these districts the regeneration of the forest has been entirely stopped, while where the fires have continued, there is a sufficient growth of healthy young trees." He thinks that this remarkable result is due to the unchecked vigorous growth of other vegetation choking the young shoots of teak, whereas, when the fire burns down the undergrowth, these survive. The first year the shoot springs up and is burnt down when the fire comes ; the next year another shoot comes up and is again burnt , but after three or four years the root is found to be more vigorous and strong, and finally puts up a fresh tree, which establishes itself.

The teak tree is remarkable for its large leaves, which are from 10 to 20 inches in length, and from 8 to 15 inches in breadth, of an oblong shape, and so rough that the natives use them for sand-papering. The trees frequently attain the height of 80 to 100 feet and more, with a circumference of from 6 to 10 feet and over. The largest log recorded was one from the Ruby Mines Division, Upper Burma, launched in 1898, which measured 82½ feet in length, 12 feet in girth at the base, and 7 feet in girth at the top, and contained 507 cubic feet of timber, which would weigh over 12 tons. Even after this length was cut, there was still a considerable sized log to be cut from the top.

A great many of the trees are inclined to be very crooked, and the stems are often twisted and fluted, making the conversion difficult and costly. To-day the best quality is considered to be that from Moulmein, although it is difficult to recognise any material difference between that and other varieties. Perhaps the Rangoon timber is slightly more crooked in the heart, while that from Bangkok, though better in this

respect, is found to contain more bee-holes. The timber from Malabar is slightly denser, harder, and heavier. Teak from Burma and Siam may often be found quite seasoned on arrival, but there is sometimes a little shrinkage: twelve pieces, each 30 inches by 2 inches square, after being subjected to a dry heat of 120° in a seasoning chamber, showed no shrinkage in length; six pieces were found to have shrunk $\frac{1}{32}$ to $\frac{1}{16}$ of an inch in width. To most people the scent of teak being sawn or worked is agreeable, and also that of a room panelled or trimmed in it, but others regard it as being unpleasant, and occasionally some parcels have had an exceedingly foul smell. In one case expensive fittings costing many hundreds of pounds, finished and fixed, were entirely rejected on this account, and had to be replaced by other wood, though no similar case has been reported.

Besides the immense quantities required for the navies and ship-building of the world, a vast amount is used for railway-carriage construction, and for this work, notwithstanding the great cost, it seems almost impossible to find a satisfactory substitute. Where it is used for panels for railway carriages, it might perhaps more often be desirable to substitute mahogany, which is already largely employed. The quantity of teak used, both on account of its fire-resisting qualities, and its immunity from the attack of the white ant, is enormous. It is also used for accumulator boxes, as the nature of the wood resists the action of the acids used, and it does not warp or split. It is largely used for floorings for public buildings of all kinds. For such work, however, the fibrous nature of the grain renders it liable to be cut by the tread of nailed shoes, which soon break down the wearing surface. For hard wear of this character other timbers can be substituted with better results at less cost, but it is very suitable for hospitals, where its resinous nature and reliable standing qualities provide a sanitary floor with a good effect. The wear which the floors of a hospital sustain is light, so that a harder wearing surface than teak is not necessary. Of late years the greatly enhanced cost has tended somewhat to reduce its use for window-sills and frames, and other forms of joinery work, for all of which purposes there are fortunately, at present, abundant supplies of equally satisfactory timbers which can be obtained at less cost. In India it was formerly largely used for sleepers, and all kinds of building construction, but here also the increased cost has made it necessary to adopt substitutes. Where used in India for sleepers, and in England for posts buried in the ground, it has been found to be very durable, more so indeed than oak. In strength, resistance to crushing, and transverse strain it ranks high, although not so high as many other Indian timbers. R. S. Pearson has made very exhaustive tests which give the relative strengths of the product of teak grown in plantation and natural forests respectively, and which can be seen in an admirable pamphlet

(*Forest Bulletin*, No. 14, 1913) entitled "A Further Note in the Relative Strength of Natural and Plantation-grown Teak in Burma." "As a rule, teak in Burma is felled when it reaches a girth of 7 feet at breast height. It then varies in age from 110 to 190 years in natural forest, the average being 150" (R. S. Troup, private notes).

Large areas of artificial plantations have been formed. These were commenced in 1862, and have been continued ever since; their total area at present amounts to nearly 70,000 acres. It will probably be about thirty to forty years before they commence yielding regular supplies of large size, but the out-turn then will be by no means negligible. The famous teak plantations of Nilambur in Malabar deserve special mention. These plantations were commenced in 1842, since which date continual additions have been made. They now aggregate about 5000 acres, though probably only one-third of this area will produce timber of large size. Already, however, a good many trees have reached a girth of over 7 feet.

The out-turn of teak from Burma in the five years preceding the war was:

1908–1909	270,140	tons
1909–1910	284,607	,,
1910–1911	309,787	,,
1911–1912	252,723	,,
1912–1913	255,876	,,

and later:

1917–1918	111,964	,,
1918–1919	66,579	,,
1919–1920	436,022	,,
1920–1921	437,290	,,
1921–1922	507,648	,,
1922–1923	469,364	,,
1923–1924	519,145	,,
1924–1925	424,492	,,
1925–1926	436,014	,,
1926–1927	453,961	,,
1927–1928	442,198	,,
1928–1929	434,269	,,
1929–1930	394,692	,,

It is worthy of note that before the European war the Germans were purchasing regularly one ton of teak seed for planting in the colonies which they then possessed in East Africa. The enterprise thus shown with regard to this valuable timber might well be more largely followed by the British Government.

Rows of regularly arranged pores mark the annual rings; the other pores, which are variable in size, are scattered and few in number. The medullary rays are fairly numerous, and give a fine silver-grain effect.

TEAK, JAVA. *Tectona grandis* Linn. f.

Weight 45 lbs. 7 oz. Java.

The supplies of teak from Java come from the seven districts of Remband, Semarang, Madioen, Sourabaya, Cheribon, Kembal, and Kedire.

From the district of Remband " Blora " teak is procured, which is the best quality obtainable in Java. The next best comes from Semarang, but some from this district is not good. Madioen has some good teak, but most of the timber is chalky. Sourabaya wood is not very good, being light in colour and weight. The supplies from the remaining three—Cheribon, Kembal, and Kedire—are all of inferior quality and full of chalk.

The teak tree is not indigenous to Java, but the conditions are remarkably favourable to its growth. Originally planted round the temples or shrines, it has spread over a wide area in pure forest, unlike its habit in Burma and India, where it invariably grows in mixed forests. In many places a very free natural regeneration occurs, so that often in a few weeks a magnificent healthy new crop of young seedlings will spring up and flourish vigorously. On the other hand, the conditions are not favourable to satisfactory growth in the later life of the tree, which becomes stunted and will not produce the same straight boles as can be found in Burma and Siam. Thus the produce of the trees is of less size, and it is difficult to obtain any quantity of long timber. The densely populated island of Java uses a very considerable quantity of teak annually, as there are no other domestic jungle woods, such as are largely used in India for all purposes, and many of which have now to be imported into Java to keep up the required supply. There is not, therefore, much prospect of any considerable export of teak in the future. The effect of a change that the Government made in the manner of selling the timber has also restricted the volume of export. Until recently, in spite of large supplies of good quality from Java, obtainable at a lower price than the Burma wood, it was found difficult to overcome the prejudice against it. This was due partly to the manner of description : the term Java being used to describe the whole of the supplies without discrimination, whereas the quality of Blora teak was good enough for the best purposes, and some of the other qualities hardly fit for common use. This difference was well understood by the Dutch at home in Holland, and by the shippers in Java, so that better qualities commanded a proportionately higher price. A very heavy rise in the value of the Burma and Siam wood has had the result of stimulating the inquiry for Java teak, and many who would not formerly entertain it are now anxious to obtain supplies. The colour varies from a light straw, paler than that of the wood from Burma, to a rich brown, equal to any other sort. Some of it is harder to work,

heavier in weight and chalky, and the gritty nature of the wood blunts the edges of the tools readily, but the best quality obtainable is as good as any of the Burma or Siam timber, from which it is impossible to distinguish it. It generally contains a more curly and wavy grain, and a much larger proportion of what is termed " roe and mottle " figure. A special feature of the Java wood is the dark-coloured, almost black, streaky marks which it contains, and which make it very attractive when used for panelling or any decorative work. This last quality is so pronounced that, for those who desire to secure the best appearance in teak panelling or furniture, it would be worth while to specify the use of the Java wood.

For identification of wood growth see TEAK, BURMA.

TEAK, SURINAM. *Hymenaea Courbaril* Linn.

Weight 70 lbs. 8 oz. (very wet and fresh).

The Guianas, West Indies, South America.

VERN—*West Indian locust, South American locust, leather-leaved locust, locust gum, Brazilian gum-copal tree, gum-anime tree, courbaril, courbaril plum,* Eng.—*Locust, cimiri, courbaril, caouroubali, kawanari, kwanari,* Br. G.—*Locus, lokus, jengi kanda, lokisi kaka, Surinaamsch teakhout, Westindsch teakhout, julchthout, courbaril hout,* Sur —*Courbaril, courbaril montagne, courbaril de savane, bois de courbaril, locustier, cacachien, algarrobo, chimidida, caroubier de la Guyane, copalier de Amerique, diphylle pois de confiture,* Fr. G. —*Locust, stinking-toe, courbaril, algarobo,* Trin.—*Algarrobo,* Cuba —*Courbaril, marbre,* Guad.—*Algarrobo, courbaril, quapinole jutahy, jatoba,* P.R.—*Jatay, jetay, jataiba, jatobá, jatobá roxa, jatahy, jatahy roxo, jatahy peba, jutahy, jutahy café, jutahy assú, jutahy de campo, jutahy miry, jutahy pororoca, jutahy peba, jutahy catinga, jutahy roxo, yatayba, yutahi, yutahy, algarobo,* Braz.—*Avati, abati timbary,* Parag.—*Algarrobo, corobore,* Venez.—*Algarrobo, nazareno,* Col.—*Cuapinol, cuapinole, cuapinoli, coapinol, guapinol, copinole, algarrobo,* Mex., C A —*Lokustbaum, animebaum, henschrenkenbaum,* Germ.—*Bois de simire, bois de courbaril,* Fr.— *Cannariboom, gom anime boom, locusboom, spruitkhaanboom,* Dutch—*Algarrobo, legno locusta,* Ital. (Various species included in preceding.)

The duplication of names in South American woods has caused much confusion, and in no case is this more pronounced than in that of *Hymenaea courbaril,* which is the true locust or locus wood of the Guianas. While it is called Surinam teak, it bears no resemblance to the true teak (*Tectona grandis*).

Dr. J. Ph. Pfeiffer, of Delft University, explains in a private letter that the confusion exists because the product of *Dicorynia paraensis* Bth. is called " basralocus," " bastard locust," " nut-wood," " angelique."

The colour of so-called Surinam teak is a light brick-red, with slightly lighter streaks, or " a dark brown to orange-red wood, often streaky,"

which are the terms used by Stone and Freeman. The wood has a hard texture with rather open grain, and has proved reliable, standing well when seasoned, possessing those qualities which make it durable. It is essentially a cabinet-maker's and turner's wood.

It is not generally met with in commerce in the United Kingdom, but during the war a few logs came into the London market, and proved to be of good, sound, useful quality.

The pores are regular and usually even in size; they are generally single, but sometimes occur in duplicate and triplicate. The medullary rays are strongly defined, and at uneven intervals are joined at right angles by a clear light ring, similar in appearance, which follows the line of concentric layers and marks their line of growth.

TEMPINIS. *Sloetia sideroxylon* Teysu & Binn.

Malaya.

The wood is a bright golden mahogany colour, with a very fine, firm grain similar to that of Spanish mahogany. The timber has not been seen in commerce in the United Kingdom, but Foxworthy reports it as probably the strongest of all the Malayan woods. Its qualities recommend it for use for fine decorative woodwork, where the fine qualities of mahogany are required.

The pores are very small and plugged, arranged in short wavy bands; the fine medullary rays are very irregular and uneven, showing in faint dark-coloured flecks on the radial section.

Terminalia Arjuna Bedd.

Weight 59 lbs. India, Burma.

VERN—*Anjan, arjún, arjúna, anjani, arjan, jamla, koha, kowa, kahúa,* Hind—*Arjún,* Oudh, Beng—*Arjúno, panda sahajo,* Uriya—*Hanjal,* Cuttack—*Kowha,* Sonthal—*Gara patana,* Kól—*Mardi,* Khond—*Vella marda, vella matti, vella maruthú,* Tam—*Arjun, anjan, sadura, savimadat,* Mar.—*Maddi, billi matti,* Mysore—*Yermaddi, érra maddi, tella madu,* Tel.—*Holematti,* Kan.—*Arjuna sadra,* Guz.—*Kahu,* Baigas—*Mangi, koha,* Gondi—*Kumbuk,* Cingh.—*Taukkyan,* Burm

The product of a beautiful tree which is planted for ornamental purposes in gardens and avenues, yielding a wood which, if it could be supplied in quantity, would be one of the valuable timbers of commerce.

Strange indeed it is that the Forest Service of India has never discovered the value of such a wood; also that, in 1918, a specimen I received of a bright straw-coloured yellowish-timber, although marked *T. arjuna* in two places, was found to be the produce of an entirely different species, which resulted in a quite incorrect report of the wood in my first edition.

The wood is practically of the same colour as that of American black

walnut, but of a more pleasing appearance, giving a clean, fine, smooth surface from the tool, and specially sharp edges to mouldings, etc.

Gamble quotes it as apt to split in seasoning, but this is due to want of experience in the way it has been handled.

Terminalia belerica Roxb.

Weight 35-59 lbs. (Gamble). India, Burma, Ceylon.

VERN—*Babela, beleyeh,* Pers.—*Bahera, bhaira, behara,* Hind.—*Banda, bairo,* Kumaon—*Bohera,* Beng.—*Baheri,* Rajbanshi—*Kanom,* Lepcha—*Chiroroe,* Gáro—*Hulluch, bauri, bhumra, bohora,* Ass.—*Thara,* Uriya—*Lupúng, lihúng,* Kól—*Lapong,* Sonthal—*Behra,* Mal Pahari—*Bahré,* Khond—*Tani, kattu elupay,* Tam.—*Tani, tandi, toandi, thandra,* Tel.—*Thera, jhera,* Hyderabad—*Santi, thari,* Kan.—*Bherda, bahera, hela, yela,* Mar.—*Beheda,* Kurku—*Balra, balda,* Dekkan—*Behedo,* Mandevi—*Tahaka, taka, banjir,* Gondi—*Yehera,* Bhil—*Adamaruthi,* Trav. Hills—*Búlú,* Cingh.—*Sacheng,* Magh.—*Thitsein, makalae,* Burm.

An uninteresting, greyish straw-coloured wood, with an unsatisfactory, rather soft grain. Not durable, liable to attack from beetle, which causes "worm-holes"; only suitable for local uses in unimportant works. The annual layers are clearly marked by dark lines.

The pores are scarce and open, rather large, joined by bands or belts of light tissue. Medullary rays confused, difficult to locate, and crossed at right angles by indistinct, thin, light-coloured lines.

Terminalia bialata Wall.

Weight 48 lbs. (Gamble). The Andaman Islands.

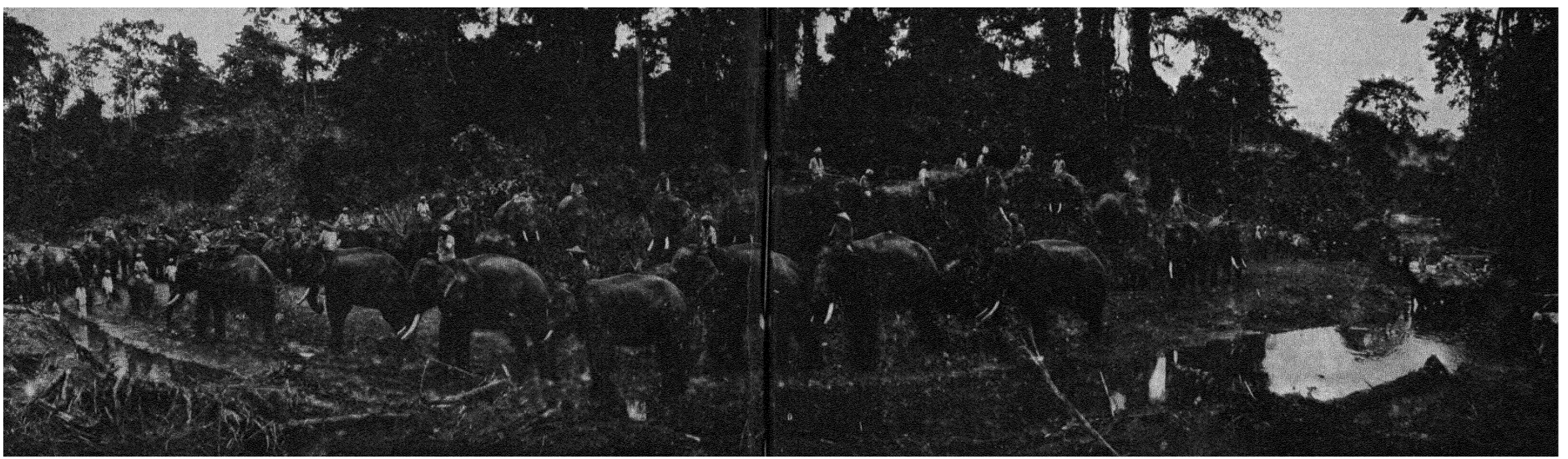
VERN—*Chugalam,* And.

The tree yields a timber of two different kinds; some producing a wood of a consistent yellow straw colour throughout, while others have both a darker and lighter colour. Generally the darker-coloured wood is around the portion of the inner rings, covering a greater or smaller proportion of the whole tree, though in some cases the lighter-coloured wood is found within the inner part, and the darker on the outer part; the proportion of darker wood is very small. A mistaken impression has led to a pronouncement that the lighter-coloured portion is the sap-wood, which is quite incorrect.

In the new edition of Gamble, published in 1922, the name "laurel-wood" is incorrectly given to the wood of *Terminalia bialata* (see LAUREL-WOOD).

The product, for trade purposes, has been described as "white chuglam" for the light colour, and "Indian silver-greywood" for the dark colour. In both cases the wood is attractive, fine, hard-grained, capable of a very smooth surface from the plane, and especially suited for the sharp members of mouldings or edgings.

