

Madras Forest college magazine.

V13. no. 2. December 1928.



JL

JB, d, m 24, n 16

N28

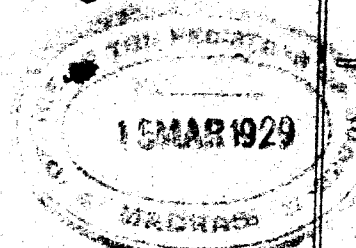
190046

Vol. XIII.

DECEMBER 1928.

No. 2.

THE MADRAS
Forest College Magazine.



EDITED AT COIMBATORE.

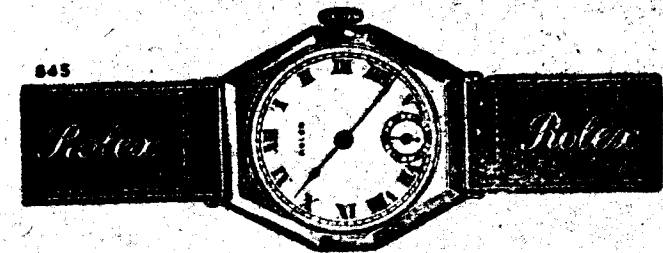
MADRAS PRESIDENCY.

Published by the Principal,

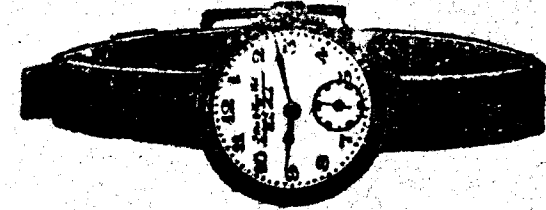
MADRAS FOREST COLLEGE.

PRINTED BY S. VINCENT AT THE ELECTRIC PRINTING WORKS,
COIMBATORE.

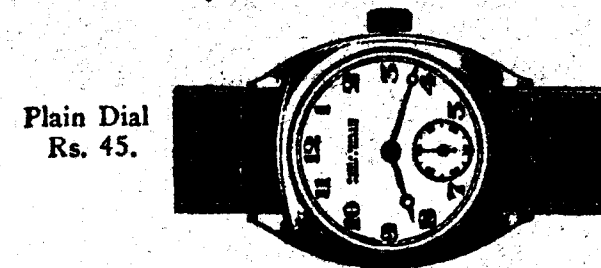
THREE PERFECT WATCHES.



D. 4430. Silver Wrist Watch with 'Rolex' Lever Movement, 15 Jewelled with Black or White Radium Dial.
Rs. 40.



D. 4425. The "Minor" Special 9 ct. Gold Wrist Watch, with 15 Jewelled Lever Movement.
Plain Dial Rs. 45. Radium Dial Rs. 50.



Plain Dial
Rs. 45.

Radium
Dial Rs. 50.

D. 4428. Cushion Shaped Silver Wrist Watch,
Extra Heavy Case, Fine 15 Jewelled
Lever Movement.

10 % DISCOUNT FOR CASH OR V. P. P.

P. ORR & SONS LTD.
MOUNT ROAD MADRAS.

THE
Madras Forest College Magazine.

Vol XIII.

DECEMBER 1928.

No. 2.

CONTENTS.

PAGE.

1. On the identification of timber with special reference to the more important Madras woods.—By *G. Viswanatham B. A.* ... 33
2. Is silviculture a science?—By *H. Mukerji, M. F. O.* 1927—29 Division ... 62
3. EXTRACTS.
 1. Wood pulp in Australia.—2. Flame of the Forest.—3. Fourth Forest Panchayat Conference.
 4. Singampatti Forests.—5. The leaf butterfly.—6. The greatest geyser of the World.—7. Unseen life in drinking water.—8. Insect orchestra.—9. Tapping *Hardwickia pinnata* for wood oil.
 10. Dry-rot in wood.—11. Forest facts.
4. Additions to the Forest College Library... 77
5. Additions to the Forest Museum ... 79
6. Gazette Notifications ...

PUBLISHED QUARTERLY.

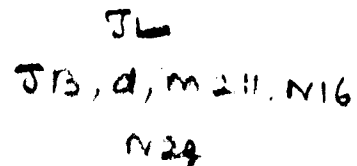
MANAGING COMMITTEE.