Before the year 1920 both descriptions were entirely unknown, and the



SOME OF THE GOVERNMENT ELEPHANTS, ANDAMAN ISLANDS

timber, in considerable quantities, was being used for the commonest purposes, or burned, in the Andaman Islands. From that date an increasing export has occurred from the Andaman Islands, and a considerable quantity has been used in decorative woodwork of the highest class. The light-coloured wood has been employed for the less costly woodwork in pianofortes and the like, while the silver-greywood has been used extensively in the highest class, and the demand has far exceeded the supply. The wood must not be used in an unseasoned condition, but when seasoned it stands well. A superb dining-room was exhibited at the 1924 Empire Exhibition at Wembley, and among the outstanding works which have been completed since that date the following may be mentioned: First-class dining-cars on the London Midland & Scottish and Southern Railways, which have been universally admired; the new buildings of the County Fire Assurance Company, Piccadilly Circus, designed by Wm. G. Newton & Partners, and executed by Holloway Bros.; the fittings and decorative woodwork of a very large number of the Underground Railways.

" The pores are very scanty, large, frequently subdivided, joined by irregular, wavy, concentric bands of soft, loose, cellular tissue. Fine, equidistant, uniform medullary rays are indistinctly visible in the harder and darker portions between the bands, and on the radial section, where too the pores are prominent " (Gamble).

Terminalia Catappa Linn.

Weight 38–41 lbs. (Gamble).

India, Burma, The Andaman Islands.

VERN—*Badam*, Beng.—*Taree*, Kan.—*Nat vadom*, Tam.—*Vedam*, Tel.—*Adamarram*, Mal.—*Kottamba*, Cingh —*Catappa*, Malay

The colour of the wood is light reddish-brown, with a hard, close grain, and the pores display on the transverse section numberless bright shining specks of gum. Parkinson reports this as the " Bengal almond " or " Indian almond " tree. This wood has not been exported commercially.

The concentric layers are marked by pronounced dark rings. The pores are so uniform and regular that they give the impression of a hand-manufactured pattern. The medullary rays are very close, parallel, exceedingly fine.

Terminalia Chebula Retz. The Myrobolan tree.

Weight 64 lbs. India, Ceylon, Burma, Malay.

VERN—*Harra, har, harrara*, Hind.—*Haira*, Kumaon—*Harıtaki*, Beng.—*Hılikha*, Ass.—*Sılim*, Lepcha—*Karedha, horada*, Uriya—*Halra, harla, hirda*, Mar.—*Rola*, Kól—*Hadra*, Oraon—*Hilda*, Berar—

Karka, hir, harro, mahoka, Gondi—*Kadakai,* Tam.—*Kadukka,* Mal.—*Karaka, kadukar,* Tel.—*Herrda, anale,* Kan.—*Alalé,* Mysore—*Kajo,* Magh.—*Panga,* Burm.—*Aralu,* Cingh.

Brownish-yellow with a purplish tinge, this wood has a close, fairly hard grain. If supplies could be made in regular decorative woodwork sizes, a considerable demand would result ; at present it is not met with in ordinary commerce.

Pearson and Brown, in *Commercial Timbers of India,* say that it very much resembles *T. Oliveri* but is more ornamental, an opinion which might be open to question.

The pores are numerous and mostly plugged, regular in position and size. The medullary rays are very fine, and hardly discernible under the lens.

Terminalia glabra W. & A.

Weight 52–60 lbs. (Gamble).

Central and Southern India, Burma, Ceylon.

VERN—Same as for *T. Arjuna*

A brown, walnut-coloured wood, with close, compact grain, very much resembling the produce of *T. Arjuna.* It takes a fine surface from the tool and is marked concentrically by wider or narrower dark lines. The small-sized pores, which are evenly distributed between the layers, are clearly visible to the naked eye. But the medullary rays are exceedingly fine, and hardly discernible under the lens.

Terminalia Manii King.

Weight 39 lbs. Andaman and Nicobar Islands.

VERN—*Kala Chuglam.*

This wood is known as " black chuglam " ; the colour is greyish-brown, resembling that of Ancona walnut. It possesses a very hard, close grain with good bottom, and takes a smooth surface from the plane, displaying a lustrous face. If properly seasoned, the wood stands very well indeed, but it should be used mainly for veneering, and not in any great thickness.

The very numerous pores, which are mostly plugged, are rather small and are uniform both in position and size. The concentric layer of growth is confused and uncertain. The medullary rays are exceedingly fine, close, and parallel.

Terminalia myriocarpa Heurck & Muell, Arg.

Weight 51 lbs. India, Upper Burma.

VERN—*Panisaj,* Nep.—*Sungloch,* Lepcha—*Hollock,* Ass.

The colour is greyish-brown, resembling that of grey Ancona walnut, for which wood, if prepared by a competent workman, it might be mis-

taken. Gamble reports the tree as common and conspicuous, and quotes Chevalier Paganini that it is "excellent for many purposes, straight-grained, pretty hard, does not warp or split to any considerable extent when it is seasoned, stands well in and out of doors. Its only enemy is a kind of small borer. It is peculiarly adapted for cheap furniture, windows, doors, railway carriages and generally for any work where accurate fitting is the main object."

In 1922 we find it reported as being extensively used for tea-boxes. While these were the best uses to which this valuable timber was put, the railway company covering the district in which the tree grew abundantly was making use of imported American maple, American poplar, and American satinwood—three trees which neither in appearance nor quality could be compared with hollock. A large-sized panel, made in a ply-wood factory in India, was shown to me in 1922 when I was in Calcutta, and I was informed that the panel had been prepared for the new Secretariat building in Delhi. Although I understood it had been tried in various circumstances for some period, the panel showed no sign of shrinkage or defect, and gave every evidence of being entirely satisfactory. The potential value of this timber seems to be considerable, and the failure to have recognised its merits earlier illustrates the backwardness of the development of the uses of Indian timber, referred to by American writers, especially as it was reported many years ago to be available in large quantities and in large sizes. It has never been available in commerce in the United Kindgom.

The pores vary in size, are distinctly on the large side, and are very open, irregularly placed, and not very numerous. The medullary rays are exceedingly fine, close, wavy, and broken, crossed at right angles by white lines shaded dark, showing what might or might not be lines of concentric growth.

Terminalia paniculata W. & A.

Weight 48–65 lbs. (Gamble). India.

VERN—*Kindal, kinjal,* Mar —*Neemeeri,* Tel —*Pe-karakai, ven marúthú,* Tam —*Honal, hongal, hunab, huluvá, hulvé,* Kan —*Ulwe,* Coorg—*Pu marutha,* Mal.—*Poo mardá, pillai mardá,* Anamalais.

The colour is a rich warm brown, similar to that of American black walnut, for which, when in finished work, it might easily be mistaken. It works exceedingly well, and is capable of a smooth surface from the tool. Gamble says: "A fine tree with a good wood, but not so valuable as that of *T. tomentosa.* It is improved by being kept under water." Gamble's experience was too limited. While individual specimens of trees of *T. tomentosa* are certainly more valuable, the plain wood of *T. paniculata,* if produced in the approved manner for commercial purposes, would be of

still greater value. A small shipment was brought over for the Holland Park Exhibition in 1920, and was offered for sale under the name of kindal, one of its vernacular names, but the absence of any indication of a regular import failed to create any interest commercially.

The pores are very numerous, and vary greatly in size from very small to fairly large. The larger pores form a layer with a very light mark, which might or might not be a line of concentric growth. The medullary rays are very numerous, irregular, not equidistant, and somewhat rough.

Terminalia parviflora Thw.

Weight 47 lbs. Ceylon.

VERN—*Hanpalandra*, Cingh.

This wood, which is a light straw colour, displays still one more distinctive and remarkable appearance, differing from the already numerous descriptions of wood produced by the Terminalia species, so that an observer, at first glance, would not believe it possible that the wood should belong to this genus. The grain is fine and close on the tangential surface, having almost the appearance of a fine-quality pine; but on the radial section, showing its hard dense nature, with the medullary ray in small flecks as in sycamore. It would be much appreciated if it were obtainable in the usual sizes required for decorative woodwork.

The very small pores are arranged in belts, making a pretty pattern with the fine, clearly defined medullary rays intersecting the pores at right angles.

Tetrameles nudiflora Br.

Weight 24 lbs. (Gamble). India, Burma, Ceylon, The Andamans, Java.

VERN—*Mainakat, hoongia*, Nep—*Payomko*, Lepcha—*Bolong*, Garo—*Sandugaza*, Beng—*Bolur, jermalu*, Kan.—*Ugado*, Mar.—*Chini*, Tam.—*Chini, vella chini*, Mal.—*Nigunu, mugunu*, Cingh.—*Tseikpoban*, Magh—*Baing, thitpok, sawbya*, Burm.

The wood is a light greyish-straw colour, with a fine, close grain, and shows great strength relatively to its weight. Gamble reports Kurz as stating that the wood is valueless, but Bourdillon that it is used for dug-out canoes, "and if rubbed with fish oil and used in salt water a boat will last from 8 to 10 years." This information is important in view of its suitability as a substitute for balsa wood—a name to which it is as much entitled as the balsa wood of South America.

Considering its exceptional strength in relation to its weight, it should be regarded as a most valuable wood for use in those works of importance for which its character renders it valuable.

The rather scarce pores are moderate to small in size, ranging singly and in groups of two and three between strongly defined medullary rays, parallel, fairly equidistant, which are crossed at right angles by very thin, light, clear lines.

Thespesia populnea Corr.

Weight 50 lbs. India, Ceylon.

VERN—*Parsipu*, Hind —*Poresh, parash, dumbla*, Beng —*Poris, purasia, portia, pursa, pursung, puvarasam, kavarachu, puvarachu*, Tam.—*Gangareni, gangarava*, Tel —*Bhendi*, Mar.—*Bendi*, Guz.—*Asha, hurvashi*, Kan.—*Bugari*, Hassan—*Suriya*, Cingh.

This is the wood of the Portia, or tulip tree, and is of a pale salmon-mahogany colour. It has a close texture, and a grain with contrary hard and soft layers ; the medullary rays showing as silver grain on the radial section. Gamble reports it as " durable . . . used in South India for gun-stocks, boats, cart and carriage making, and for furniture ; in Bombay for wheel-spokes ; in Burma for furniture and carts."

Record reports it as also growing in the coastal forests of the Indo-Malayan region, tropical Africa, the West Indies, and certain other portions of tropical America.

The names by which it is known there are as follows : *Seaside mahoe, cork tree, Spanish cork*, Bah.—*Emajaguilla, palo de jaqueca, santa maria*, P.R.—*Majagua de Florida*, Cuba—*Catalpa*, Guad., Mart.—*Mahault de londres*, Trin.—*Portia tree, tulip tree*, India—*Banálo*, P.I.—*Fref, eijan*, Gold Coast, Afr.—*Faux bois de rose, bois de rose d'Océanie*, Fr.—*Rosewood of Seychelles, umbrella tree*, Eng.

The pores are small and regular. The medullary rays are clear, strong, and well-defined.

THINGAN.

See *Hopea odorata.*

THITKA. *Pentace burmanica.*

See MAHOGANY, BURMA.

THITSHO.

See *Pentace Griffithii.*

THITYA. *Shorea obtusa* Wall.

Weight 52–53 lbs. India.

A yellowish-brown coloured wood with a close, firm grain, but giving rather a rough texture from the plane ; in appearance much like yôn, though a little darker in colour, inclined to warp badly in seasoning. Has not been seen in commerce.

The concentric growth marked by darker and lighter coloured rings.

The rather small pores are mostly plugged, regular in size and position, with faint, rough-edged medullary rays regular, parallel, and almost equidistant.

THUYA. *Tetraclinis articulata* Masters.

Morocco, Algeria.

Algerian thuya is similar to the American or English grown thuya, the product of *Thuya occidentalis* L., *T. plicata*, but the Algerian wood is only seen in the United Kingdom in the form of burrs.

The colour is yellowish-brown red, with a softer grain than that of Amboyna, but very much resembling it, and capable of an exceedingly smooth surface from the tool. The wood has a sweet aromatic scent, and of late has become fashionable for small tables and boxes, etc.

A comparison between the wood of an Algerian burr and that taken from a tree grown in Sussex shows little difference; the one might easily be mistaken for the other.

According to Boulger the wood is known as "Atlas Cypress," "Citrus," or "Citron-wood," and is probably the "Thyine wood" of the Apocalypse. At Cordova it is used for the roof of the Cathedral and known as "Alerce"; Boulger also says that it is the "Lignum-Vitae" of the French.

I am unable to find any confirmation of either of these statements. In any case, the wood of thuya has no resemblance to either the well-known alerce, or the lignum-vitae of commerce.

TIAMA. *Entandrophragma macrophyllum* A. Chev.

West Africa.

Very large quantities of this timber have been imported into London and Liverpool for a great many years past, and have been sold under the name of African mahogany. In the course of the last few years a distinction has been made between the different woods, and that named tiama separated from the others. A more careful separation was practised in France and Germany than in England, in which countries it is probable that the wood has only been sold under the name of tiama.

The colour is browner, the grain slightly rougher than in African mahogany, *Khaya Senegalensis*, with a stronger resemblance to the Sapeli wood; but the difference is not very marked, and the wood is suitable in all respects for the same kind of uses as the others.

The pores are variable in size, not very numerous, occurring in singles and doubles. The medullary rays are exceedingly irregular in size, position, and distinctness, showing in a marked manner on the radial section, and crossed at right angles by extremely fine, similar light lines, which show irregularly.

TIMIDAK. Source unknown.
Weight 46 lbs. 4 oz. Borneo, The Malay States.

This is a cross-grained, fine-textured wood of a light yellowish-brown colour, with a surface very similar to that of Honduras mahogany. It takes a nice finish from the tool, stands well, and would be a useful substitute for any work for which mahogany is used.

The pores are of moderate size and rather open. The medullary rays are close, fine, and parallel.

TINGLE-TINGLE.
See STRINGY-BARK.

TITOKI. *Alectryon excelsum* Gaert.
New Zealand.

The Board of Agriculture, New Zealand, report this wood as of a "light-red colour, straight-grained, of great strength, toughness, and elasticity. Used in wheelwrights' and coachwrights' work, axe handles, swingle-trees, and handles of carpenters' tools."

TOBROOS. *Enterolobium cyclocarpum* Gris.
Weight 36 lbs. British Honduras, Northern South America, Central America, West Indies.

VERN—*Guanacaste, conacaste, pichwood, genizero, South American walnut,* Mexico

The colour is a strong reddish-brown, resembling koko (*Albizzia Lebbek*) (*q.v.*) both in colour and grain, and with the same rather lustrous appearance. In fact, it would be hard to distinguish between these two woods.

Mr. Stevenson, the Conservator of Forests, Belize, in a private letter, reports that it "grows in British Honduras as a scattered riverain tree chiefly used for the making of dories," and says that he doubts whether any large supplies could be obtained, and that no shipments have yet been made to the U.S.A.

The open pores are rather large, occurring singly and in duplicate. They are rather scarce, with fine, indistinct medullary rays, crossed at irregular intervals by similar white lines.

TOCHI. *Aesculus turbinata* Bl.
Weight 32 lbs. Japan.

According to Goto this wood is called tochi-noki, and comes from the district of Chusenji.

This Japanese horse-chestnut is very similar to the English, alike in

grain, but of a darker, and golden-brown colour. Highly figured planks and flitches, containing attractive splash mottle figure of a smaller and bolder pattern, have found their way to the English market of late years (1930). Some of the planks are marked by a slight discoloration, with black lines.

The concentric layers are marked by fine, dark streaks. The minute plugged pores and the very numerous, exceedingly fine medullary rays are hardly discernible under the lens.

TOTARA. *Podocarpus Totara* A. Cunn.
Weight 28–37 lbs. New Zealand.

This is one of the most valuable timbers of New Zealand, but it has not been imported on a commercial scale. The Board of Agriculture, New Zealand, reports it as "deep red in colour, clean and straight in the grain, also capable of resisting the marine worm for protracted periods. Procurable in long lengths and up to great widths. Used for general building purposes, joinery, and cabinet-making; bridge and wharf work, and wood pavements." Some years ago many well-marked pieces were sent to this country for figured veneer work, the figure being of a curly, wavy, burry character. The veneers were well received and used for panels in pianoforte work and cabinets.

TOWHAI. *Weinmannia racemosa* Linn.
Weight 45 lbs. New Zealand.

According to the New Zealand Board of Agriculture this wood is of a "deep red colour, hard and strong, ornamental grain. Procurable in medium lengths up to 10 inches in width. Used for cabinet-making and ornamental work."

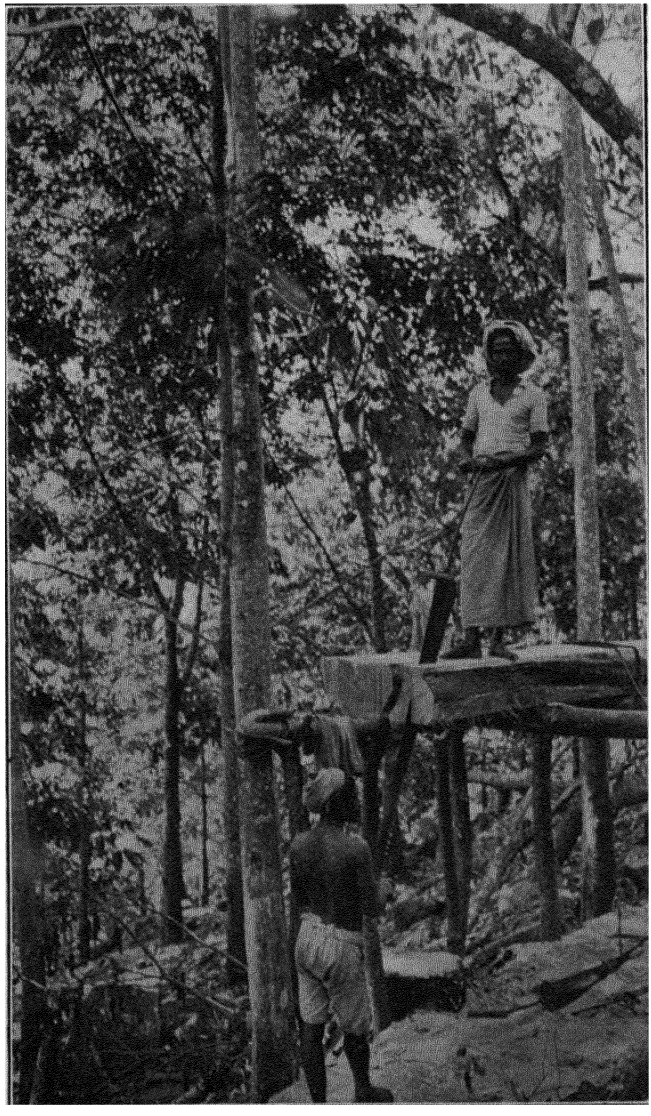
TRINCOMALI WOOD. *Berrya Ammonilla* Roxb.
Weight 60 lbs. (Troup). India, Burma, Ceylon, The Malay States.

VERN—*Halmillila, halmilla,* Cingh.—*Chevandelai,* Tam.—*Petwun,* Burm.

The colour is a deep, dark red, similar to that of beefwood, or bullet tree. It has a coarse, sticky, hard grain, and an oily feeling to the touch. It resembles the hard wood of lignum-vitae, and for certain uses it is a very good substitute for that wood. Troup reports that in the seasoning small radial cracks are apt to form. Gamble reports the wood as very durable; experiments made by Professor W. C. Unwin, F.R.S., in 1899 gave the following results:

Weight	49·93 per cub. foot.
Resistance to shearing along the fibres	830·3 per sq. inch.
Crushing stress	3·442 tons per sq. inch.
Coefficient of transverse strength	6·898 ,, ,, ,,
Coefficient of elasticity	780·7 ,, ,, ,,

It is difficult, however, to understand the weight arrived at by Professor Unwin, as several specimens which have been examined exceed the figure he has given.



Photograph by G. R. Keen

NATIVES HAND-SAWING, CEYLON

Trincomali wood has been known under this name in the United Kingdom for a great number of years, and in the adoption of suitable names it presents a good illustration of the necessity for accepting one

easily remembered, and not likely to confuse the users of the wood. When it was introduced about 1920 as *Berrya Ammonilla*, it was even rejected by those people who had formerly used Trincomali wood. Strangely enough, the same thing happened in Ceylon, and Mr. Lushington, when called upon to make a report as to the failure of the development of the Ceylon woods, reported that the authorities in Ceylon, when offered the wood of *Berrya Ammonilla*, refused it under this name, although under the name of Trincomali wood it was favourably received. This is an illustration of the doubtful advantage of mixing the botanical Latin name with the regular trade name, whether correct or otherwise.

Its good standing qualities make this wood greatly sought for, where hardness and toughness, elasticity, and durability are required.

The numerous, very small pores are regular in size and distribution, joined by wavy belts of minute secondary pores, which make a pretty pattern. The rays are exceedingly fine, parallel, nearly equidistant, and show on the radial section very marked, and almost as strongly as in the plane, with a ripple ray prominent on both sections.

Ts'i-ch'ai.

China.

Professor Record identifies this wood as *Tetradenia* sp. Professor Chung says that it is the wood of the lacquer tree.

The colour is an attractive brownish olive-green, with a shining bright lustre, and a very fine, close grain, yielding a smooth surface from the tool.

The close concentric layers are marked by fine dark lines. The pores are very small, plugged, and regularly distributed. The medullary rays are fine, rather coarse, irregular, and crossed at irregular intervals by conspicuous dark lines, marking the concentric layers of growth.

TSUGA. *Tsuga Sieboldi* Carr.

Weight 38 lbs. Formosa, Nikko, and Chizengi.

The Tsuga family, or genus, is properly confined to Japan, China, North America, and the Himalayas, and embraces many different varieties, none of which have been met with in general use in commerce. After the war, small experimental shipments came to hand, as there seemed a prospect of a demand, but little interest was displayed in the timber, and there has been no further development.

The wood has an attractive, fine grain, harder and heavier than Scots pine, but much resembling it. The initial shipments came from Japan or Formosa, or both. Mr. H. J. Elwes, on his visit to Formosa, secured some specimen planks, and also some exceedingly fine burrs, which he sent to England, and from which he had some handsome cabinets made.

Tsuga Brunoniana Carr.

Weight 23 lbs. Central and Eastern Himalaya.

VERN—*Changathasi dhup, thingia, thingani sula, tengre salla,* Nep.—*Tangshing,* Bhutia—*Semadung, chemdang, nyitkuri,* Lepcha.

The Indian hemlock spruce. A light-coloured wood with a pinkish tinge, soft, light in weight, and of poor quality ; it is used for shingles of roofs.

TUART. *Eucalyptus gomphocephala* DC.

Weight 70 lbs. (Julius). Western Australia.

The wood is of a yellowish or straw colour, hard, heavy, tough, strong, and rigid ; the texture close, and the grain so twisted and curled as to render it difficult either to cleave or work. It is a very sound wood, possessing few or no defects, with the exception of a mild form of heart- or star-shake at the centre, which would necessitate a small amount of waste if it were required to reduce the logs into thin planks or boards ; but if employed in large scantlings it will be found a most valuable wood, especially where great strength is needed. In seasoning it shrinks very little and does not split ; it is also characteristic of this wood that it will bear exposure to all the vicissitudes of weather for a long time, being only to a small degree affected by it. It has been known to be subjected to this severe test for fully ten years, and when afterwards converted, it opened out with all the freshness of newly felled timber. Possibly no better evidence is required to show that this is a durable wood. It is used in shipbuilding for beams, keelsons, stern-posts, engine-bearers, and for other works below the line of flotation, for which great strength is required, a weighty material in that position not being objectionable in the construction of a ship. It would make good piles for piers and supports in bridges, and be useful in the framing of dock-gates, as it withstands the action of water and is one of the strongest woods known, whether it be tried transversely or otherwise. It would, however, probably be found too heavy for use in the domestic arts.

Julius says : " In consequence of the comparatively small quantities of this timber so far used, definite information in regard to durability is hardly available. . . . Tuart is very rarely attacked by white ant, and is not liable to attack by dry rot . . . stands well when steamed and bent as roof-sticks, and many hundreds are in use in the State for this purpose."

C. E. Lane-Poole says : " Its main use, along with wandoo, is for railway waggon and truck construction. The chief mechanical engineer in Western Australia, Mr. E. S. Hume, has reduced the maintenance of his trucks from £3 : 7 : 6 to 10s. per year per truck by substituting for steel, tuart and wandoo in under-carriages."

Tu-ch'ai.

China.

Professor Record says this is *Podocarpus*. The wood is of a pale straw colour, with a grain slightly harder, but resembling that of Swiss pine. It has a slight aromatic scent, rather like Japanese hinoki, which the wood resembles in other respects. The concentric layers are marked by strong, well-defined, dark lines, showing a somewhat uneven growth.

TULIP WOOD. ? *Physocalymma scaberrimum* Pohl.
P. floridum.
Weight 50–64 lbs. Brazil.

VERN—*Tulip wood, rosewood,* Trade—*Sebastiao de arruda, pao rosa, grao de porco* ?, *cego machado* or *maschado* ?, Braz.—*Brazilianisches rozenholz, tulpenholz,* Germ.—*Bois de rose,* Fr.

In the confusion of timbers from South American sources arising from the multiplication of names, no case is more pronounced than that of so-called tulip wood. It is evident that supplies of several different botanical varieties have been given the name of tulip-wood for trade purposes. Record says there is a general mistaken belief that tulip is produced by *Physocalymma scaberrimum*, as above, which equals *P. floridum*. In *Tropical Woods* he says: "It is intermediate between specimens of *Dalbergia* and *Tipuanha*." The wood is known locally as "sebastiao de arruda," also as "pão rosa," a name which is also given to *Dalbergia* sp.

The well-known Brazilian tulip wood is imported in small, round, irregularly shaped logs and billets, ranging from 2 to perhaps 8 inches in diameter, and generally of a somewhat faulty character. The colour is a fresh violet-red, streaked with deeper red and salmon-coloured stripes; if exposed to strong light, the bright colour fades almost completely. The growth is dense and hard, but the wood is liable to split after being sawn.

It is a very favourite wood in the composition of certain kinds of French furniture, especially of the Empire period, and it is used to-day for bandings and ornamental inlay work, also in turnery. "The wood, which is very wasteful and splintery, is used for Tunbridge ware manufactures and brushes" (Holtzapffel).

Supplies grow more scarce every year.

The specimen "sebastiao de arruda" which is said to be the produce of *P. floridum* in Colonel Gamble's collection, is unlike the tulip wood described above. It is a pale, even, yellow colour without stripes, lighter in weight (49 lbs.), and does not seem to answer to the other descriptions of this wood.

The concentric annual layers of growth are marked by dark rings. The pores in line of the concentric layers are fairly large and open, with very numerous, very small pores in the remainder of the layer. The medullary rays are irregular, exceedingly fine, and parallel.

Tung-ch'ai. Source unknown.

China.

The colour is a light grey, with a straight, even, soft grain, and a rather satiny sheen, showing tiny flecks of medullary rays on the radial section. The wood is very light and is not unlike the Japanese kiri, *Paulownia* sp.

Professor Chung reports that the " traders " say the seeds of this tree produce Tung oil, and that the name means the wood of the *Aleurites* sp., but Professor Record questions this opinion.

The concentric layers of growth are clearly distinguished by the larger pores of spring growth, with much smaller pores in the later growth. The medullary rays are not very clearly defined on the transverse section, but show in marked, small flakes on the radial.

Tung-tsao. Source unknown.

China.

This appears to be *Cedrela* species. The wood resembles that of *Cedrela Toona* of India, Burma, etc. A valuable wood, with a brighter colour than either the Indian or the American *C. odorata.*

In the spring growth the pores are wide open, but with sparse, very small, mostly plugged pores in the later growth. The medullary rays are irregular, parallel, and numerous, showing in fine clash on the radial section.

TUPELO. *Nyssa aquatica* Marsh
N. sylvatica Marsh and/or
N. uniflora Wang.
Weight 45 lbs. 7 oz. North America.

This wood, in the United Kingdom correctly called tupelo, also incorrectly, American whitewood and basswood, is known in America as tupelo gum or bay poplar. It is a timber possessing qualities which have been insufficiently recognised. The failure to season the timber thoroughly before use has caused disappointment and loss ; but if thoroughly seasoned it possesses qualities which cannot be excelled, even if equalled, by any wood of similar character. It should not be employed for unfixed work, such as tops of doors and screens, as it is liable to warp and twist in such positions. It is capable of an extremely smooth surface from the tool, giving sharp, clear-cut lines for mouldings, and wearing well notwith-

standing hard usage ; while the whitish-yellow ivory colour it possesses is peculiar to this timber and cannot be matched.

Elwes quotes Holroyd—*U.S. Department Agricultural Forestry Service Circular*, No. 40, 1906—reporting that it had been impossible to market this timber excepting under a fictitious name " so great has been the prejudice against this, and others, known as gums." This report illustrates the strange habit which Forestry Services seem to indulge in of publishing remarks calculated to depreciate the commercial value of forest products in timber rather than to search for opportunities which may create values ; for instance, the astute American lumberman has discovered that one of the American gums, the product of *Liquidambar styraciflua*, could be handled so that it has produced a great source of wealth. The Forestry Service would do well to realise that to use a name which would help to popularise the use of an important wood is an advantage which might even justify the use of a fictitious name, but surely the term " fictitious " is in this sense inaccurate ? If the appearance of the timber suggests the term " satin walnut " the name is quite as justifiable as if it were called " monkey slip-wood," the name proposed by the Forestry Service following the somewhat common practice to describe the bark of the tree. The Forestry Service of any country might congratulate its officers if they were able to show ingenuity by giving a name to the timber which would bring it into popularity and use.

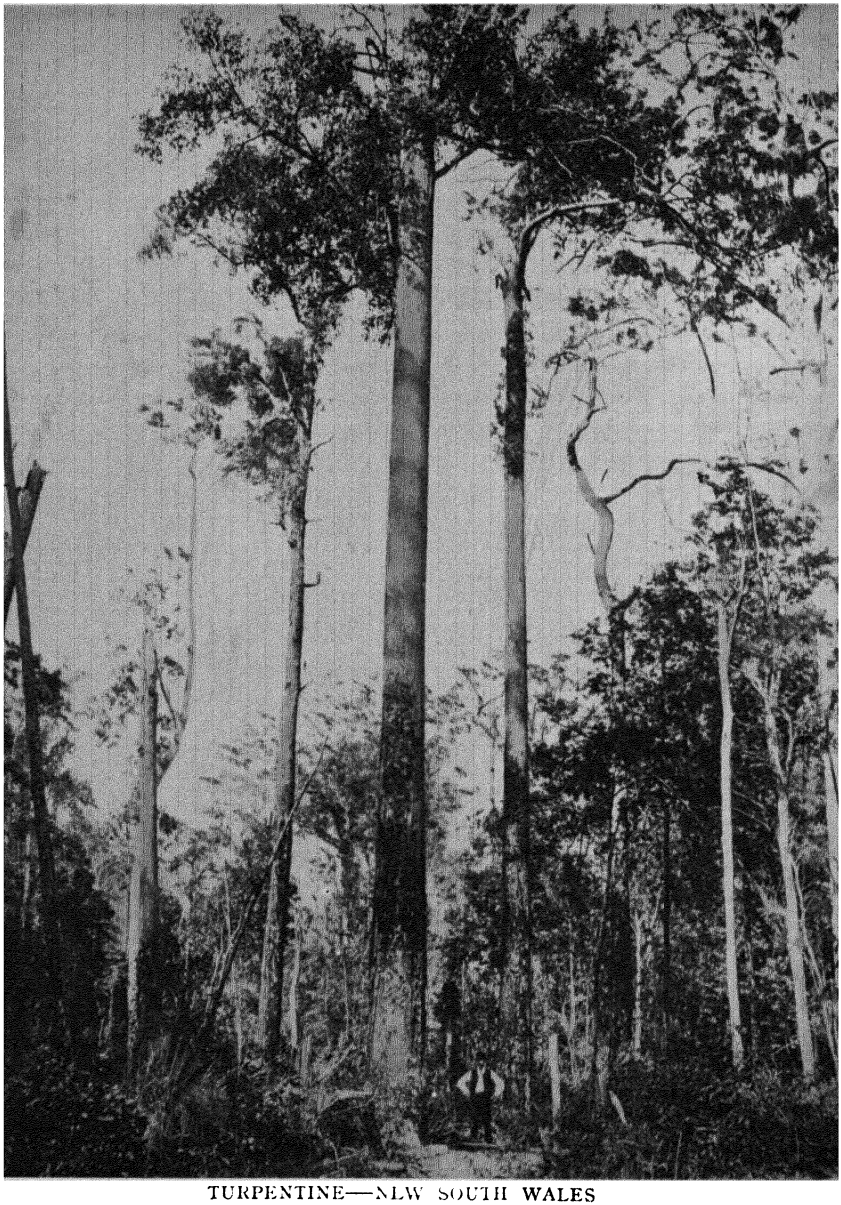
When tupelo was first introduced into the United Kingdom it was difficult to find a market, but as soon as its qualities were known a good demand was created.

The pores are exceedingly small, numerous, and plugged ; the medullary rays very fine, and hardly discernible under the lens.

TURPENTINE. *Syncarpia laurifolia* Ten.
Weight 60–61 lbs. New South Wales.

The difficulty of describing the colour of a wood has been referred to elsewhere. In the case of turpentine it appears to me that the colour of my specimen is a warm rich nut-brown, with a slightly lustrous surface. Baker calls it a dark brown ; Swain, Indian pink colour with an egg-shell lustre ; and the New South Wales pamphlet says it varies from dull red to brown or purple-brown. It has a dense, hard, compact grain, which, on account of its contrary hard and soft layers, requires a sharp tool to produce a smooth surface. The seasoning is difficult, needing both care and time, as the wood is apt to warp, and to dry with an irregular surface. It has a first-class reputation in Australia for durability, and of late has been imported into the United Kingdom in considerable quantities, in logs, planks, and boards, for work where durability and strength have been required.

The Forestry Commission, N.S.W., report the wood as "resisting decay . . . white ants marine borers, the last especially if the bark



TURPENTINE—NEW SOUTH WALES

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be intact"; and further, as "a very good fire-resisting wood." The pamphlet also adds that in the case of piles, jetties, etc., "they should be

driven with the bark intact, as much of its power of resistance to cobra, etc., is apparently due to the presence of a layer of oleo-resin between the timber and the bark." It is also claimed that turpentine resists marine borers in sea water better than any other timber. A large number of round logs with the bark on have been imported this year (1932) for dock and jetty work at Falmouth, and a shipment has also reached the London Docks for the first time. It is claimed in Australia that it is desirable to use the timber with the bark on, but Captain Bartlett, of the Falmouth Dock and Harbour Board, does not think it is of any consequence, while he expresses the highest opinion of its suitability for dock work because it is so immune from marine borers.

The exceedingly small and very numerous pores, mostly plugged, are regular throughout the transverse section. Layers, which may mark a season's growth, are shown by a dark, thin line at irregular intervals. The medullary rays are so fine as to be hardly discernible under the lens (+10), but they show on the radial section in very strongly marked fine flecks.

TURPENTINE, BRUSH. *Syncarpia leptopetala* F. v. M.

Weight 62 lbs. (Baker). Queensland, New South Wales.

This wood closely resembles that of *Syncarpia laurifolia* (*q.v.*). Baker says "In some specimens very difficult to distinguish from that timber . . . a little more open in the grain . . . a faster growing tree." It should be suitable for the same purposes as *S. laurifolia*.

Tzu-hsin.

China.

Professor Record considers this is magnolia, with which I agree. It is of good quality and resembles American magnolia in every way.

The concentric layers of growth are marked by dark bands; in other respects it agrees with the identification of pien-ch'ai and ch'i-hsii (*q.v.*).

UM TOM BOTI.

See *Excoecaria* sp.

Vateria acuminata Heyne.

Weight 40–42 lbs. (F. Lewis). Ceylon.

VERN—*Hal*, Cingh.

A yellowish-brown wood with thin, dark-coloured streaks, close-grained and capable of a smooth surface from the tool. A useful wood for local consumption, but not having any characteristics to make it of value for the export market.

The very numerous pores are very small and plugged ; the medullary rays very numerous, varying in thickness from very fine to coarse.

Vateria indica Linn.

Weight 36–40 lbs. (Gamble). Southern India.

VERN—*Piney maram, dhup maram, vallay kungiliam, kondricam,* Tam.—*Dupa maram, dhupa, paini, munda dhup, illupathla, gugle,* Kan.—*Dupada,* Tel.—*Payani, paini mara, perum piney, vella kondrikam,* Mal.—*Hal,* Cingh.

The "copal" or "piney varnish" tree. Pearson and Brown, in *Commercial Timbers of India,* report that this timber has been exported to Bombay and sold as "Malabar White Pine." According to Gamble the wood is of a light grey colour, coarse-grained, moderately hard and porous. It is occasionally used for masts of native boats, coffins, packing-cases, and tea-chests.

Vatica obscura Trim.

Weight 80 lbs. (Gamble). Ceylon.

VERN—*Tumpalai,* Tam.

The colour is a dirty, dull brownish-red, with a fine, close, compact grain, yielding a smooth surface from the tool. A very useful wood, especially for turnery. Trimen says that Cinghalese wood-cutters call the tree "dun."

The exceedingly numerous minute pores are plugged, with clearly defined, numerous medullary rays, which do not show very clearly on the radial section.

Vatica Roxburghiana Bl.

Weight 59–60 lbs. (Gamble). India, Ceylon.

VERN—*Cheru piney,* Mal —*Vellei payin,* Trav. Hills—*Mendora,* Cingh

This wood is reported by Gamble as *Vatica chinensis.* It is of a light brown colour, with an even, smooth grain, and very close texture ; reported as being durable under ground. It does not possess any special character to justify its report for decorative woodwork, although it might be used to advantage locally in this manner.

The pores are extremely numerous and very small ; the medullary rays numerous, parallel, and well-defined.

Vatica Scaphula Dyer.

India.

VERN—*Boilshora,* Magh.