PRESIDENT.

BUSINESS SUPERINTENDENT.

EDITOR AND TREASURER.

MEMBERS EDITORIAL BOARD.



SOUTH INDIA.

Advertisement Rates.

The Magazine is expected to have a wide circulation among Forest Officers in the Madras Presidency. Such articles as are useful to them as camp equipments, books, mechanical appliances, transporting gear etc, etc., can be advertised with advantage through this medium.

The following is the Schedule of rates.

	Single Insertion	Per annum
For full page	... Rs 6.	Rs 12.
Half page	... „ 4.	„ 8.
Quarter page	... „ 2 as. 8	„ 5.

Preparation of blocks unless supplied by the advertiser charged extra.

Charges are payable in advance; the advertisements are subject to the approval of the working committee before insertion.

All business communications should be addressed to:

THE BUSINESS SUPERINTENDENT

M. F. C. MAGAZINE,

Madras Forest College, Lawley Road, P. O.,
Coimbatore.

Literary communications should be addressed to:

THE EDITOR, M.F.C. MAGAZINE,

Madras Forest College, Lawley Road, P. O.,
Coimbatore.

All remittances may be made to:

THE TREASURER,

M. F. C. MAGAZINE,

Madras Forest College, Lawley Road, P. O.,
Coimbatore.

THE Madras Forest College Magazine.

(PUBLISHED QUARTERLY.)

Vol. XIII.]

DECEMBER 1928.

[No. 2.]

On the Identification of Timber with special
reference to the more important
Madras Woods.*

BY, G. VISWANATHAM, B. A.,
Curator, Forest Museum, Coimbatore.

1. Poor clue: characters inconstant:

One finds it not very difficult to make out the species, or even variety—if any, of a tree, from its vegetative and floral characters, by the ample and safe clue afforded by the latter, and the aid of a 'flora'; but when it is a case of telling the tree from a sample of its timber one finds so little to go by, that the method of identification has often to be empirical to a large degree. Apart from the paucity of clue furnished by the material, there is not always that constancy of generic characters, which is the rule in such parts of the tree as the flowers or even the leaves. In the genus *Dalbergia* for instance, while the species *D. sissoo*, *D. latifolia* and *D. cultrata* have very hard, dark coloured and heavy woods, other species of it have whitish, often

* Paper read at the Indian Science Congress, held at Madras in January 1929.

soft, woods without heart wood, and one species *D. paniculata* is *sui generis* in that its wood is divided into concentric and alternate layers of wood and bast tissue. (Much less frequent is the constancy of family characters). Not only do species of the same genus often differ widely, but woods of the same species grown under different (edaphic) conditions!

2. 'Keys' to be local:

As a result of the range of variation and inconstancy characterising timber being much more than in the other parts of a tree, such as leaves and flowers, the preparation of a comprehensive 'Key' to the woods of a large area is more difficult and cumbersome and of much less practical utility than a flora covering the same. A Key for timber species to be of working value has therefore to be unambitious, and confine itself to limited tracts. Such a key if intended for ordinary purposes of identification has to be based on macroscopic features, *i. e.*, on those characters which may be made out either with the unaided eye, or a pocket lens magnifying 5—10 diameters; the aid of a microscope need be invoked only when tests in the grosser structural features fail, or for corroboration.

3. Method of identification:

(a) **Equipment:**—A sharp pocket knife, and carpenter's plane, a hand lens and a bit of glass-paper would be enough equipment for many cases.

(b) **Preparation of material:**—Before dressing a given piece of wood, examine the material in 'the lump' noting the nature of the weathered surface as this gives a clue in certain cases. Then prepare a *truly* transverse, a radial, and a tangential surface with a *sharp* plane. A surface exposed by a dull blade cannot make for an accurate

diagnosis as a partial crushing of the tissue instead of a clean cut face will result. Again, the transverse face must be strictly so, as otherwise a round hole will appear oblique or elliptical, and if the tangential face is not truly so the ends of the medullary rays will appear spread and distorted. For finishing the surface, scraping with the keen edge of a small glass pane is better than glass-papering as the latter tends to produce scratches and block the pores if empty; If at all glass-paper is used it must be of the finer sort and a worn out one. To bring out the contrast of the tissues certain reagents are employed; moistening with water, coffee decoction or red ink in certain cases, increases the contrast in the cross section, the rays in particular, being rendered clearer. A *small quantity* of oil (such as cocoanut oil) is usefully applied on the radial section especially when the latter is to be photographed.