A rather open-grained, silver-grey coloured wood, with brown open pores, showing on the tangential ray, with a slightly glossy sheen.

VERA-WOOD. *Bulnesia arborea* Engl.

Weight 66–67 lbs. South America (Maracaibo).

VERN—*Vera, vera aceituna, v. amarilla, v. azul, v. blanca, bera, berra,* Venez., Col.—*Maracaibo lignum-vitae, vera-wood,* Trade—*Guayacan, palo sano,* Colombia—*Gayac de Caracas,* Fr.—*Veraholz,* Ger.—" *Congo cypress,*" Brushback trade.

The wood known as vera-wood and Maracaibo-wood has been on the markets of the United Kingdom, the Continent, and America for a long time. Partly on account of efforts made by traders to pass it off as the genuine lignum-vitae (*Guaiacum officinale*), and partly because no definite statement as to its source could be found from any authority, confusion existed and users became suspicious, so that even on occasions the genuine lignum-vitae was suspected of being vera-wood. Although Record reports it as being liable to cup-shakes, radial cracks, and similar defects, the shipments to this country have been, on the whole, of first-rate quality, and for a number of purposes vera-wood is a very good substitute, although for the most important uses of lignum-vitae it is not suitable.

In a pamphlet issued by Professor Record, Bulletin No. 6, 1921, the subject is very clearly stated : " This ' Maracaibo lignum-vitae ' or vera-wood is not considered suitable for propeller-shaft bushings and certain other purposes. The objections that have been made to it are that it does not wear well and that the grain is less interwoven than in the best of the genuine wood, and accordingly there is more liability to cup-shakes, radial cracks, and similar defects. One New York dealer states that 75 per cent of the vera logs he has seen showed bad ring-shakes." He further says : " The heart-wood is very durable under exposure and will last indefinitely in the ground. Mr. H. M. Curran found among the ruins of an old Spanish fort on the tip of Araya Peninsula, Venezuela, a pole which was in perfect preservation after some 300 years. A specimen of this wood was examined by the writer and identified as the heart-wood of *Bulnesia arborea.*" Also : " The variations in the color of the wood, attributed to the effect of site, give rise to the names ' vera aceituno ' (olive), ' vera amarilla ' (yellow), ' vera azul ' (blue), and ' vera blanca ' (white)."

It is "one of the most highly prized woods on the Venezuelan markets" (Zon and Sparhawk).

The concentric layers are marked, not very clearly, by dark and light rings which merge one into the other. The extremely tiny pores, grouped thickly in the early growth of the layer, become more scarce and widely distributed later, partially plugged, with the finest of all fine threaded medullary rays crossed at right angles by equally fine, light lines of tissue, causing a very fine network pattern.

VERONICA. Possibly *Trevesia.*

Europe.

This shrub produces a whitish-brown, very hard, close-grained wood, which carries a great deal of inbark growth, perhaps destroying its value as a cabinet wood. It is tough and strong and could be used for those purposes which require these qualities.

VINE, COMMON or **GRAPE.** *Vitis vinifera* Linn.

Western Asia, The Caucasus, N.W. India, The Deccan, Burma.

VERN—*Dakh, dakki, draksha, angur,* Hind —*Lanang,* Kunawar—*Sabyit,* Burm.

The grape vine is so universally known that it would seem almost superfluous to refer to it. Boulger says that it was originally a native of Armenia, from whence it has been introduced to every part of the world where the grape will grow.

The wood is of a grey-yellowish colour, with a hard, bony grain and a somewhat rough texture, the medullary rays showing prominently on the radial surface. A stout walking-stick, prepared from a suitable trunk, might perhaps be of assistance to the wayfarer who had enjoyed the juice of the vine " not wisely but too well."

The pores vary greatly in size, from very small to medium, open and pronounced. The medullary rays are very strongly defined, wide, rough-edged, and showing on the radial section as in live oak.

VINHATICO. *Echirospermum Balthazarii* Fr. Allem.

Weight 42–52 lbs. Brazil.

In common with all the Brazilian woods, the identification of vinhatico is exceedingly confused. The specimen with this name in Colonel Gamble's collection is of a brilliant gamboge yellow, with a lustrous sheen. Several different shipments have come to London from time to time and have been sold under the name of vinhatico, but although a common name has been employed, each shipment has been of a different kind of wood, and it seems impossible therefore to make any definite pronouncement upon it.

Vitex altissima Linn.

Weight 61 lbs. (Gamble).

Ceylon, Southern and Western India.

VERN—*Nemili-adagu,* Tel.—*Maila, mayila, kadamanakku,* Tam.—*Myrole, mairol, balgay, nauladi, sampaga-pala,* Kan.—*Banalgay,* Mar.—*Mayilella,* Mal.—*Milla, miyan-milla, sapu-milla,* Cingh.

An attractive wood of an olive-green colour, with a hard, firm grain, prettily marked. Similar to *V. pubescens,* and equally suitable for high-

class work. Gamble reports it as in use for building construction, and for making carts, and other purposes—a wasteful use of a valuable cabinet wood. Carved elephants and toys made of " milla " and " sapu-milla " can be seen in the bazaars of Ceylon to-day (1932).

The very small pores are irregular in position, and plugged. The numerous and very fine medullary rays are wavy and irregular, and show faintly on the radial section.

Vitex glabrata Br.

Weight 40 lbs. India, Burma.

VERN—*Goda, hoima, ashwal,* Beng —*Tokra,* Magh.—*Tauksha,* Burm.

The colour is a somewhat dirty brownish-grey, resembling the sapwood of French walnut. It has a rather hard grain, capable of taking a medium surface from the tool, and has been found to be fairly durable, but no exploitation of this wood has taken place in commerce. It has been known by the name of Indian grey lancewood, which is quite misleading, as it has neither the strength, texture, nor elasticity of the lancewoods.

The very numerous, very small pores, mostly plugged, are irregularly placed over the surface. The medullary rays are fairly strong, but confused, showing on the radial section in tiny flecks.

Vitex Leucoxylon Linn. f.

Weight 40 lbs. (Troup). India.

VERN—*Songarbi, sherus,* Mar.—*Luki, konda vavili, neva-ledi,* Tel.—*Sengeni, senkani, karril, hola naki,* Kan.—*Jimekoi,* Koya—*Kadunochchi, nir-nochchi,* Tam —*Nébedda,* Cingh.

This is a very nice wood, of a greyish-brown colour, and a regular, even, and close grain. If supplies could be assured, and the wood became known, it would be appreciated for a highly artistic, decorative cabinet, or other work, as the colour is attractive and the grain good.

The pores are small and regular. The medullary rays are broad and conspicuous, showing in very small flecks of silver grain.

Vitex pubescens Vahl.

Weight 54 lbs. India, Burma, The Andaman Islands, Malay Peninsula.

VERN—*Dhalasingha, muria,* Uriya—*Nowli eragu, hemili adugu, búsi,* Tel.—*Mvladi,* Tam —*Kyetyo, kyungauknivè,* Burm.—*Leban, halban,* Malay.

A very hard wood, of a warm olive-brown colour. It has a close, compact grain, not unlike English laburnum, and is capable of a very smooth surface. A highly attractive wood, suitable for all classes of

decorative woodwork, for turning and inlay, and is said to be durable in the ground.

The pores, which are rather scarce and very small, are so forked as to mark concentric lines at irregular intervals. The medullary rays are very fine, clear, distinct and parallel, equidistant and numerous. There is a fine mottle running through the grain.

WAIKA CHEWSTICK. *Symphonia globulifera* L. f.

Weight 41–43 lbs. British Honduras, West Indies to Central America.

VERN—*Hog gum, doctor gum, boar wood,* B.W.I.—*Mannıballi, karımanni, buck-wax tree,* B.G.—*Bois cochon, manı́, manıl,* Fr. G.—*Anany, oanani,* Braz.—*Manı́, peraman,* Venez.—*Cerillo, sambogum,* Pan., C.R —*Barıllo,* Guat., Hond.

The wood is a dirty, straw-yellow colour with a firm, close, hard grain. Record says that it is used to a small extent for general construction and carpentry, and that occasional logs have been shipped into the United States from Jamaica under the name of boarwood.

The concentric layers are marked by rings visible to the naked eye. The pores are very scarce and small, with very strongly marked medullary rays, crossed at right angles by even stronger whitish lines of small pores, making belts of white lines, and producing a pretty pattern. The medullary ray shows very strongly on the radial section.

WALNUT. *Juglans regia* Linn.

Weight, European 40–48 lbs., N.W. Himalayas 41 lbs.; Sikkim 33 lbs. (average) (Gamble).

Great Britain, France, Italy, Turkey, Caucasia, India, China.

VERN—*Charmaghz,* Pers.—*Ughz, waghz,* Afg.—*Akhor, khor, krot, dún,* Kashmır—*Kabotang, thanka,* Pb.—*Starga,* Ladak—*Ká, khol,* Kunawar—*Akhor, okhár,* Jaunsar—*Akhor, kharot,* Kumaon—*Akhrot,* Hınd.—*Kabshıng,* Byans—*Akrút,* Beng.—*Kól,* Lepcha—*Tagashıng,* Bhutıa—*Thıtcha,* Burm.

Supplies of this familiar wood reach England from all the above-named countries with the exception of China, while from India there has as yet been scarcely any commercial export. It has been imported in the form of logs, round and square, burrs, planks, boards, and veneers. In colour it varies from light greyish-brown to dark brown, often traversed by black and golden or golden-red streaks and stripes, or it is handsomely mottled and shows a wavy "roey" grain.

Although walnut requires some time to season, and shrinks considerably during the process, yet when subsequently exposed to drying or moistening influences it stands excellently, and it is exceedingly diffi-

cult, if not impossible, to find another wood possessing this attribute to the same degree. For this reason it is the best known wood for gun and rifle stocks. After the rifle stock has been cut out and shaped, the wood retains its form and shape exactly, so that the rifle barrel and locks will drop into their position and rest, without bending the locks or throwing the barrel out of the straight. No variation in climate affects this wood. Exhaustive experiments made by Mr. Phillips, the Superintendent of the Small Arms Factory at Enfield, have shown the great difficulty of procuring any other kind of timber capable of enduring the same test. The combination of characters which confer on walnut its reputation of being by far the best wood for gun stocks may be here summarised.

1. Relative strength, toughness, and elasticity, which provide the power of resisting shock.
2. Appropriate weight, which gives proper balance.
3. Relative freedom of the seasoned polished wood from any shrinkage, swelling, or splitting when exposed to wet, damp, or heat.
4. Uniform texture and appropriate hardness, so that the wood is readily cut into delicate shape, yielding a smooth surface which is easily plugged by polish.
5. The hardness necessary to prevent the wood from being dented.
6. Lack of brittleness, or tendency to split, which decreases the danger of fragments of the wood being knocked off.

Recently also, walnut has been found to be very suitable for the propeller blades of aeroplanes, as, apart from its resistance to damp and drought, it shows a degree of toughness, or the lack of that brittleness to which I have previously referred, which excludes many timbers from such use.

From a very early date walnut has been used for furniture and decorative work throughout Europe. The much-admired Queen Anne furniture is particularly associated with this wood, which at that period was almost exclusively used in the manufacture of the best work. Much of the rare and valuable Italian furniture and decorative architectural work of still earlier date was made in this wood. The superb choir-stalls in the Frari Church at Venice were executed in Italian walnut in 1468 by Marco di Vicenza, who also worked in 1465 on the choir-stalls of the church of S. Stefano. The S. Zaccaria choir-stalls (Coro delle Monachei) were also made in Italian walnut by Francesco and Marco di Vicenza between 1455 and 1464.[1]

The colour, general appearance, and carving qualities of the wood appeal particularly to the decorative artist, yet it seems undesirable that works of art, whose great beauty makes them worthy of permanence,

[1] According to a private letter of Mr. Gerald Campbell, British Vice-Consul at Venice (1914).

should be executed in walnut, for this wood is almost invariably attacked by "worm" (boring beetle), which ultimately destroys the whole work. Reference has already been made in the article on oak (*q.v.*) to the crumbling walnut woodwork in Italian churches, in contrast with the perfect condition of equally old woodwork in oak. The beautiful inlaid stalls and panelling, and magnificent carved solid work in many of the churches in Venice are perforated with holes, and are falling to pieces, reduced to dust. The attack is by no means limited to old walnut, for fresh panelling and new furniture may become seriously "worm"-eaten within two or three years of completion. Moreover, the beetles ("worm"), thus finding in walnut a favourite feeding- and breeding-place, readily advance to a similar destruction of articles made of other kinds of wood. Many authorities refer to the liability of "worm" attack on walnut as being confined to the sap-wood, but although this is the more liable, and the attack may begin there, it always spreads over both heart- and sap-wood. Besides the architectural work, much of the exquisite furniture of early date is undoubtedly lost to the present age on this account. On the other hand, there are many fine specimens extant which are still in good condition. At the South Kensington Museum may be seen a pair of folding doors in walnut inlaid with holly and pear-wood from the Palace of Federino, Duke of Urbino, at Gubbio, which date from the early sixteenth century. Of the same period is a coffer of walnut bearing the arms of the Rospigliosi and the Altieri families in Rome. Neither of them shows sign of decay.

BRITISH.—This varies very considerably in quality, texture, and colour, according to the place and soil on which the trees grow; and a much larger proportion of finely figured, good-coloured British wood can be obtained than is usually recognised. A particularly finely figured tree of rich colour, which I was informed grew on Mr. Harcourt's estate, was sold and sent to America some years ago. The figure, quality, and colour certainly equalled, if it did not surpass, anything which has been found elsewhere in Europe. The tree, originally sold in England for a moderate price, produced thousands of feet of veneer which is now adorning some beautiful rooms in America, where it has realised a total value of well over £1000 sterling. A polished panel made from it by the American cabinet-maker is at the Lynch House, Totteridge, Herts. At an Exhibition in London in January 1932, a walnut writing-desk inlaid in pear-wood was exhibited bearing the inscription, "A tree, eight yards about and fifty high, 100 pounds value when blown down by ye great wind of 1703 in Stratton Park."

Prior to the war probably not more than from forty to fifty English walnut trees, or burrs, were shipped to America, but in the last few years (1931) every walnut tree which could be found, of any size or quality, has

been ruthlessly felled and shipped, so that it is increasingly difficult to find a single tree of any size and quality left standing.

Notwithstanding the disadvantages as to the use of walnut in some kinds of work, referred to above, it remains one of the most valuable of timbers, and having in mind the world-wide demand and universal depletion of supplies, the planting of walnut trees should have an important place in any future schemes of reafforestation.

CAUCASIAN.—Although, in England, Italian walnut has always held the reputation of being the finest in quality, colour, and figure, yet by far the largest volume, of fine quality, has come from the Caucasus, and that imported from Circassia the best, especially that from the district of Poti. The supply has been much reduced, and most of the so-called " Circassian " walnut has been Georgian, Mingrelian, Imerethian, Gourian, and Abasian, all districts farther east, and at greater distance from the sea coast. The traders have been generally very astute, and it has been difficult to discover the source of the supply, and as a result many disputes and difficulties have occurred, leading, in one case at least, to a law-suit. Every year supplies become scantier, while the quality deteriorates, so that the walnut of the better class will soon become unobtainable. As in the case of most other valuable figured woods, by far the greater part of the best walnut has found its way to the United States, where it is much appreciated for decorative panelling or " trim," and for furniture and pianos. The practice there is to select the better figured logs, which are sawn into flitches, or large-sized planks, and placed in a steaming chamber, and when thoroughly steamed, fixed on to a knife veneer-cutting machine. They are then either cut straight through or on the half round on a rotary cutter, the last-named producing wider veneers. The remainder of the logs are sawn into boards, and so forth (which is called " lumber "), and used for more ordinary " trim " or cabinet work.

It is difficult to distinguish any structural features characteristic of the woods of different countries, for in the same country the wood varies considerably in structure and weight.

In general, in transverse section the annual rings are rendered visible by the scarcity and slightly smaller size of the vessels (pores) in the outer part of each ring ; in the spring wood the pores are large and scattered and do not produce a sharply defined pore zone. With the aid of a pocket lens (+12) the fine medullary rays are rendered visible, with the fine, concentric light lines (of soft tissue) joining them at right angles.

FRENCH.—This wood is for the most part light-coloured and straight-grained ; and the relatively small amount of finely figured French wood available is practically all absorbed by Paris and Marseilles for veneers. In recent times a great amount of decorative architectural work has been executed in plain French walnut, the quiet grey colour and straight grain

of which produces a dignified and restrained artistic effect, and particularly suits the modern styles of cabinet work.

ITALIAN.—While this is generally named in architects' and other specifications, it is actually very rarely obtained. Supplies of walnut from Italy, and especially Ancona, were fairly considerable until from thirty to forty years ago, when they became very rare indeed. The special feature of this wood was that a large proportion carried with it a preponderance of dark streaks, with good figure, which was especially appreciated for artistic furniture and decorative woodwork. The probability is that the walnut trees provided by the southern slopes of the Alps were brought into Italy and produced a larger proportion of the dark-coloured wood, giving rise to the distinctive names of Italian walnut and French walnut; the more northerly slopes of the Alps apparently producing a greyer coloured and less pronounced figured wood.

The term "Ancona" walnut has greatly changed its meaning, and any supplies of dark, streaky figured wood, whether produced from French, Italian, Spanish, or Circassian sources, are now known as "Ancona walnut."

SPANISH.—A regular but not large quantity of wood has been imported from Spain. The general quality and conditions are the same as the French, from which it is difficult to distinguish it, except that on the whole the shipments have consisted of sizes more irregular in width and length, and containing more faults, with a much larger percentage of sapwood.

TURKISH.—This most nearly resembles the French walnut, but it includes a greater proportion of figured wood.

WALNUT, AFRICAN. *Lovea Klaineana* Thompson.

Weight 30 lbs. 12 oz. West Coast of Africa.

This wood is shipped, usually mixed with consignments of mahogany, from all the ports on the West African coast. The logs are generally of large sizes, 8 to 30 feet long and 18 to 40 inches square, and are at times of even larger dimensions. They are also received in the round, either with or without the bark. The wood only resembles walnut in its colour, and by the fact that it shows the same streaks of veins which are prominent in the true walnut (*Juglans regia*). This is probably the reason why the incorrect term of walnut has been applied to it in the timber trade. In all other respects, such as formation, grain, weight, texture, and figure, it resembles African mahogany. The logs vary in character, those from Cape Lopez being almost entirely plain and straight-grained, while from Benin and Lagos the larger portion of the wood is strongly marked with stripes or "roe," which, though sometimes straight, is more often broken up into an irregular growth showing black lines which curve and twist

into fantastic shapes. These form what is termed " blister " or " snail " figure, while other unusual markings also occur. The colour is somewhat similar to that of French walnut, but is more variable ; sometimes the wood is of a darker brown, but it nearly always has a golden tinge. By careful selection a yellowish-brown golden tint can be obtained which is quite unique. It is easily worked, and is not wasteful in conversion, as with most European walnut. The logs provide long lengths and good widths free from defect, so that without difficulty panels can be obtained up to 2 feet 8 inches and even 3 feet in width.

Although up to the present African walnut has been procurable at a low cost, few have discovered what a handsome decorative wood it is. Mr. Leonard Stokes, a former President of the Royal Institute of British Architects, has used this wood for many important buildings, including Emmanuel College, Cambridge. All of this beautifully designed work is left from the tool without polish, and has a very fine appearance. Mr. Stokes also designed a room in this wood for Lord Digby, which has been much admired. Mr. George Miller has had his library at Newberries, Radlett, Herts, furnished and panelled with it. In this case a dull brown polish has been used, the result being a most handsome and effective appearance. Richly figured curls or crotches have been obtained from these logs, some of which have been converted into large panels and used for decoration on the P. & O. line of steamers, the rails and stiles being of the plainer variety of the same wood. It has been used with success for the interior decoration of automobiles. Effective floors can be laid in the wood, and as flooring it both wears and keeps its colour well. Only a small proportion of the logs provides sufficiently handsome timber for decorative work, and it should not be assumed that the name of African walnut alone will ensure a satisfactory result, that being only obtained by careful selection. It should be a very good substitute for French walnut for aeroplane propellers, blades, and rifle butts, for when seasoned the wood stands very well and is not brittle.

With the tremendous wave of fashion for the use of walnut furniture and walnut panelling during the ten years up to 1930, African walnut has been greatly in demand, and in almost every part of England, woodwork can be found in which African walnut has been used as a basis for European walnut panels and trimmings. For instance, wardrobes, bedsteads, chairs, and every description of furniture has been made, in which the front parts have been faced with European walnut, while for the sides and backs, and in many cases the trimmings, African walnut has been employed.

The transverse grain shows irregularly sized scattered pores. The medullary rays are parallel but uneven ; the annual layers of growth are so obscure as to be almost untraceable.

WALNUT, BLACK. *Juglans nigra* Linn.

Weight 37 lbs. 7 oz. North America.

This wood is so familiar in this country that a detailed description would almost appear to be superfluous. The colour, which is of a more uniform tint than the European wood, is a rich purplish-brown. The beauty of the colour is apt to deteriorate under the unfortunate and ill-advised system of french-polishing which obtains in this country, and though admirable for some woods, is quite out of place with black walnut. The texture is hard and smooth and the grain generally straight and even, though occasionally it displays all descriptions of beautiful figure. A limited quantity of burrs is still obtainable, realising extraordinarily high prices. Black walnut is in good demand for all descriptions of decorative cabinet work, and for telephone instruments it is used almost exclusively. It possesses, though in a lesser degree, those exceptional qualities found in European walnut (*q.v.*) which give the wood its pre-eminence for gun and rifle stocks.

The use of this wood for decorative work is of considerable antiquity, and probably dates from the time of the early settlement of English people in America. At Totteridge Park, Hertfordshire, which in the early eighteenth century was in the possession of James Bridges, first Duke of Chandos, there are some doors of that period which have been found to have been made of American black walnut of very high quality.

At this time also a considerable number of trees were planted or grown from seed in many parts of the United Kingdom. No American timber could be bought of a better quality than that (quoted by Mr. H. J. Elwes) of a tree blown down at Albury, which was given to him by the Duke of Northumberland.

During the European War black walnut, besides being largely used for rifle stocks, was employed to a great extent for propeller blades in aircraft work. The demand was so great that supplies rapidly diminished. A movement was set on foot at Washington, however, to appeal to owners of such trees throughout the country, to sell the timber to the Government in order to aid in the more vigorous prosecution of the war. This scheme was carried out with great success, and a sufficient supply became available, both in America and in this country. A similar plan was adopted in England with regard to English ash (*q.v.*).

The pores are very irregular in size, and are evenly distributed. They are larger in the spring growth than in the autumn, and this variation causes the concentric layers to be distinctly marked. The medullary rays are clear and fine cut ; they are somewhat irregular, and are crossed at right angles by innumerable fine lines, the whole presenting a pattern, as of lace-work. They show on the radial section in very fine, light-coloured flecks.

WALNUT, MANCHURIAN. *Juglans mandschurica* Maxim.
Weight 32 lbs. Manchuria.

This resembles the European walnut (*Juglans regia*), but is generally milder and straighter in the grain. It is more of a yellowish-brown in colour, and there is a marked absence of the light and dark streaks which characterise the European walnut. According to the information at present available, the trees are, unfortunately, all small in girth and consequently only provide narrow widths, which will render the prospect of its commercial success doubtful. Like other walnuts, it stands well under all conditions without warping or twisting.

The annual rings are clearly marked. The pores, somewhat irregular in size and arrangement, do not form any definite pore-zone. The fine medullary rays and thin light lines joining them at right angles, come into view as in European walnut, when the transverse section is examined under the lens.

WALNUT, QUEENSLAND. *Cryptocarya Palmerstoni* Bail.
Weight 47-48 lbs. Northern Queensland.

Also known as "walnut bean" in Queensland. A brown wood, sometimes with a dark red-coloured streak, having none of the characteristics of either European or American walnut, excepting the colour. The grain is attractive and often well-figured, but very hard to saw and difficult to work with all tools. The wood emits a very strong and most objectionable smell, although one authority contradicts this; it splits readily, and is difficult to season, great care being required to prevent it from warping and shrinking when used in solid woodwork.

A brisk demand from America resulted in the export of large supplies, so that the market was flooded. This was followed by a controversy as to the name by which the wood was to be known, resulting at first in a suggestion that it should be called "Oriental Walnut"; and at a later date an agreement seems to have been reached for the wood to be called "Oriental Wood." It appears that upon its introduction it had been called "Oriental" wood by the original importer, to conceal the origin and identity of the Queensland timber. It is known throughout the United Kingdom as "Australian" or "Queensland" walnut, names which, correct or otherwise, seem to be the most suitable. The wood has not been received with much favour in England.

Its insulating resistance to electric current is said to be fifty times greater than with most other woods, making it especially useful for electrical appliances.

The pores are rather variable in size and position, mostly open, with very numerous, ill-defined, rough-edged medullary rays crossed at irregular intervals by faint, fine lines which follow the layers of concentric growth.

WALNUT, SATIN. *Liquidambar styraciflua* Linn.

Weight 37 lbs. 7 oz. North and Central America.

VERN—*Red gum, sweet gum, gum-wood, liquidambar, bilsted, hazelwood, alligator wood, ambar wood,* U.S.—*Hazel pine, satin walnut,* Eur.—Trade—*Amberholz, satinnuss-baum,* Germ.—*Legno di noce satinato,* Ital.—*Liquidambar* or *liquidamber,* Mex., C.A. gen.—*Estoraque, mari-penda, naba, ocotzotl, ocozol, ocozote, ocozotl, yaga-bito, yaga-bizigni,* Mex.—*Goma colorada,* Arg.

The correct name for this wood is "sweet gum" or "red gum," but the Americans have marketed it under the various names of satinwood, hazel pine, red pine, grey pine, and on one occasion as "Californian" red gum. The astuteness of the American in finding profitable markets for his woods, is shown in a marked manner by the successful results which have attended the exploitation of this timber, as, except for appearance, it possesses almost every bad quality which can be found in any wood.

It is of a light reddish-brown colour with dark streaks and a lustrous surface. The grain is hard and close, but in seasoning it shrinks unevenly, and after seasoning is completed, continues to expand and contract with variations of the climate, to a greater degree than any other timber. An experimental piece, quarter sawn to 9 inches by 3 inches, shrank on the heart side to a bare $2\frac{1}{2}$ inches, and on the outer side to $2\frac{3}{4}$ inches. The hard grain stands up and the soft grain sinks, causing a corrugated surface. The shrinkage in drying is exceptional, and even when quarter sawn it is liable to twist and warp. Immense quantities have been used throughout Europe for cheap furniture, for furniture linings, railway and other coach-work. The wood is familiar all over the world, often used for sewing machine covers and stands. In the summer of 1901 or 1902 pavements were laid down in Coventry Street, Lower Regent Street, Waterloo Place, and Whitehall, by a contractor who exploited this timber under the name of Californian red gum. Upon identification, a newspaper agitation was started, resulting in law-suits; and very shortly afterwards—in some cases within a year—in the removal of the whole pavement in those areas where the wood was employed.

The exceedingly numerous and minute pores are irregularly placed throughout the whole of the wood, with rather coarse medullary rays, which show very fine and scattered on the radial section.

Walsura piscidia Roxb.

Weight 61 lbs. (Gamble). India, Ceylon.

VERN—*Walsura, chadavakku,* Tam.—*Walursi,* Tel.—*Kirikon, mol-petta,* Cingh.

A dull, purplish plum-coloured wood, with a very hard, close grain, yielding a very smooth surface from the tool. Gamble quotes Beddome, saying the wood is used for various purposes, and the pulp of the fruit to intoxicate fish!

It would be an attractive medium for decorative woodwork or turnery.

The numerous, tiny pores are plugged. Medullary rays numerous, fine, wavy, and irregular.

WAMARA. *Swartzia tomentosa* DC.

Weight 65–80 lbs. (Record). The Guianas.

VERN—*Wamara, wamaru, womara, brown ebony, clubwood, ironwood, baracarra, wanebala,* B.G.—*Ferréol, bois fer, panacoco rouge, gran panacoco, bois de pagaie blanc, bois de perdrix, perdrix, heistère rouge, anacoco,* Fr. G.—*Apoetoe, boucara,* Sur.—*Páo de remo, hucuya, anacoco wanebala,* Braz.; *Legno ferro, legno carne di cavallo,* Ital.—*Páo ferro,* Port.—*Pferdefleischholz,* Germ.

The colour of this wood is a purplish-black, with a very hard, close grain, yielding a very smooth surface, approaching to the hardness and surface of African blackwood. This is one of the innumerable so-called ironwoods, and is referred to in this work in the article entitled Pao Ferro, which wood it much resembles.

The concentric layers are marked by fine, light- and dark-coloured lines. The pores are not very numerous, very small, and mostly plugged; the exceedingly fine, very numerous medullary rays are crossed by irregular and faint lines of light tissue, more or less pronounced.

WANA. *Nectandra Wana* and possibly *N. Pisi* Miq.

Weight 64 lbs. 2 oz. (wet). Surinam (Dutch Guiana).

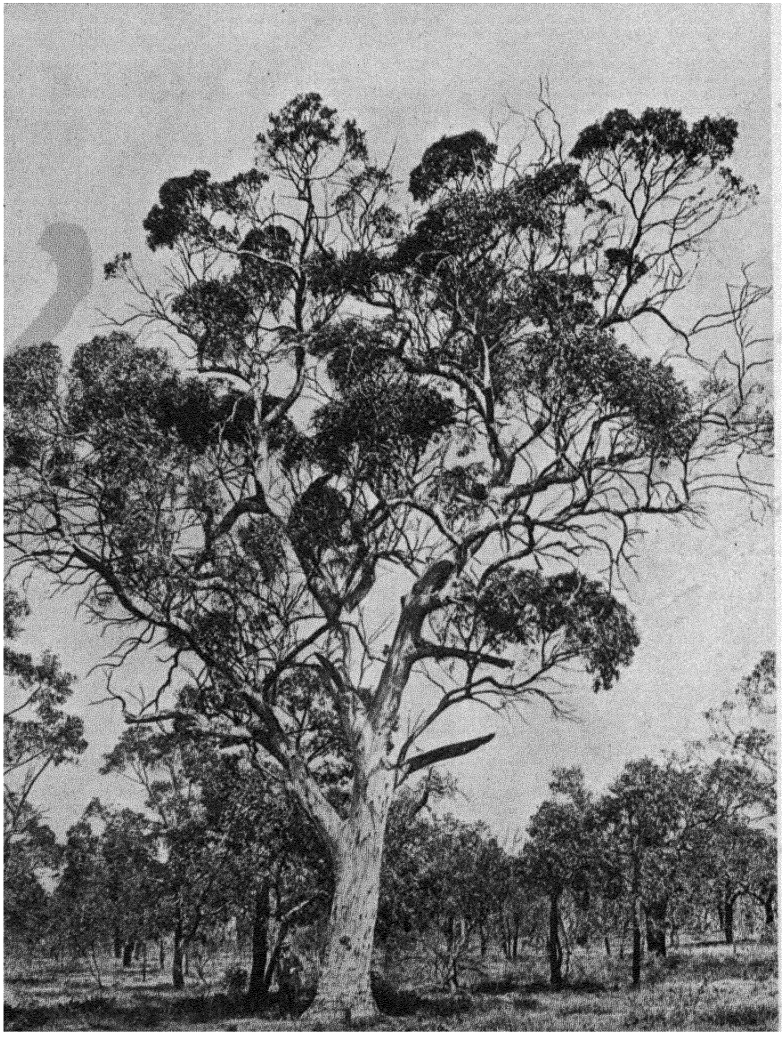
VERN—*Determa, tetruma,* B.G.—*Tétéroma, wane,* Sur.—*Grignon, grignon franc, grignon rouge,* Fr. G.—*Louro rosa* ?, Braz.

This wood is also called Surinam mahogany and cirouaballi but should not be confused with "brown silverballi," which, while resembling wana in structure and character, is heavier and of a different colour. It is of a light-red mahogany colour, and is very similar to the African mahogany in grain and texture, though a little coarser and rougher. It was unknown in the United Kingdom until 1914, when a shipment of 137 hewn logs was diverted from Havre to London on account of the war. The timber proved to be clean, straight, and sound, although somewhat defective in the heart. It works well, but does not easily take a nice finish from the tool. The sap-wood on the outside of the logs was much perforated with small worm-holes. A large quantity of this wood has been used as a substitute for Danzig pine, for the roof timbers of a church at Plymouth, and it appears to be wearing well. As long lengths and large squares can be produced, it should prove in the future to be a useful timber for many purposes.

The pores are numerous, evenly distributed, but not very open. The medullary rays are regular, parallel, and fairly even.

WANDOO. *Eucalyptus redunca* Schau.
Weight 70 lbs. Western Australia.

A local name for this wood is white gum. Julius gives the following report :



WANDOO—WESTERN AUSTRALIA
By kind permission of the High Commissioner for Australia

" Trees of average size attain the height of 60 to 80 feet, with an average diameter of 2 to 3 feet. The timber is brownish-red in colour, very hard, dense, strong and durable, and even when fully seasoned

weighs up to 70 lbs. per cubic foot. For railway sleepers this timber is deemed to rank equal to jarrah, and is also used for short piles and for bridge and wharf planking, etc., in permanent works when conveniently procurable. It has been, and continues to be, freely and very successfully employed for both wheelwrights' and millwrights' work, for which its extreme hardness, especially when seasoned, is particularly appreciated. It is used for ribs, bends, and knees in lugger and boat-building, (and) for mining timbers; while it serves to provide very durable fencing, stockyards and other settlers' wants. . . . As in other Eucalypts, the heart-wood core is to be avoided. Specifications for cut timbers should therefore require freedom from heart-wood, except in the case of piles, which are better round than squared.

"With regard to the durability of wandoo, the Railway Department, in reporting the result of sleepers laid on the Newcastle (Western Australia) line as a test, states: 'About 150 of these were put in about seventeen or eighteen years ago when the line was constructed. Fully 90 per cent of them are, to all appearance, as good as new, being very hard and sound, and they will in all probability last yet for many years. A few of the sleepers were slightly decayed on the outside, but on scraping off about a quarter of an inch the remainder of the timber was found in each instance to be perfectly sound. . . . The wood is not liable to attack by dry rot unless under conditions exceptionally favourable to its development.'"

C. E. Lane-Poole says that "its main use, however, is for waggon scantlings for the railway stock for the Government Railways of the State. It gives a life of twenty-five years in under-carriages of trucks. The top plank of these trucks is always made of wandoo, which stands the wear of the loading and unloading better than steel; also the stanchions of the trucks are of wandoo. A remarkable quality which this timber possesses is that when used in conjunction with steel there is no chemical action between the wood and the metal. Bolts have been taken from the under-frames of trucks after twenty years' use, and been found to be quite as clean as when put there, while the auger marks were still visible in the holes."

Warburgia ugandensis

Weight 54 lbs. East Africa.

VERN—*Musiga*.

This wood, which is also called greenheart, has somewhat the appearance of the darker kind of Demerara wood of the same name, but of a much closer texture, and very smooth to the touch, comparable with that of African blackwood.

It is yellow-gold with dark-coloured streaks, forming together a very handsome wood, far more decorative than the name greenheart might imply.

The small pores vary from small to minute, and are somewhat scarce and irregular in position, with well-defined, but fine, medullary rays, which are numerous, showing on the radial section as a faint ripple ray.

WASHIBA or **BOWWOOD.** *Tecoma* (or *Tabebuia*) spp. (Record).
Weight 58–59 lbs. British and French Guiana, Tropical South America.

The wood is of a dark olive-brown, with a close, firm, straight grain, similar to greenheart, with a rather lustrous surface. According to Record, " it attains a height of 120 feet or more, with trunks large enough to square 30 inches free of sap. The wood is strong, very elastic, and highly durable." On account of its particularly tough and elastic quality, it is highly prized for bows and fishing-rods, possessing the same qualities which make greenheart useful for this purpose, the tangential and bending strength being very great, although it does not possess great tensile strength.

Record refers to a confusion which has existed between washiba, *Tecoma* sp., and satine, *Brosimum paraense*, which also probably confused Herbert Stone. While washiba has no resemblance whatever to satine, it very closely resembles Surinam groenhart, and not in the same degree, the well-known Demerara greenheart ; indeed, even after examination the expert might make the mistake.

A report from Mr. Wood, Conservator of Forests, British Guiana, states that the tree is so rare in British Guiana that it would be doubtful whether a single log could be supplied.

The exceedingly numerous, very small pores are all plugged. The medullary rays are very fine indeed, very numerous, with exceedingly fine rays between, rather stronger and more pronounced on the radial section.

WATTLE. *Acacia dealbata* Link.
Weight 47 lbs. (Gamble). Eastern Australia, Tasmania, Northern India, Ceylon.

This wood, also called mimosa, white wattle, and silver wattle, produces a timber which is not considered of much value. The colour is a yellowish-red, with a metallic lustre, and it is perhaps suitable as a decorative inlay wood for cabinet work. Its general uses are for cheap casks, trenails, turnery, and fuel. It has a rapid growth, reaching a great height. It was introduced into India in 1840, where Gamble reports it as having reached a height of 46 feet with a diameter of 12 inches in eleven years, and it is to be seen as an attractive ornamental tree at Nuwara Eliya in Ceylon. A specimen grown at Powerscourt Castle, in Ireland, yields a fairly good-quality wood.

The concentric layers of growth are marked by dark lines. The pores are scarce and exceedingly small, occurring singly and in duplicate, surrounded by light-coloured tissue. Medullary rays very fine and wavy, irregular.

Wendlandia Notoniana Wall.

Weight 53 lbs. (Gamble). Ceylon, Southern India.