4. Physical properties:

Before examining the structure we note the physical properties such as weight, hardness, colour, odour, touch, nature of extract with water, alcohol etc.

(a) **Weight:**—is often of great diagnostic value, as for instance when it is to be decided quickly whether a given piece is a *Mesua** or a *Poeciloneuron*; Red sanders or *Gluta*: Sandal or *Adina* (doctored by a coat of sandal oil) Jack or Satin wood.

In determining the weight of a timber and comparing it with that of others, air-dry** seasoned heartwood must be tested as it is usually so recorded in standard works

* <i>Mesua ferrea</i> :	65 to 75 (lbs. per c. ft);	<i>Poeciloneuron indicum</i> :	59 lbs.
Red sanders:	76 to 79	<i>Gluta travancoric</i> :	50 lbs.
<i>Adina cordifolia</i> :	40 to 43	Sandal:	60
Jack:	35 to 40	Satinwood:	55-65 lbs.

(b) **Hardness:**—is tested accurately by finding out the minimum weight required to imbed a steel shot to a depth of its radius on the radial face of the timber, but for rough and ready methods of testing, the ease with which the knife blade can be imbedded to a short depth is a fair measure of hardness, the blade being pressed † *across the grain*, and on the radial face. The greater hardness of satinwood can enable one to distinguish it from the similarly looking *Adina*, Jack or *Morinda*; *Hardwickia binata* from Rosewood; *Hopea* from *Eugenia* spp; Sandal from a doctored piece of *Adina* (smeared with sandal oil) and so on.

(c) **Colour:**—Of all the physical properties of timber colour exhibits perhaps the widest range of variation.

Jackwood from big and mature trees and near the root region is almost like mahogany while that from immature or smaller trees is pure yellow of varying depth without the orange tinge. In addition to this variation there is the difference in the appearance of the fresh cut surface and the weathered or exposed one. A wide range of variation in the depth of colour is likewise exhibited by many Madras timbers such as †† *Mesua ferrea*, ††† *Dalbergia latifolia*, *Terminalia tomentosa* etc. and one has to bear this in mind in deciding the identity of such species.

* * The determination of the specific gravity of all the Indian commercial species is said to be underway at the Forest Research Institute, Dehra Dun, where it is based on *oven-dry* weight and volume.

† This method of testing was suggested to me by C. C. Wilson Esq., I. F. S.

†† The variety *speciosa* of *M. ferrea* with long leaves and large showy flowers is pale red, while the broad leaved one with small flowers and fruit is deep red and has the strongest timber.

††† *Dalbergia sissooides* till lately regarded as a variety of *D. latifolia* is almost devoid of the rich dark purple back ground and the red stripes so characteristic of *D. latifolia*.

A fresh cut surface suffers a change of colour, and this is caused by various factors, oxygen, light, heat etc. A darkening is effected by ammonia vapour as in the case of wood in the stables, and in marshy ground. It is said that the natives of certain parts of Africa throw mangrove logs which are brown, into bogs in order to blacken them and palm them off as ebony. But very often the change is only 'skin deep' a slight cut exposing again the original colour. It is therefore necessary to remove a few layers of weathered surface before recording the colour of a timber.

A gradual darkening is the rule, only a few species fading in colour. Red cedar, Red sanders, *Gluta*, Rosewood, *Mesua*, *Calophyllum* and *Michelia* fade in colour, while *Artocarpus hirsuta*, *Shorea*, *Balanocarpus*, etc darken. A rich red, purple, or light yellow generally fades. But dark yellow and certain other tints deepen exceedingly and rapidly. In such cases one accustomed to the colour of only the weathered surface can hardly recognise them if they are presented freshly dressed. In fact a newly planed surface of *Shroea Talura* was found to be so sensitive and darkening so appreciably and rapidly that the writer was able to obtain on it a sort of positive picture by applying a film negative to it for a few days. The picture was then fairly well 'fixed' by applying a coat of polish!

Some species cause stains when wetted with water or alcohol. *Pterocarpus Marsupium* gives a yellow reaction with water, and Red sanders salmon-pink with alcohol. The Mangroves and *Dillenias* turn black when immersed in water. Many *Eugenias* behave in like manner especially if a trace of iron is added to the water. I have often noticed carpenters' fingers stained black when dressing *Eugenia* panels, the sweat on the hand, the iron of the plane and the tannin of the wood-dust combining to produce the discoloration.

(d) **Fluorescence***:—is exhibited by the aqueous or alcoholic extracts of some woods. Put some shavings of the wood in question into a test tube of alcohol or boiling water and examine the solution by transmitted and by reflected light. Fluorescence is characteristic of species of *Pterocarpus*, *Ougeinia dalbergioides* etc.

(e) **Lustre**:—the property of reflecting light so as to produce a shining appearance is characteristic of some species, and varies with the plane in which it is viewed. *Calophyllums*, and Sal with their 'ribbon grain,' Satinwood with its satiny lustre, and *Chukrassia tabularis* with its 'curly' and wavy grain are familiar examples. The lustre is often enhanced by tyloses which are more or less iridescent under a lens, and by broad medullary rays, if present, especially noticeable on a radial face ("quarter-sawn" boards.)

(f) **Odour**:—In the majority of woods the odour is not sufficiently pronounced, or is too fleeting to be of value in identification. The strength and kind of odour must always be judged from a fresh cut or newly planed surface. Sandal, *Erythroxylon monogynum*, *Ægle Marmelos*, many of the *Lauraceae*, some of the *Meliaceae* such as Toon, *Aglaia*, white cedar, and some of the *Myristicas* have a fairly strong and characteristic smell. *Bischofia javanica* emits a vinegar smell when fresh cut, and the peculiar scent not unlike that of rose given off when rose-wood is planed is an effective means of distinguishing it from *Dalbergia sissoo*. In the absence of a plane, a vigorous glass papering and † wetting with water will bring out the smell if any, of specimens.

* Cf. behaviour of chlorophyll extract, green by transmitted, and red by reflected, light.

† Wetting revives the smell in certain cases, as in white cedar, and in others changes the character of the odour as in Rosewood.

5. Examination of the gross structure :

(a) **Vessels (tracheae or 'pores')**. In the study of the gross structural features, a transverse section generally gives more clue than the other two faces. Taking up the vessels (which are often referred to as 'pores' as they appear so in the cross section,) the visibility, size, number, arrangement, shape, contents etc are noted. The scale of size adopted by Gamble in his well-known 'Manual of Indian Timbers' is as under: The pores of 'lianes' are described as '*extremely large*;' of *Bassia latifolia* 'moderate sized;' *Adina cordifolia*, 'small,' *Gardenia*, 'very small;' box-wood '*extremely small*.' Note (1) The number of vessels per square m.m. in both Spring and Autumn wood; (2) the arrangement; whether in concentric belts,—as in Teak, Red cedar, and other 'ring-porous' woods; or diffuse; if in the latter condition, whether scattered all over or in short radial rows of 2 to 10 or more (as in *Diospyros melanoxylon*), or in radially oblique chains as in *Calophyllums*, *Mesua* etc or in interrupted concentric lines as in *Poeciloneuron*.

(b) **Tyloses**:—occluding vessels more or less completely are characteristic of woods that offer resistance to infiltration of preservatives etc., as in *Shorea*, *Lagerstroemias*, *Careya arborea*, *Bischofia javanica*, *Berrya Ammonilla*. In *Calophyllums* and many species of *Dipterocarpus* they are sparse. They are recognised by their somewhat iridescent appearance.