VERN—*Showla,* Mar.—*Puvu, thovara,* Trav. Hills—*Rawanidala,* Cingh.

The wood, which is of very little value, is of a light yellowish-brown colour, with a hard, close, even texture, showing signs of incipient decay.

The numerous pores are very small, with numerous medullary rays, very fine, sharp cut, and showing on the radial section in tiny flecks. Dark veins follow the lines of concentric growth and also strike at right angles across them.

WHITEBEAM. *Pyrus Aria* Ehrhart.

Weight 39 lbs. Europe, Asia.

The colour is generally yellowish-brown, but certain trees cut at the right time may yield white timber, with a very fine, close, hard grain, yielding a very smooth surface from the tool. According to Elwes its principal uses are for axle-trees, naves and felloes of wheels, carpenters' tools, walking-sticks, and in Hampshire (where the wood is known as whipcrop), for whip handles, handles of cutlery, musical instruments. The same author refers to an authority who states that it is liable to warp and split badly in drying, which last defect could be entirely prevented by proper handling.

The innumerable minute pores are almost invisible under the lens; medullary rays very numerous and fine, and show on the radial section as in beech, but of a much finer pattern.

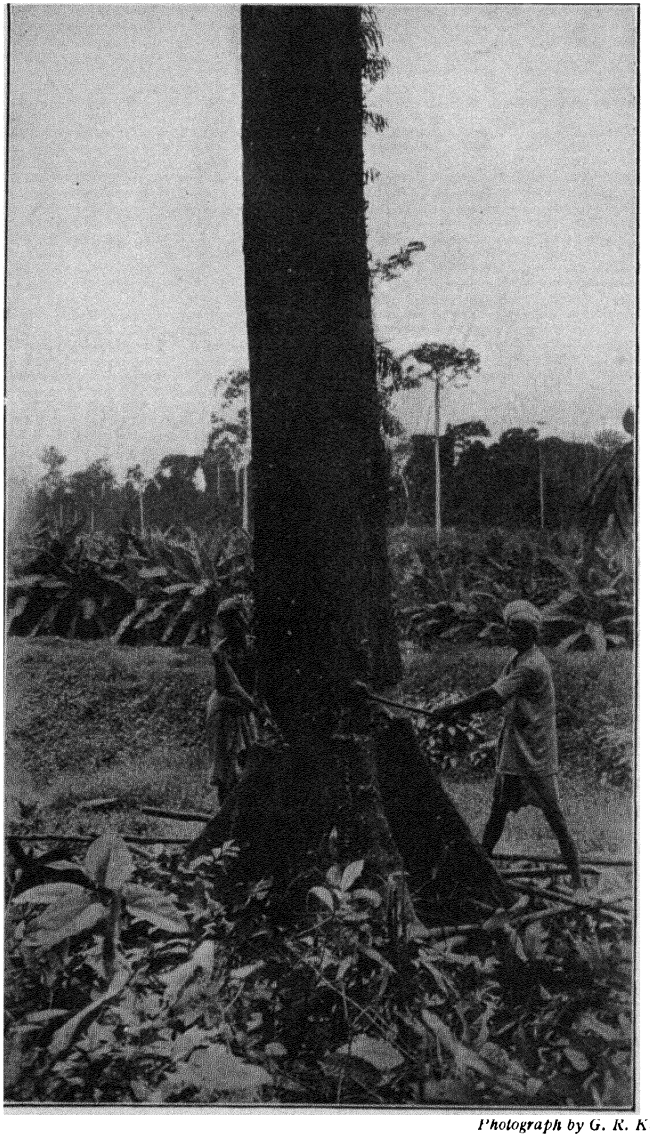
WHITE BOMBWE. *Terminalia procera* Roxb.

Weight 49 lbs. India, Burma, The Andaman Islands.

VERN—*Safed Bombway,* Hind.

The wood is a light brown nut colour, with slight, dark streaks, presenting the appearance of a grey Ancona walnut, with a somewhat similar grain, easy to work and yielding a smooth surface from the plane. Supplies have been confined to shipments from the Andaman Islands, the quality of which has proved satisfactory and produced a considerable demand, which might be greatly increased if regular supplies could be relied upon. There is some confusion as to the term " white " bombwe, some supplies being termed " bombwe " or " bombway," and what was thought to be the same wood, on arrival proving quite different and unsatisfactory.

Gamble would appear to have treated the produce of *T. procera* as equivalent to that of *T. Catappa*. Parkinson, on the other hand, differ-



Photograph by G. K. Keen

CONVICTS FELLING A *TERMINALIA PROCERA* TREE IN THE ANDAMAN ISLANDS

entiates between the two, referring to *T. procera* as the " white bombway tree," and *T. Catappa* as the " Bengal almond " or " Indian almond tree," the local name for the latter being " badam." The wood called " white bombwe " and that which was described as the produce of *T. Catappa*

(*q.v.*) and which has been supplied up to the present time, are quite different.

The pores are irregular in size and position, in singles and duplicates, partially plugged. The medullary rays are irregular, uneven in size, and not straight, showing strongly on the radial section.

WHITE CEDAR. *Tabebuia longipes.*

Weight 45 lbs. British Guiana, Brazil.

VERN—*Warikurru, warikuri, waracoori.*

A yellow-brown straw-coloured wood with a fairly hard grain, but not giving a very smooth surface from the tool. Has not been seen in commerce in Europe, but is reported as being used for oars and paddles, and considered very durable, especially underground. Although it is named cedar and white cedar, this wood must not be confused with the other Guiana cedar (*Protium altissima* or *Icica altissima*), although called cèdre blanc. The wood called tàipoca from Brazil is evidently the same as the above.

The not very numerous pores vary in size from small to medium, mostly plugged, with extremely fine medullary rays arranged at regular intervals and crossed at right angles by faint lines, which carry with them a row of pores.

WHITE MAHOGANY. *Eucalyptus acmenoides* Schauer.

Weight 64 lbs. (Baker).

New South Wales, Eastern Australia.

The colour of the wood so strangely termed " White Mahogany " is a dull brown walnut, with a grain quite unlike mahogany. Once more the misfortune of naming timbers because of the appearance of the bark, which appears to be the reason why this timber is called " white mahogany," is brought into prominence. The name should be immediately changed, and if no other more suitable one could be found, it might be called " New South Wales Walnut."

The grain is close, firm, and hard, harder than Queensland walnut but equally suitable for plain cabinet work, where a straight-grained, hard wood is wanted.

Baker mentions two varieties, viz. *Eucalyptus acmenoides* Sch. and *E. umbra* R.T.B., referring to the former as " hard, close-grained and heavy, suitable for general building purposes, shipbuilding, and wood blocks, also extensively used for sleepers, being one of the finest of our hardwoods." Weight 64 lbs. per foot cube. The latter, *E. umbra*, is 62 lbs. per foot cube. " Not recommended for use in the ground . . . occasionally subject to attack by borers, nevertheless a useful wood for house-building, bridge work, some forms of carriage construction, axe handles, and spokes."

WHITETHORN.

See HAWTHORN.

WHITEWOOD. *Liriodendron tulipifera* Linn. (The Tulip Tree).
Weight 28 lbs. 10 oz. North America.

This very important timber has been used for a vast number of purposes in the United Kingdom, America, and elsewhere. One of the most majestic of trees, it provides in that season of the year when it blooms, a most imposing and impressive sight ; the eye ranges along a great mass of wide-spreading foliage, while the tree-tops are clothed with innumerable tulip-like flowers. Scattered about in England are many beautiful specimens which our forefathers, with a greater appreciation of the effects of arboriculture than, alas ! is found to-day, planted around their dwellings and in their parks. One such tree was standing in what a few years since were the grounds of Bitterne Manor, at Southampton, on the site of the first Roman town in England, which was named Clausentium. This tree, probably 160 to 200 years old, proved to be an extremely well-figured tulip tree, having those particular marks which are called " blister," " snail," and " burr," and yielded a large quantity of veneer.

There is a handsome tulip tree of unusual size, which has a burry growth surrounding it, growing on the land belonging to Mr. Nichol, near Manningtree, which in the summer of 1930 bore a full crop of tulip flowers.

The timber is known in England as " whitewood " or " canary whitewood " ; in Scotland and England sometimes, though incorrectly, as " basswood " ; and in America as " poplar." The colour, when the wood is fresh cut, is canary yellow, sometimes with rather a bluish tint deepening and toning down with exposure to air to a light yellowish-brown, with a satiny lustre, which is probably caused by the countless small specks of bright, shining gum which glisten on all sections. It is mild, easy to work, silky in grain, and capable of a very smooth surface from the tool. Having been available in very large quantities, in long lengths and wide widths of beautiful quality, at a cost far below its real value, it has been extensively used for all kinds of joinery and cabinet work, fittings and similar work.

It requires time to season thoroughly, and shrinks considerably, but when properly dried, stands well under all conditions. It also finishes with a sharp edge, which renders it a good wood for moulding. It is extensively used in America, and, to a more limited extent, in the United Kingdom, for ply construction. A few trees are found possessing a curly grain ; these are generally cut into veneer, on a rotary veneer cutter round the log, producing a marking which is called " blister figure." These figury veneers are used for panels for decorative work in railway coaches,

state-rooms and saloons for yachts and steamers, and for general cabinet work.

The numerous pores are very small and regular. The medullary rays are uniform, distinct, and parallel, showing in small flecks on the radial section in a very even and artificial looking pattern.

WILLOW, EUROPEAN. *Salix coerulea* Smith
S. alba Linn.
Weight 24 lbs. 12 oz. Europe.

The well-known "bat-willow" is famous wherever the English language is spoken, and is so familiar that it seems almost superfluous to give a description. Although it always commands such a high price for bat-blades, and the demand is so large, it possesses many valuable characteristics which should encourage every forester to plant the tree wherever it can thrive. For bat-blades trees have been known to realise as much as 10s. 6d. per foot cube, or more. No other wood has been found which can be used to such advantage for artificial limbs. The tree trunk itself, or squares sawn out if the size be large enough, can be shaped and hollowed to the form of the limb, and although during the process, or when drying, it does occasionally split, it will generally stand. No other wood has been found that will satisfactorily pass this test. A considerable quantity was imported from America during the war, and the American artificers, who during the war were in charge of the artificial limb factories at Roehampton, called the wood they used "red willow." I have been unable to trace the actual species, but I cannot distinguish it from the English bat-willow. Owing to the wood denting instead of splitting when struck by heavy objects, it is valuable for linings for carts, barrows, brakes for railway and other waggons, being especially good for the last-named purpose, as it does not fire so readily as other woods by the friction of the wheels. Elwes and Henry say that the best class of bat-blades are obtained from *Salix coerulea, S. alba* producing blades of an inferior kind. The report adds: "G. W. Newton states that George Stephenson had a high opinion of willow as forming durable blocks for paving. Gorrie states that in roofing, it has been known to stand over one hundred years as couples, and with the exception of about half an inch on the outside, the wood has been found as fresh at the end of that period as to be fit for boat-building. Boards of willow were laid for floors in 1700."

Willow has been tried for aircraft construction at the Royal Aircraft Factory, with quite satisfactory results, but it is doubtful if sufficient supplies in the necessary lengths and sizes of straight-grained timber free from knots could be obtained to make its use practicable.

The numerous pores are exceedingly small. The medullary rays cannot be distinguished with the lens (+12).

WILLOW, JAPANESE. *Salix Urbaniana* Von Seeman.

Japan.

The Japanese name of this wood is Tokachiyanigi. It is obtainable in logs ranging from 12 to 20 inches in diameter, averaging about 15 inches. The wood is reddish-yellow in colour, with a white to straw-coloured sapwood, and is closer and finer in texture and grain than the English willow. It takes a smooth surface from the tool, and would make a good substitute for the latter in bat-making. It would also be suitable for aircraft construction, possessing as it does the same qualities as the English wood, as it is very similar to this, but the colour is slightly browner, and the annual rings are much closer.

The concentric layers are well-defined, the pores are not very numerous or large, and the medullary rays are obscure. On the tangential section the pores shine with minute particles of gum.

WOOLLYBUTT. *Eucalyptus longifolia* Link et Otto.

Weight 68 lbs. (Baker). New South Wales.

A deep red colour, tough, strong, hard, and close-grained. The Forestry Commission, N.S.W., report it as " not unlike red ironbark, for which more valuable timber it is sometimes substituted." It is a very durable timber but deficient in strength and elasticity, particularly near the heart.

Wu-chang.

China.

Professor Record identifies this as the wood of the cinnamon tree (*Cinnamomum zeylanicum*) (*q.v.*), with which I agree. Professor Chung's specimen is marked " the taste of wood sour."

The lines of concentric growth are marked by strong bands. Pores very small and scarce, mostly plugged. Medullary rays very sparse and confused.

Wu-tien.

China.

The colour is a rather dirty reddish-brown, with a soft, straight grain, showing the open pores like a poor-quality Spanish chestnut. Record identifies this wood as *Castanopsis* sp.

The concentric layers are marked by dark lines. The pores are very small and rather scarce. Medullary rays very fine, and almost unobservable under the lens, crossed at right angles by fine, small belts of light tissue.

Wu-t'ung.

China.

Professor Chung reports that this wood is said to be *Firminiana simplex.* Professor Record considers it to be *Paulownia.* The specimen submitted by Professor Chung does not resemble *Paulownia,* but is more like the Indian wood of *Bombax* sp.

It is soft-grained, of indifferent quality, and is a wood of which little use could be made in England, although there is a note on the specimen saying it is " good for making musical instruments."

The concentric layers are exceedingly wide, up to nearly one inch. The pores are numerous, plugged, coarse, and pithy, with coarse medullary rays showing on the radial section.

Xylia xylocarpa

Weight 57–61 lbs. India, Burma.

VERN—*Jambu,* Hind —*Jamba, yerúl, suria,* Mar —*Boja, kongora, tangani,* Uriya—*Tangedi,* Khond—*Irúl,* Tam —*Kada,* Mal —*Konda tangedu, tangedu, eruvalu, bojeh,* Tel —*Jambé, tirawa,* Kan —*Irúl, irummala, pangali,* Trav Hills—*Orjori,* Khond —*Tangani,* Saura —*Tangudu,* Palkonda—*Shilve,* Coorg

Until lately this timber was thought to be the same as the Burma pyinkado, *Xylia dolabriformis* Benth. Its range is throughout the Indian Peninsula, attaining a large size on the west coast, though not so great as pyinkado in Burma. The colour is brown, without the red tinge noticeable in Burma pyinkado. The grain is closer with more numerous but smaller pores, and the wood is more liable to split in seasoning. It has a very high reputation in India, where it is greatly in demand for all work where durability is required. On account of a brisk demand in India, sufficient quantities are not available for export.

The exceedingly numerous pores vary in size , they are single, and in groups of two, three, and even more, and usually plugged. The very strongly marked, finely defined medullary rays are very numerous, and with the pores make a pretty pattern on the tranverse section. The difference of construction as shown in the transverse section of the two woods—that is, the Burma *X. dolabriformis* and the Indian *X. xylocarpa*—are so marked that it seems strange that the two should ever have been included under one name.

Xylopia parvifolia Hk.

Weight 35–47 lbs. (Gamble). Ceylon, Southern India.

VERN—*Netawu, atukétiya,* Cingh.

A rather dirty, grey-coloured wood, with a straight, fine, hard grain, yielding a very smooth surface. A useful wood, but not suitable for export.

The concentric layers of growth are marked by strong, dark lines. The not very numerous pores are very small and plugged. Medullary rays numerous, regular, parallel, not showing on the radial section, crossed at right angles by similar white lines, making a very pretty lace pattern.

YACA or **YASI.** *Santalum Yasi* Seem.
Weight 36–37 lbs. The Fiji Islands.

A yellowish-brown wood streaked with lighter and darker markings, resembling New Zealand rimu, rather like olive-wood, and capable of a smooth surface like pencil cedar, having a slightly aromatic scent.

It is called the sandalwood of Fiji, and is a very attractive wood.

The numberless, minute pores are, together with the medullary rays, hardly discernible under the lens.

YACAL. *Shorea* sp.
Weight 62 lbs. 4 oz. The Philippines.

A shipment of fine, clean, faultless planks of this timber came to hand shortly before the war, and, as its undoubtedly good qualities were unknown, it was sold at an exceedingly unremunerative price. The wood is of a light yellowish-brown colour, with a firm, hard texture and close grain. It is very durable and reliable under all conditions, and would be much in demand if it were better known. According to Foxworthy, " yacal seems to be supplied by *Shorea balangeran* Burch., and other species of *Shorea*. Some of it is also supplied by *Hopea odorata* Roxb., and other species of *Hopea*. Large quantities . . . are used in the Philippines for railroad ties. Perhaps the largest place of export for the wood is British North Borneo. . . . A very excellent, durable wood which is said to be free from insect attack."

Experiments conducted in America have shown that yacal is one of the best woods that could possibly be used for acid containers.

The pores are of moderate size, generally plugged with glistening gum, and are disposed in groups forming a pretty pattern. The fine, clear-cut medullary rays, which are parallel, are very numerous, and are joined at wide intervals by a faint light-coloured ring, which follows the line of the concentric layers.

YANG. *Dipterocarpus tuberculatus* Roxb. (?)
Weight 42 lbs. 7 oz. Siam.

The resemblance of this wood to eng (*q.v.*) is so strong that one will pass for the other. It has been claimed that yang is better than eng, and *vice versa*. In general, it may be possible that yang is slightly lighter in colour, otherwise it is difficult to name any difference, and for description it will be well to refer to the section on eng.

YARURU. *Aspidosperma* sp.
Weight 62 lbs. British Guiana.

Record remarks that this wood is said to be *Aspidosperma excelsum* Benth., and he also adds that on account of the peculiar growth of the tree the wood is not much used, except by the Indians for paddles.

The colour is yellowish-white striped with salmon-pink, and it has a very close, hard, compact grain, which will not yield a very smooth surface from the tool. *Tropical Woods*, No. 17, p. 41, refers to its use for pulp, without giving it a very good character for this purpose.

The innumerable tiny pores, plugged and open, lie between numberless very close and fine medullary rays, parallel, at irregular intervals, not very straight.

YATE. *Eucalyptus cornuta* Labill.
Weight 77 lbs. Western Australia.

The colour of this wood is a rather dirty yellowish-grey. It is reported by Western Australian experts as the "strongest timber in the world." In one test for tensile strength, the breaking load was 17½ tons per square inch, 3½ tons less than that usually specified for wrought iron of ordinary quality. Its uses in Australia are for general wheelwrights' work. It occurs in localities in the South-west and Western Australia, but the supplies are so small that it has become almost a negligible quantity for milling, and insufficient for export.

The very small, plugged pores are arranged in short, twisted belts of bands, with innumerable, exceedingly fine, sharp medullary rays, which do not show on the radial section.

YELLOW-WOOD, AFRICAN. Source unknown.
Weight 20 lbs. East Africa.