(c) **Medullary rays**:—form the subject of study next. Note (1) their visibility (with naked eye and with lens) by moistening with water if need be, (2) width, and number & (3) regularity. They are aggregates of cells elongated in the radial direction forming the '*woof*' as it were, if the vessels and tracheids and wood-parenchyma that course

longitudinally are compared to the 'warp' of textiles. The transverse section, therefore, gives the width, the radial, the lateral surface view, and the tangential, the height and thickness. The scale of width is on the same plan as for the size of vessels or degree of hardness of the timber, the terms 'extremely or very broad' being applied to rays like those on the Oaks, 'moderately broad' to *Dillenia pentagyna* or *Grevillea robusta*, 'fine' to *Albizia Lebbek*, 'very fine' to *Diospyros* spp. and so on. Broad rayed wood especially if quarter sawn (i.e., truly radially) display a 'silver grain' so characteristic of woods like Oaks, *Carallias*, *Grevillea robusta*, *Cordia rothii* etc. All the conifers and the majority of Dicots have narrow rays and of uniform width,—the 'diffuse' type. Compound or aggregate rays formed by the massing of a number of simple rays (with or without tracheal tissue) are comparatively rare in Madras or Indian woods. It must be noted that *ray-depth* * (seen in *tangential* face) is of greater diagnostic value than ray-width (seen in transverse face). The depth of ray is constant for certain species or even genera, as in all species of *Dipterocarpus*.

(d) 'Seasonal' or 'growth zones.'—("Annual rings" or "growth rings" or "pore rings").

Find out whether the boundary of the pore rings is well marked, and if the contrast is due to difference in size of pores or different tissue (wood-parenchyma). Distinct seasonal zones characterise only such woods as are grown in regions with well marked seasons having a wide fluctuation in temperature and available moisture. Defoliation by insects, frost, unusual climatic conditions, fire etc may cause false or double rings.

* For accurate measurements of this a microscope is necessary and a thin tangential slice must be examined.

Again samples from different localities of a particular species such as, *Bombax malabaricum*, of wide occurrence may exhibit rings of varying degrees of distinctness.

(e) **Resin cavities** :—may be present in some woods. They are *schizogenic* (formed by splitting of adjoining cell walls) as in Red cedar, *Cordias*, *Anogeissus latifolia* etc, or *lysigenic* by dissolution of cells themselves as in many conifers and in *Shorea*. In many conifers both vertical and horizontal ducts are common. In the *Dipterocarps* only vertical ducts are present, while only radially aligned canals characterise woods* of *Odina*, *Buchanania*, *Gluta* and *Boswellia*.

(f) **Longitudinal Wood-parenchyma** :—("Soft tissue"): On pressing the end of a scalpel at different places in the cross section of a piece of wood one can easily note many regions which are softer than the fibres. Such zones are mostly composed of what Gamble refers to as 'soft-tissue.' Microscopic examination will shew that it consists of parenchyma. To distinguish this from the similar tissue of the rays aligned radially it is referred to as "*longitudinal wood parenchyma*" *

The distribution and arrangement of this is characteristic of many species, genera and even families, and is often of great diagnostic value. It falls under three general types.

(i) **Terminal** :—when at the ring-boundry only, usually on the outer face of it, forming a thin zone, or line which is sometimes coloured. This type is exemplified by many of the *Meliaceae* (*Chukrassia*, *Chloroxylon swietenia*, Mahogany), *Michelia* etc.

* Name adopted by H. P. Brown in his 'Manual of Wood technology.'

(ii) **Metatracheal:**—when found imbedded in the fibrous tissue and running in concentric bands (complete or interrupted), and irrespective of the pores. In *Calophyllum*, the parenchyma takes the form of dark wavy concentric bands more or less interrupted; in *Mesua* the zones are very narrow—mere lines, (with lens 3–10×) and of lighter colour than the back ground. In *Anonacea*, *Sapotaceae*; and species of *Diospyros* the parenchyma bands or lines are so regular and numerous that the cross section under a lens appears like squared paper with the pores imbedded in the meshes.

(iii) **Paratracheal:**—when the parenchyma clothes the vessels or pores as with a thin sheath of irregular thickness which appears on a transverse section as a narrow aureole or halo round the orifice of the pore making the latter appear thick-walled e.g. *Albizia procera*, Babul, many of the *Combretaceae* and *Anacardiaceae*. In other species the parenchyma shows a further development, of which we have various stages. The halo extends tangentially into slight wings joining with those of neighbouring vessels thus connecting a series of pores into a chain, or festoons, as in *Ulmus* spp., *Cassia Fistula*, *Acrocarpus fraxinifolius* and *Terminalia tomentosa*, or the festoons may become confluent so as to form wavy concentric bands with the pores of the pore-ring imbedded in it as in Teak, *Terminalia belerica* and Jack.

A word of caution is necessary here. The occurrence of the 'soft tissue' in a particular species of wood is subject to wide variation and one has therefore to be on one's guard in deciding the identity from this feature alone. It is said * that in the wood obtained from a Jack tree growing wild, the parenchyma is abundant and unites the pores in wide conspicuous patches, while in the cultivated Jack it is poorly developed and surrounds the pores as narrow aureoles only.

* "Text Book of Wood"—By Herbert Stone.

6. Radial and tangential sections:

The details of the gross structure mentioned so far for examination on the transverse face must be followed up in the other two faces as well. The grain in particular is evident on the radial face, the interlocked grain and the reversal in the spiral alignment of the fibres producing the 'ribbon-grain' of Poon and Sal, the curly grain of *Chukrassia* and *Dillenia* and similar features being best seen on the radial face.

7. The use of a microscope: (40× or more)

While a microscopic* study of wood is very fascinating and may reveal certain important structural features to which many of the technical properties of timber are traceable, and which cannot be made out at lower magnifications, the macroscopic examination is quite enough, and in certain cases even more suited, for the identification of many wood specimens. In lower magnifications, for instance, we get a bird's-eye-view of the components of the wood, and such features as the colour of the rays and of wood parenchyma, the radial alignment of the pores etc are better discernible. The parenchyma in *Calophyllum inophyllum* is easily seen as prominent dark concentric lines on a block of its wood but is invisible by transmitted light on a transparent cross section of the same block prepared for the microscope, being rendered visible only by oblique or reflected light on the slide.

On the other hand useful clues are obtained by the use of a microscope in certain cases. Where *resin canals* occur, this instrument helps us to find out if they run both longitudinally and radially, in which case it is safe to conclude we are dealing with a conifer, when this feature is considered in conjunction with others such as absence of

vessels, presence of ray tracheids etc. If they are restricted either to the longitudinal or the radial type the wood sample in question belongs to the Dicots, if only of the former type to the *Dipterocarpaceae*, and if of the latter type only, to *Anacardiaceae* or *Burseraceae*. Again, *ray depth* which is best seen on the tangential face of a transparent section under the microscope enables us to identify some species as it is constant for a given species unlike ray-width which varies with the place of section in the cross face. The various *pittings* on the walls of vessels characteristic of certain species also give a clue, or at least serve for a corroboration by comparing with named slides. There are a host of other such anatomical features revealed by the microscope, and leading to a guess or diagnosis, but very often a correct diagnosis is possible by a macroscopic examination alone.

8. Some Family characters.

Wood identification presumes a fund of knowledge on the structure of timber, wide experience, and keen power of observation. In addition to the information given under the various components of wood, the following notes should prove useful in making a near guess of the identity. (I regret space does not permit me to include in this paper a short 'Key' for the more important Madras woods. *Vide* Appendix for the same). The *Gymnosperms* (*Gnetales* excepted) are characterised by the absence of vessels; the *Coniferae* in particular have a very regular radial arrangement of the tracheids, and rays, the latter usually with resin ducts and tracheids, fusiform and uniseriate, (very narrow). Vertical resin canals are also abundant. The *Dicots* on the other hand have vessels, generally broader (multiseriate) rays, and less pronounced radial alignment of the elements of the wood. The average length of the fibres of the various Indian Conifers (according to H.P. Brown) varies from 1.4

to 7 m m, while Dicot woods are relatively short fibred (1—2 m m). The woods of *Anonaceae*, appear in transverse section (3—10×) like squared paper. Those of *Sapotaceae* have wavy concentric lines with the pores in short echeloned lines and generally are some shade of red which distinguishes them from those of the closely allied *Ebenaceae* which has woods of a whitish, grey, or black colour. Concentric lines of parenchyma are common in the *Leguminosae*, in some *Guttiferae*, *Celastrineae*, *Meliaceae*, *Boragineae*, *Combretaceae*. A close & even-grained wood * pertains to most species of *Rubiaceae*. Species of *Ficus* are characterised by the extraordinarily copious and regular bands of parenchyma simulating growth rings. Somewhat broad rays point to *Dilleniaceae*, *Rhizophoreae* or *Myrsineae*.