This timber is also known as African pine. It has not yet been imported commercially into the United Kingdom, but is likely to be so in the near future. It is of a dirty yellowish-straw colour, with streaks of darker brownish-black. It is straight-grained, very light in weight, close and compact, and capable of a smooth surface.

Besides the above, the names of Natal yellowwood, and upright yellowwood, both of which are a species of *Podocarpus*, have been used, but as there has been no commercial import, and the wood is practically unknown in this country, the source of my specimen is doubtful.

On the transverse section even a sharp plane produces a broken fibre, and it is difficult to distinguish either pores or medullary rays.

YEMANE.

See *Gmelina arborea*.

YEMERI. *Vochysia hondurensis* Sprague.

British Honduras.

The colour of the wood is a whitish-yellow with a rather dirty blue stain, and a soft straight grain. A wood of little value. Record reports it as being used to a limited extent in Brazil for canoes, camp interior construction, and charcoal ; and in the drier regions, for fence-posts. On account of its pithy nature, the wood of the Honduras species does not give promise of being either durable or useful.

The pores are evenly distributed and regular, with somewhat confused and slight medullary rays, hardly visible under the lens on the radial section.

YEW, BRITISH. *Taxus baccata* Linn.

Weight 48–50 lbs. (Baterden). Europe.

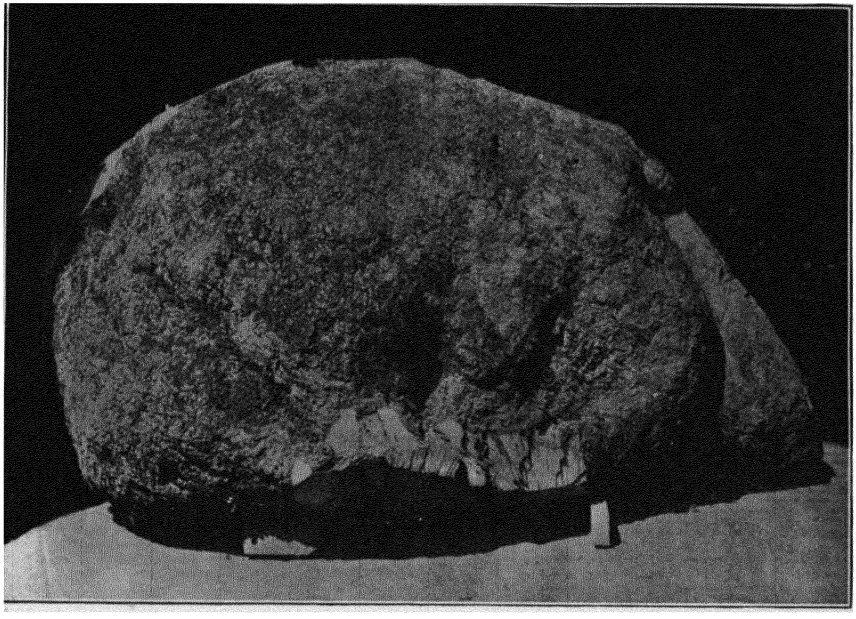
This useful and highly decorative wood is now little known or esteemed, although it possesses qualities which deserve much better recognition. If the economic use of domestic woods were practised in this country as it has been in France and Germany, yew would have undoubtedly been brought into prominence. The colour is a pale red, somewhat like cherry-wood or pencil cedar ; it has a beautiful, smooth lustrous grain. Sometimes it is handsomely figured, and occasionally has a burr growth, the produce of which will compare favourably with amboyna, and has indeed actually been mistaken for it. The strength and elasticity of yew-wood has been known for centuries, particularly on account of its use for bows, in this country. It also makes a good golf-club shaft, although its strength is not quite equal to sustaining the sudden shock of the striking blow, as with hickory for example, so that its life in the club is not so long as that of hickory.

At Sir Mark Collet's house, St. Clere, Kemsing, Sevenoaks, some handsome doors are made of yew. The stiles and rails are of the ordinary figured wood, and the panels of exceptionally fine figured burr. The colour has deepened with long exposure, assisted by careful polishing, and is now a rich warm red-brown leather colour, altogether forming one of the most attractive mediums for house decoration. Yew is particularly suited for the purpose of chair-making, and some very fine specimens of considerable antiquity are to be found in many places. Elwes and Henry allude to an extremely handsome armchair in Hornby Castle, the property of the Duke of Leeds. "The date is about 1550. It is made of yew, which adds to its rarity, for up to this time it was practically penal to employ yew-wood for any other purposes than the manufacture of the national weapon ; in this instance the wood has become close, as hard as steel, and of a beautiful dark amber colour." The wood, though it is difficult to obtain, is also valued for brush-work.

Lord Powerscourt has sent me a piece of yew tree taken from a bog in Ireland, which is a very rich dark plum colour. The wood seems to have greatly hardened and become excessively smooth, being also abnormally heavy.

The timber is so good that it deserves the full attention of forest economists, who should plant the tree for the use of future generations.

The concentric layers are strongly defined by dark lines.



AN EXCEPTIONALLY LARGE AND FINE YEW BURR FROM THE CAUCASUS
It measured over 7 feet in length

YEW, CAUCASIAN. *Taxus baccata* Linn.

The Caucasus.

This wood is imported in short hewn logs, from 7 feet to 10 feet in length and 14 inches to 28 inches in width. It is similar to the British-grown variety, but is a little denser and harder in grain. It has been used for brush-work, and for this purpose has occasionally been imported into Liverpool from the Caucasus. In 1911 one of the finest burrs I have ever seen was shipped to London from Batoum. This burr weighed nearly one ton and was magnificently marked. It was purchased by an American and sent to Paris.

Yung-shu. Source unknown.

China.

This is a common tree in Foochow, often attaining great size, and said to be a *Ficus* sp. A very attractive wood, which would be greatly admired

in any decorative woodwork. The colour and grain are similar to that of the Japanese keyaki, *Zelkowa keyaki*, but finer and closer.

The pores are very open, but small and scarce. The medullary rays are strongly marked, parallel at irregular distances, and joined at right angles by wide belts of similar white lines. It has a pretty transverse section. The medullary rays show strongly on the radial section.

ZEBRA-WOOD. *Astronium fraxinifolium* Schott. and *A. Conzattii.*

Weight 53–62 lbs. (Record). South America, Mexico.

VERN—*Gonçalo alves, gonçalo alves rajado branco* or *preto, guarabú rajado, guarabú batata, guarabú encirado, jejuira, muiraquatiara,* Braz.—*Zebra wood, Kingwood.*

It is doubtful if this wood has been imported into the United Kingdom for the last thirty years (1930).

Late in the eighteenth and early in the nineteenth century, during the period that rosewood was fashionable, zebra-wood was used to a limited extent, perhaps introduced by inclusion in shipments of rosewood, possibly from ignorance. It has again been seen lately in the London market (1931), called rosewood, but whether the present shipments are the produce of *Astronium fraxinifolium* or *A. Conzattii* is not clear. The alternative name of kingwood has not been used in the English market, the well-known kingwood of present and earlier times being distinctive.

Record states: "It is beautifully figured and is highly esteemed for the manufacture of fine furniture. The darker and heavier grades make good railway ties, and are useful for any purpose requiring a strong and durable wood. It is often mixed in shipments of Brazilian rosewood."

The wood is streaked with coloured lines of light yellow to red, and has dark red and almost black stripes. It has a close grain, with broad contrary layers of hard and soft texture, capable of a very smooth surface, but hard to work for British requirements.

The numerous small pores are very regular in position, almost invariably plugged; medullary rays very numerous, exceedingly fine, but not showing on the radial section.

ZEBRA-WOOD, RED.

See *Melanorrhoea* spp.

ZEBRANO or **ZINGANA.** ? *Cynometra* aff. *C. Lujai* Willd.

Weight 64–65 lbs. West Coast of Africa.

VERN—*Bois zébre, zébrano,* Col.—*Izingana,* Ferran-Vaz—*Zingana,* Setté-Cama.

Known also as "zebra" wood in the United Kingdom and America. The colour is a lustrous, light gold with narrow streaks in varying widths

of a deep warm brown, which slightly darken on exposure. A highly decorative fancy wood of exceptional appearance, quality, and colour. The Continental and American demand has been fairly considerable, and a certain amount of interest has been created in the United Kingdom.

A specimen of this wood was given to me many years ago, accompanied by a statement that it grew on the foothills of the Cordilleras in South America, and that the wood contained a certain amount of gold, and was named " goldwood " on that account. It seems probable that this was an invented story to obscure its origin, for trade purposes. Record mentions goldwood as a common name of *Pithecolobium vinhatico* ; there is no resemblance between these two woods and they should not, therefore, be confused.

According to the French authorities, the tree belongs to the Gaboon district and the Cameroons, and is not abundant.

The pores are of medium size and are fairly numerous ; they are sometimes surrounded by a patch of loose tissue. The medullary rays are exceedingly fine and very numerous.

ZELKOWA or ZELKVA. *Zelkowa crenata* Spach.
Z. ulmoides Schneider.
Southern Russia (Caucasus), Northern Persia.

The name of the tree in its native land is " dzelkwa," meaning " stone-wood," so called because of the hardness of the wood and the difficulty in driving nails.

Three species are known, the largest of which is *Z. acuminata* in Japan and China, *Z. crenata* as above, and *Z. cretica*, a shrub of Crete and Cyprus.

The wood is yellowish-white, with a tough, hard grain, much like American or Canadian elm, but not so close-grained or long in the fibre. Mr. Dollimore says : " The tree was introduced into England in 1760 . . . it is tough and flexible, does not crack and warp, takes a fine polish, and is very durable even when placed in wet situations . . . suitable for cabinet work and carriage building." While there is some resemblance to the keyaki of Japan (*Z. acuminata*), there is an entire absence of that beautiful sheen or lustre which the Japanese wood possesses in a high degree, and although the wood of *Z. crenata* is undoubtedly a strong serviceable timber, it would never be so noticeable when used as pillars to the temples, as the Japanese *Z. acuminata*, both in Japan and China. In a private note Mr. Dollimore calls attention to the resemblance of these woods to those of the elm (*Ulmus*), a likeness so marked that the expert in timber who had never heard the name " zelkva " would immediately identify the wood as of *Ulmus* sp.

ZIRICOTE. *Cordia dodecandra* DC.

Weight 60 lbs. Honduras, Mexico.

The colour is a warm brown, streaked with dark and almost black lines, with a firm, close, hard grain similar to rosewood. A very attractive decorative wood for the best class cabinet and inlay work, suitable for turning.

Mr. Hugh Saunders finds records of its being held in stock and in considerable demand seventy years ago.

Record in *Timbers of Tropical America* does not name ziricote but gives siricote as a " similar wood " and tentatively refers to it as *Cordia gerascanthoides*, but in a letter (1931) corrects this decision. Ziricote and canalete *C. gerascanthus* must not be confused, the difference between the two woods being very great.

The not very numerous pores, variable from very small to medium size, and mostly open, are ranged between prominent and secondary medullary rays, varying from exceedingly fine to very coarse, crossed at right angles by strong, deep, almost black, irregular lines, which look like the dark black veins in marble. The rays do not show on the radial section.

Zizyphus jujuba Lam.

Weight 48 lbs. India.

VERN—*Bér, baer, beri*, Hind.—*Kúl, bér*, Beng—*Rengha, regi*, Tel.—*Yellande, ellandi*, Tam—*Bhor, bér*, Mar—*Renga*, Bhil—*Elentha*, Mal.—*Yelchi, ilanji, ilantai*, Kan—*Yellantha*, Madura—*Botay*, Melghát—*Jóm, janóm*, Sonthal—*Janumjan*, Kól—*Boré*, Khond—*Ringa*, Gondi—*Bor*, Baigas—*Bogei*, Rajbanshi—*Jibang*, Magh.—*Ber, bogri*, Ass—*Boro-koli*, Uriya—*Maha-debara*, Cingh—*Zi, zidaw*, Burm.

The wood of the " jujube " tree very much resembles a plain, straight, even-grained black walnut (*Juglans nigra* Linn.), though it is slightly lighter in colour. The evenness and regularity of the grain, and its evidence of good standing qualities, should recommend it for important cabinet and other work. Gamble reports it as " universally used for saddle-trees, also for agricultural implements, sandals, bedstead legs, tent-pegs, golf clubs (Chicago Exch. Cat.), and other purposes." Troup mentions its use for gun-stocks, for which its qualities would appear strongly to recommend it.

Pearson and Brown in *Commercial Timbers of India* name *Z. Xylopyrus* Willd. as producing a wood which is generally considered inferior to that of *Z. jujuba*, but nevertheless attractive and likely to be useful.

The pores are very small and are surrounded by a pale halo ; the concentric layers are very clearly marked. The medullary rays are hardly discernible under the lens (+12).

Zizyphus mucronata and *Z. Spina-Christi* Lam.

Baluchistan.

Neither of these woods is known in commerce, but according to the Annual Report of the Imperial Forestry Institute, Oxford, for 1930–31, one of the two woods taken from the shrines outside the sarcophagus of Tutankhamen (*circa* 1356–50 B.C.) resembles *Z. Spina-Christi*, and closely resembles *Z. mucronata* (the *sidder* of the Sudan).

A specimen of *Z. Spina-Christi* has just been received at the Imperial Forestry Institute, and is being examined, and it is thought that it may throw further light on the identity of the species found as stated above. The wood is reported to be in a fine state of preservation after surviving about 3200 years.

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CLASSIFICATION OF TIMBERS ACCORDING TO COUNTRY OF ORIGIN

AFRICA

Abura
Acacia seyal
Acacia verugera
Afara
Agba
Ainyeran
Alder
Aligna
Ash, Cape
Assegai Wood
Avodire
Ayous

Baobab
Barwood
Beech, Cape
Blackwood
Bongossi
Borassus flabellifer
Boxwood, African or East London
Boxwood, Knysna
Briar Root
Bubinga

Camphor
Camwood
Cape Sandal
Cassia kotschyana
Cedar, Pencil
Cedar, Red
Cedar, True
Cedar, West African
Crataeva Adamsonii
Cunonia capensis

Danta

Ebony
Ekhimi
Excoecaria sp.

Fig
Framere
Furniture Wood

Gold Wood
Greenheart

Hawthorn or Whitethorn
Hazel

Iroko
Ironwood, East African

Kingwood

Mahogany
Mangrove
Melia composita
M'kunguni
Moeri
Movingui
Muer
Mugaita
Muhugu
Murosi
Musengera
Mushami
Mutari
Muzaita

Oak, African
Oak, Holm
Oak, *Lophira alata*
Obechi and Arere
Obobonekhui
Ocotea usambarensis
Ogugu
Okwein
Orange

Padauk
Pine, Maritime
Pleurostylia Wightii
Podocarpus spp.
Podocarpus elongata
Privet

Sabicu, African
Samba
Sandaleen
Sasswood
Satinwood
Sneezewood
Spindle Tree
Stinkwood

Thuya
Tiama
Tiamo

Um-tom-boti

Walnut, African
Warburgia ugandensis
Whitethorn or Hawthorn

Yellow-wood

Zebrano or Zingana

CENTRAL AMERICA AND THE WEST INDIES

Abey
Abey Macho
Acana
Almond Wood, Cuba
Amaranth
Amyris Wood

Balsa Wood
Banak
Bay Cedar
Baywood
Bibiru
Billy Webb
Bitterwood
Black Mangrove
Black Poison
Boxwood, West Indian
Bullet Tree
Bullet Wood

Cabbage Bark
Cabilma or Cabirma
Canalete
Cape Sandal
Catalpa
Cedar
Cedar Pencil
Cheesewood
Chicaron
Cinnamon
Cocobola
Cocus Wood
Concha Satinwood
Coral Wood
Cypress
Degame Wood
Dialium divaricatum
Dogwood

Ebony, Green
Enterolobium Saman
Excoecaria sp.

Fustic

Glassy Wood
Greenheart
Guajada
Gullacan
Guiri

Harewood
Hojochee

Ira rosa

Jug

Koa

Lalone
Lancewood, San Domingo
Lignum-vitae
Locust Wood
Logwood

Madre cacao
Mahoe, Blue
Mahogany
Mahogany, Costa Rica

Mamee Apple
Mangrove
Mayflower
Moho
My Lady

Nargusta
Negrito

Olivier
Orange

Pimento
Pine, Cuban
Podocarpus spp.
Polak
Populus trichocarpa
Prickly Yellow
Prima Vera

Qualm
Quassia
Quira

Redwood
Rhododendron
Rosewood

Sabicu
Salm Wood
Sandalwood
Santa Maria
Sapodilla
Satinwood, West Indian
Silly Young

Tamarind
Teak, Surinam
Tobroos

Waika Chewstick
Walnut, Satin

Yemeri

Zebra-wood
Zircote

CANADA AND U.S.A.

Acacia
Alder, Red
Alder, White
Apple, Oregon Crab
Arbor Vitae
Ash, American
Ash, Canadian

Balsam, Alpine Fir
Balsam, Amabilis Fir
Balsam, Lowland Fir
Barberry
Basswood
Beech, Canadian
Big Tree
Birch
Bird Cherry
Black Mangrove
Buckeye, Ohio
Butternut

Cape Sandal
Cedar, Pencil
Cedar, Port Orford
Cedar, Red
Cedar, Western Red
Cedar, White
Cedar, Yellow
Cherry, American Black
Chestnut
Corkwood
Cornel
Cotton Wood
Cupressus macrocarpa
Cypress, Bald

Dogwood

Elm
Excoecaria sp.