In all cases, conclusions must be verified by comparing with authenticated specimens. The samples compared should be held side by side (preferably in a vice) with their cross sectional faces quite level, so that a portion of each shall come into the field of the lens at the same time.

Where useful clues are afforded by the sculpture of the cells and vessels, a *macerated* preparation is better than a thin section. For this purpose the wood is covered with potassium chloride and enough nitric acid; when it has turned white it is washed, and the cells are teased out, and stained.

Section-cutting :—In the absence of a wood-cutting microtome an iron plane of the Stanley type with adjustable iron which is virtually one, can give sections thin enough for certain types of woods. A piece of wood cut out of the given material, long enough to permit a steady stroke, the width not exceeding about half an inch,

* Together with the metatracheal diffused type of parenchyma.

is held in a vice, and planed in a direction parallel to the rays, moistening with water or glycerine between each stroke. For radial sections, wood obtained from the periphery of large logs where the divergence of the rays is less, is preferable. A quantity of shavings made is examined with a lens and the thinnest portions selected for mounting. The shaving is laid on a glass slide and moistened below only, the liquid being allowed to mount gradually upwards; this will straighten any curl in the shaving.

I cannot conclude this paper without expressing my deep indebtedness to C. C. Wilson Esq., M. A., I. F. S., who initiated me in the Science of wood-identification especially in the practical aspect, and to C. R. F. Williams Esqr., M. A., I. F. S., who likewise guided & helped me with practical hints on the preparation of photomicrographs with no costlier apparatus than a Stanley plane, an ordinary type of camera with a good lens, and a compound microscope. I have also consulted the following books in preparing this paper:—

1. "An Elementary manual of Indian Wood technology"—By H. P. BROWN, PH. D.
2. 'A Text book of Wood'—By HERBERT STONE.
3. 'A manual of Indian Timbers'—By J. S. GAMBLE.

Abstract.

The method of identifying timber, as generally practised at present, requires to be made more scientific, as it is still somewhat empirical. The chief difficulties in the way are the paucity of clue, and the prevalence—in a given genus—of greater variation and inconstancy than in flowers, and even leaves, which renders it more difficult

and of less practical use) for one to prepare a workable 'Key' for woods than a 'flora' for a given locality.

The equipment needed, and the preparation of the material for a * *macroscopic* examination are very simple.

The physical properties of the wood such as weight, (of the seasoned & sound heartwood), hardness, colour (of fresh cut & weathered surfaces), lustre, odour (when cut or wetted), touch, grain, nature of aqueous and alcoholic extracts, such as fluorescence etc., are studied first. This is followed by an examination of the gross structure (as revealed by the three sections) with the eye unaided, and also with a pocket lens (3 to 10×) starting with a *transverse section* of the material as it furnishes more clue than the other two faces (radial and tangential).

Clues of varying diagnostic values are afforded by:—

- i. The '*Vessels*' (or '*pores*' as they appear so in a cross section): by their visibility, appearing as holes or coloured points (tyloses etc), number per unit area in spring and autumn wood, shape, and arrangement (in concentric lines or diffuse, in continuous or interrupted chains disposed radially or otherwise etc).
- ii. *The Medullary rays*:—by their visibility, colour, width (if of two kinds or not) and number, regularity, course (straight or undulating, tapering or forking), and relation between diameter of pores and distance between rays.
- iii. *The Seasonal or growth Zones*:—("annual rings"): by their clearness or otherwise.

* A study of characters which can be made out either with the naked eye, or with a pocket lens magnifying about 5 to 10 diameters.

- iv. *The longitudinal wood-parenchyma*:—('soft tissue'): by their visibility, colour, and arrangement ('terminal,' 'metatracheal,' or 'paratracheal'). and
- v. *Resin canals*:—by their alignment, (longitudinal or radial or both).

Having arrived at the identity by the application of as many tests as possible, the conclusion must be corroborated by comparing the sample with an authoritatively named one.

The macroscopic examination is often quite enough, and in certain cases better suited than a microscopic. The latter, however, has to be resorted to now and then, especially when the species in question cannot be identified with an ordinary lens, and valuable clues are to be found mainly in such anatomical features as the sculpture (pittings on walls etc) of the cells and vessels; for this, a macerated preparation is better than a thin section. As for the latter, if a wood-cutting microtome is not to be had, an iron plane of the Stanely type with adjustable iron (costing not more than Rs. 20) can give sections thin enough for certain types of wood.