Hackberry
Hemlock, Mountain
Hemlock, Western
Hickory
Hornbeam

Ivy

Larch, Alpine
Larch, Western
Lilac, California

Madrona
Magnolia
Maple
Maple, Vine, Dwarf

Oak
Oak, Live
Orham Wood
Osage-orange

Persimmon Wood
Pine, British Columbia or Oregon
Pine, Jack
Pine, Limber
Pine, Lodge-Pole
Pine, Pitch
Pine, Red
Pine, Sugar
Pine, Tonawanda
Pine, White
Pine, Yellow or White
Pinus Coulteri
Pinus ponderosa
Plane
Populus trichocarpa
Privet, Swamp

Rhododendron

Sequoia
Serviceberry, Western
Service Tree
Snowdrop Tree
Spruce
Spruce, Black
Spruce, Engelmann
Spruce, Hemlock
Spruce, Silver
Sumach

Tamarack
Tsuga
Tupelo

Walnut, Black
Walnut, Satin
Whitewood
Wych Elm

SOUTH AMERICA

Acapu
Aceude Candeia
Aderno
Alerce
Amaranth
Amarello
Amarello Vinhatico
Amyris Wood
Angelim
Angelim Amargosa
Angelim Pedra
Angelim Rosa
Angélique
Angico
Aniba panurensis
Araribá, *Centrolobium* sp.
Arariba, *Sickingia* sp.
Arariba Vermelha
Araucaria imbricata
Arisauru
Aroeira do Sertão
Assa Leitao

Bacupary
Balsa Wood
Barba Timao
Bay Cedar
Beefwood
Black Mangrove
Boxwood, West Indian
Brauna Parda
Brazil-wood
Brownheart
Bullet Wood

Cabbage-bark
Cabo de Jucho
Caligoa
Camassary
Camassary de Carunxo
Canella
Canella Imbuia
Cangerana
Carcaunda
Catingueira
Cedar, Brazilian
Cedar, Guiana
Cedar, Paraguay
Cedrela
Cocao

Cocobolo
Conduru
Copie
Coracao
Coracao de Negro
Cow Tree
Crabwood
Cravo do Maranhao
Cuaruba
Cunaru or Cumaru
Cupressus macrocarpa
Curupay

Desbota
Dialium divaricatum

Enterolobium Saman
Eperua falcata
Escallonia
Espavé

Fejao Brabo
Fire Bush
Foocadie
Frei-jorge

Garapa
Goapiba
Goia beira
Goity coro
Goldwood
Gororoba
Grapia-Punha
Greenheart
Greenheart, Surinam
Guanandirana
Guarabu
Guatecare
Guiri

Hoobooballi
Hornbeam

Ibicuiba
Imberiba branca
Imbiu amarello
Ipe
Itauba puana

Jacua or Jagua
Jarana preta
Jequitiba
Juca

Kakaralli, Black
King-tree
Kingwood

Lancewood
Larangeira
Locus Wood
Locust Wood
Louro vermelho

Mahogany, Colombian
Mahogany, Venezuelan
Mamee Apple
Mangrove
Maria preta
Massaranduba
Matamata
Milho cozido
Moho
Moira-tinga
Monca branca
Mora
Muirapiranga
Multa
Munguba

Negrito
Nutwood

Oity
Oleo vermelho
Orelha de Macaco

Páo d'arco
Páo branco
Páo carga
Páo ferro
Páo mullato
Páo d'oleo
Páo pombo
Páo santo
Páo setim
Papaw
Paraguay Lignum-vitae
Paraju
Partridge-wood
Pau or Pao amarello
Peroba branca
Peroba rosa
Pindahyba
Pine, Brazilian
Pine, Cuban
Pinho do Minas

Piquia
Piquia marfim
Piquia peroba
Porcupine Wood
Purpleheart

Quassia
Quebracho
Quira

Rabuge
Rain Tree
Rhododendron
Roble
Rosewood, Bahia and Rio

Sabia
Salm Wood
Sandalwood
Santa Maria
Sapocarana
Sapucaia
Sapucaia de Pilao
Satinee
Silverballi, Brown
Silverballi, Keriti
Silverballi, Yellow
Simaruba amara
Snakewood
Sucupira
Sucupira amarella

Tambaiba
Tapinhoan
Tariman
Teak, Surinam
Tobroos
Tulipwood

Vera Wood
Vinhatico

Wamara
Wana
Washiba or Bow Wood
White Cedar

Yaruru

Zebra Wood

ASIA

Alder
Arbutus unedo

Bay Tree
Birch
Boxwood

Caucasian Wing Nut
Cedar, True
Cherry, Wild
Cypress

Hazel
Hopea odorata

Larch, Siberian
Laurel, Common

Melia composita

Oak, Russian
Pine
Pine, Bosnian Pitch
Plane
Populus euphratica

Rhododendron

Sapan
Spindle Tree

Vine, Common

Walnut, Caucasian
Walnut, *Juglans regia*
Whitebeam
Whitethorn and Hawthorn

Yew, Caucasian

Zelkowa or Zelkwa

AUSTRALIA, TASMANIA, NEW ZEALAND

Akeake
Araucaria Bidwilli
Ash, Mountain
Ash, Red
Ash, Silky

Banksia
Beech, Silky
Beech, White
Blackbean
Blackbutt
Blackwood
Bollywood, Brown
Box, Grey
Box, Swamp
Boxwood
Boxwood, Buff
Boxwood, Yellow
Brush Box
Bull Oak

Cedar, Moulmein
Cedar, Red
Cheesewood, Tasmanian
Cherry, Vic.
Chicaron
Coach Wood
Corkwood or Marara
Crowsfoot Elm
Cudgerie
Cupressus macrocarpa

Eucalyptus capitellata
Eucalyptus corymbosa
Eucalyptus Delegatensis
Eucalyptus fastigata
Eucalyptus fraxinoides
Eucalyptus Oreades
Eucalyptus Sieberiana
Eucalyptus Smithii
Eucalyptus virgata
Eumung
Excoecaria agallocha

Flindersia australis

Gum, Blue
Gum, Forest Red
Gum, Grey
Gum, Murray Red
Gum, Red
Gum, Salmon
Gum, Slaty
Gum, Spotted
Gum, Sydney Blue
Gum, York

Harpullia pendula
Hickory, Queensland
Hinau
Horoeka

Ironbarks
Ironbox, Black
Ironwood, Red
Ivorywood

Jarrah

Karri
Kowhai

Litsoea chinensis
Long Jack

Maiden's Blush
Maire, Black
Malletwood, Brown
Mangeao
Manuka
Maple Silkwood
Marblewood
Matai
Melaleuca leucadendron
Melia composita
Miro
Morrell
Mulga
Muskwood
Myall
Myoporum serratum
Myrtle

Native Cherry
Needlewood
Nettle Tree

Oak, Caledonian
Oak, Forest
Oak, Tasmanian

Pahautea
Pear, Native
Peppermint
Pine, Aleppo
Pine, Brown
Pine, Celery Top
Pine, Cypress
Pine, Hoop
Pine, Huon
Pine, Kauri
Pine, King William
Pine, Maritime
Pine, New Zealand
Pine, Silver
Pittosporum
Podocarpus spp.
Pohutukawa
Pukatea
Puriri

Quangdong, White

Raspberry Jam Wood
Rata
Red Ash
Red Bean
Red Mahogany
Red Silky Oak
Rewa-Rewa
Rimu
Roble
Rosewood

Sandalwood
Sassafras, Tasmanian
Shee Oak
Silkwood, Bolly
Silky Oak
Stringybark
Stringybark, White
Sycamore, Satin

Tallow Wood
Taraire
Tawhai
Tingle-Tingle
Titoki
Totara
Towhai
Tuart
Turpentine
Turpentine, Brush

Walnut, Queensland
Wandoo
Wattle
White Mahogany
Woollybutt

Yaca or Yasi
Yate

BORNEO, THE PHILIPPINES AND MALAYA

Albizzia odoratissima
Altingia excelsa
Amboyna
Apitong and Bagac

Bagtikan. *See* Lauan
Bedaru
Betis
Billian
Bua-Bua

Camphor Wood
Cassia siamea
Chingal
Coromandel Wood

Dedali

Ebony, Macassar
Elaeocarpus serratus
Empata
Excoecaria agallocha

Feronia elephantum
Ficus callosa

Guizo or Guijo

Harpullia imbricata
Hopea odorata

Ingyin

Jarul
Jelutong

Kamap
Keledang
Kranji or Keranji

K'runtum
Kungkur

Lagerstroemia Flos-reginae
Lauan (Bagtikan)
Litsoea chinensis
Lumbayao

Madre cacao
Mangifera indica
Medang or Mendong
Melaleuca leucadendron
Melanorrhoea spp.
Mempening
Mengkulang
Meranti
Merawan
Mesua ferrea
Mingris
Mirabow, Miraboo or Merbau
Molave
Myristica Irya

Narra
Niri

Pagatpat
Petaling
Punah

Red Sanders
Resak
Ringas or Rengas

Sapan
Sepetir
Serayah

Taingbok
Tapang
Teak, Java
Tempenis
Terminalia Chebula
Tetrameles nudiflora
Timidak
Trincomali Wood

Vitex pubescens

Yacal

Zebra-wood, Red

CHINA

Ailanthus glandulosa
Amlika

Bombax ceiba

Camphor, True
Cha-chai
Chang-chai
Ch'i-hsii
Ch'i-lin
Chin-ch'ai
Ch'i-sha
Chu-mu
Cypress, Funeral

Elm

Fu-ch'ai

Hon-huan-shi
Hopea odorata
Huai-ch'ai
Hua-li-mu or Cang-szu
Huang-nun-mu

Hung-ch'ai
Hung-li

Ingyin

Jsing-p'i-hsiang
Juniperus chinensis

Ko-ch'ai
Kuei-ch'ai
K'u-szu

Li-ch'ai
Litsea chinensis
Longan-ch'ai
Lumbayao

Nan-ch'ai
Nan-mu-hua

Paulownia
Pê-ch'i-sha
Pê-li
Pê-ya

Phyllanthus emblica
Pien-ch'ai
Pine, Korean
Privet

Sa-ch'ai
Sha
Sha-chu
Shan-t'ao
Sh-eng-ch'ai
Shih-kun
Shui-li
Sophora
Stephegyne tubulosa
Sung-pê
T'ao-jen
Ts'i-ch'ai
Tsuga
Tu-ch'ai
Tung-ch'ai
Tung-tsao
Tzu-hsin

Walnut, *Juglans regia*
Walnut, Manchurian
Wu-chang
Wu-tien
Wu-t'ung

Yung-shu

EUROPE

Acacia
Alder
Almond
Apple
Araucaria imbricata
Arbutus unedo
Ash
Aspen

Bay Tree
Beech
Birch
Blackthorn
Boxwood
Briar-root

Cedar, True
Cherry, Wild
Chestnut
Cupressus macrocarpa
Cypress

Damson

Elder
Elm
Elm, Cornish
Elm, Wych
Excoecaria sp.

Fir, Silver

Hazel
Hickory
Holly
Hornbeam
Horse-chestnut

Ivy

Laburnum
Larch
Larch, Siberian
Laurel, Common
Laurustinus
Lilac Tree
Lime

Mulberry

Oak, Austrian
Oak, British
Oak, Bog
Oak, Brown
Oak, Burr and Pollard
Oak, Cork
Oak, Holm
Oak, Russian
Oak, Spessart
Olive
Orange

Pear Tree
Pine, Aleppo
Pine, Alpine
Pine, Bosnian Pitch
Pine, Dantzic
Pine, Maritime

Pine, Red Baltic
Plane
Plum
Poplar, English
Poplar, Grey
Privet

Service Tree
Spindle Tree
Spruce
Sycamore

Veronica
Vine, Grape or Common

Walnut, British
Walnut, French
Walnut, Italian
Walnut, *Juglans regia*
Walnut, Spanish
Walnut, Turkish
Whitebeam
Whitethorn or Hawthorn
Willow

Yew, British

Zelkowa or Zelkva

INDIA, BURMA, CEYLON, THE ANDAMAN ISLANDS

Abies pindrow
Abies Webbiana
Acacia arabica (Babul Tree)
Acacia Catechu
Acacia ferruginea
Acacia leucophloea
Acacia modesta
Acacia Robinia pseudacacia
Acer Campbelli
Acer caudatum
Acrocarpus fraxinifolius
Aesculus indica
Aglaia Roxburghiana
Albizzia amara
Albizzia lucida
Albizzia odoratissima
Albizzia procera
Albizzia stipulata
Almond Wood
Alnus nepalensis
Alseodaphne semecarpifolia
Alstonia scholaris
Altingia excelsa
Amlika
Amoora Rohituka
Amoora Wallichii
Anacardium occidentale
Anan
Anisophyllea zeylanica
Anogeissus acuminata
Anogeissus latifolia
Anthocephalus Cadamba
Aquilaria agallocha
Artocarpus Chaplasha
Artocarpus hirsuta
Artocarpus integrifolia
Artocarpus Lakoocha
Artocarpus nobilis
Aukchinza

Balanocarpus utilis
Balsa
Barberry
Barringtonia acutangula
Barringtonia racemosa
Bassia latifolia
Bassia longifolia
Bauhinia racemosa
Bauhinia retusa
Beilschmiedia sikkimensis
Benteak
Birch, Indian
Bischofia javanica
Blackwood
Boehmeria rugulosa
Bombax insigne
Bombax malabaricum
Borassus flabellifer
Boswellia serrata
Boxwood
Bridelia retusa
Bruguiera gymnorhiza
Bua Bua
Buchanania latifolia
Bucklandia populnea
Bursera serrata
Butea frondosa

Calophyllum spp.

Camphor, Nepal
Campnosperma zeylanicum
Canarium sikkimense
Canarium zeylanicum
Canthium didymum
Carallia calycina
Carallia integerrima
Carapa moluccensis
Careya arborea
Caryota urens
Cassia fistula
Cassia marginata
Cassia siamea
Castanopsis Hystrix
Castanopsis indica
Cedar, Moulmein
Cedar, Red
Cedrela multijuga
Cedrela serrata
Champ
Chickrassia tabularis
Chooi
Cinnamomum Cecicodaphne
Cinnamomum inunctum
Cinnamomum zeylanicum
Coral Wood
Cordia sp.
Coromandel wood
Cotoneaster frigida
Crataeva Roxburghii
Crypteronia paniculata
Cullenia excelsa
Cupressus torulosa
Cynometra ramiflora
Cypress, Funeral

Dalbergia cultrata
Dalbergia lanceolaria
Dalbergia Oliveri
Dedali
Dephelium longana
Dhup
Dialium ovoideum
Dichopsis polyantha
Dillenia sp.
Diospyros Embryopteris
Diospyros tomentosa
Dipterocarpus glandulosa
Dipterocarpus indicus
Dipterocarpus pilosus
Dipterocarpus zeylanicus
Dolichandrone stipulata
Doona congestiflora
Doona Gardneri
Doona trapezifolia
Doona zeylanica
Duabanga sonneratioides
Dysoxylum spp.
Dysoxylum binectariferum
Dysoxylum glandulosum
Dysoxylum malabaricum

Ebony
Ebony, Burmese
Echinocarpus dasycarpus
Elaeocarpus serratus
Elaeodendron glaucum
Elm
Eng
Engelhardtia spicata
Eriolaena candollei
Eugenia bracteata
Eugenia Gardneri
Eugenia Jambolana
Eugenia sylvestris
Excoecaria agallocha

Feronia elephantum
Ficus callosa
Ficus Tsiela
Fig
Filicium decipiens
Fire Bush, The
Flacourtia Cataphracta

Gangaw
Gardenia spp.
Garuga pinnata
Gluta tavoyana
Gluta travancorica
Gmelina arborea
Grewia tiliaefolia
Grewia vestita
Gum, Blue
Gurjun
Gyo

Haldu
Hardwickia binata
Hardwickia pinnata
Harpullia imbricata
Hemicyclia sepiara
Heritiera Fomes
Heritiera littoralis
Heterophragma adenophyllum

Heterophragma Roxburghii
Holarrhena antidysenterica
Homalium tomentosum
Homalium zeylanicum
Hopea odorata
Hopea parviflora
Hopea Wightana
Hymenodictyon excelsum

Ingyin
Ivy

Jackwood
Jamba
Jarul

Kayea assamica
Koko
Kurrima zeylanica
Kydia calycina

Lagerstroemia Flos-Reginae
Lagerstroemia hypoleuca
Lagerstroemia lanceolata
Lagerstroemia parviflora
Lancewood, Moulmein
Laurel Wood
Leza Wood
Limonia acidissima
Litsoea chinensis
Litsoea Gardneri
Litsoea zeylanica
Lophopetalum fimbriatum
Lophopetalum Wightianum
Losonia
Louro

Machilus edulis
Machilus Gammieana
Machilus macrantha
Machilus odoratissima
Magnolia Campbellii
Mahogany
Mahwa
Mallotus Philippensis
Mangifera indica
Mangrove
Marblewood, Andamans
Mastixia Thwaitesii
Melaleuca leucadendron
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Melia Azedarach
Melia composita
Melia indica, M. Azadirachta
Memecylon capitellatum
Mesua ferrea
Michelia Kisopa
Michelia nilagirica
Miliusa velutina
Millettia pendula
Mimusops elengi
Mimusops hexandra
Mimusops littoralis
Mirabow or Miraboo
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Morus indica
Morus laevigata
Myristica Irya
Myristica laurifolia

Nedun

Oak, Himalayan
Oak, Indian
Odina Wodier
Olea ferruginea
Orange
Ormosia stralta

Padauk, Andamans
Padauk, Burma
Palaquium ellipticum
Palaquium grande
Palaquium petiolare
Papaw
Parashorea stellata
Parishia insignis
Pentace Griffithii
Phyllanthus emblica
Phyllanthus indicus
Pine, Blue
Pine, Long-leafed
Pine, Maritime
Pistacia integerrima
Pityrantha verrucosa
Pleurostylia Wightii
Podocarpus neriifolia
Poeciloneuron indicum
Polyalthia cerasoides
Polyalthia simiarum
Populus euphratica
Porcupine Wood
Premna tomentosa
Prosopis spicigera
Prunus Puddum
Pterocarpus Marsupium
Pterospermum acerifolium

Pterospermum suberifolium
Pyinkado

Quercus Lamellosa
Quince

Rain Tree
Red Bombway
Red Sanders
Ringas or Rengas
Rosewood, East Indian

Saccopetalum tomentosum
Sal
Salix tetrasperma
Sandalwood
Sandan
Sapindus emarginatus
Sarcocephalus cordatus
Satinwood, Andaman
Satinwood, East Indian
Schima Wallichii
Schrebera Swietenioides
Semecarpus Anacardium
Shorea assamica
Shorea talura
Sideroxylon tomentosum
Sissoo
Snakewood
Sonneratia apetala
Soymida febrifuga
Spondias mangifera
Spruce, Himalayan
Stephegyne diversifolia
Stephegyne parvifolia
Stephegyne tubulosa
Sterculia foetida
Stereospermum chelonoides
Stereospermum suaveolens
Stereospermum xylocarpum

Taingbok
Talipot Palm
Tamarisk

Teak
Terminalia arjuna
Terminalia belerica
Terminalia bialata
Terminalia Catappa
Terminalia Chebula
Terminalia glabra
Terminalia Manii
Terminalia myriocarpa
Terminalia paniculata
Terminalia parviflora
Tetrameles nudiflora
Thespesia populnea
Thingan
Thitka
Thitsho
Thitya
Trincomali Wood
Tsuga Brunoniana

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Walsura piscidia
Wattle
Wendlandia Notoniana
White Bombwe

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Yang

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Zizyphus mucronata

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Acacia Robinia Pseudacacia
Ailanthus glandulosa
Alder, *Alnus glutinosa*
Alder, *Alnus maritima*
Amlika
Ash

Beech
Birch
Bischofia javanica
Boxwood

Camphor, True
Camphor Wood, Formosan

Castanopsis brevi-spina
Cedar
Cushimucho

Hinoki
Horse chestnut

Juniperus chinensis

Kaki
Katsura
Kaya
Keyaki
Kiri
Kuren

Machilus Blumeai
Maple

Oak, Formosan
Oak, Holly
Oak, Japanese

Pasania or Pasinia
Phyllanthus emblica
Pine, Korean
Pine, Red
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Spruce
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Tochi
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Printed in Great Britain by R. & R. CLARK, LIMITED, *Edinburgh.*