APPENDIX.

A Key for the identification of the more important or Common Madras timbers.

—:o:—

As a supplement to my paper on timber identification I append below a Key which I hope embraces nearly all Madras timbers considered to be of importance commercially or otherwise. Owing to the inconstancy and wide range of variation of timber characters, and the inclusion of more than four dozen species, the Key cannot bear that scrutiny which a 'flora' covering the same can. I have not been able to examine for every species samples of it from trees growing under different conditions of soil and climate. I am also conscious of the defect in the Key in that many more species could have been included, but a more ambitious Key might prove cumbersome or unworkable. Species such as *Terminalia belerica*, and *Lansium anamalayanum* figure in it as a description of them would help one to detect attempts often made to palm them off as superior species, (such as *Terminalia paniculata* and *Dysoxylum malabaricum* respectively). A few others have been included as being of anatomical interest.

The Key is based on macroscopic features, and I am indebted to C. C. Wilson Esqr. I. F. S., for the main headings and some of the anatomical observations. I have also made a liberal use of Gamble's 'Manual of Indian Timbers' and Bourdillon's 'Forest Trees of Travancore.' I shall be grateful for suggestions for improvement of the Key.

In the main headings such as, I A (a), the transverse face is referred to. 'Lens' is a pocket lens magnifying 3-10 diameters. Wt. = Weight in lbs. per cubic foot of the seasoned heart wood. H. W. = Heart wood. S. W. = Sapwood. Par = Longitudinal wood parenchyma.

1. **Pores** (vessels) clearly visible to the naked eye :—

A. Pores (or, the majority of them) appearing as minute *holes* (with halo fairly thin, if present,); eye or x 3 :—

(a) **Rays** clearly visible to the naked eye :—

Odour strong ; or fairly strong (when cut):

Wt. less than 40. Feel not greasy

Wt. more than 40. Feel greasy ...

Odour feeble or absent :

Wt. less than 21. Annual rings marked by a dark line

Wt. more than 21. Annual rings not so marked:

Colour grey; wood very soft; pores large and subdivided

Colour brownish yellow; white deposit in pores conspicuous ...

Colour bright yellow to orange-brown; white deposit in pores

rather sparse ...

Colour greyish; no white deposit in pores; pores in short more

or less concentric chains...

Colour greyish brown; pores ringed ; rays of two kinds

appearing on radial face as rough plates with white

shining fibres between ...

(b) **Rays** barely visible to naked eye, but clearly visible with lens :

Pores very large, and scanty: (Wt. below 30)

Pores large :

Pores in radial chains; parenchyma metatracheal

Pores not in radial chains (diffuse); par. paratracheal

Pores in oblique chains; par. paratracheal ...

Pores moderately large to small:

Radial face showing silvery white lines here and there; tyloses

abundant; smelling vinegar when fresh cut

... (13) *Bischofia javanica*.

Radial face showing dark lines (resin ducts) here and there, which

show as dark oval patches on cross section; par. metatracheal...

Radial face showing a fairly distinct silver grain; wood very

hard; par. paratracheal ...

Timber moderately hard :

Pores in radial chains ...

Pores not in radial chains ...

Timber soft or moderately soft :

Radial face showing vessels as long straight streaks

Radial face showing vessels as short and slightly wavy streaks

Timber sweet-scented; close grained; Par. often terminal (as white

concentric lines) ...

(c) **Rays** invisible or indistinct even with lens :—

Dark-purple, with black or red stripes; paratracheal par. not well

developed ...

Dark-brown, with a few purple or darker-brown streaks. Paratracheal par.

well-developed. (as grey concentric lines); apt to be cross-grained ...

Brown to dark-brown with darker brown or black streaks; streaks rather

wavy ; white deposit common ; halo of pores thicker than in (21) &

(22); paratracheal par. joining the pores, wavy ...

Grey, with a tinge of olive-brown; halo of pores very thin

Staining yellow when wetted with water; aqueous extract fluorescent ...

Dark reddish brown; extremely hard; cross grained: pores resinous ...

Reddish brown; moderately hard; straight grained; pores not resinous ...

Bright pink (from light to dark shades); close-grained; pores with a

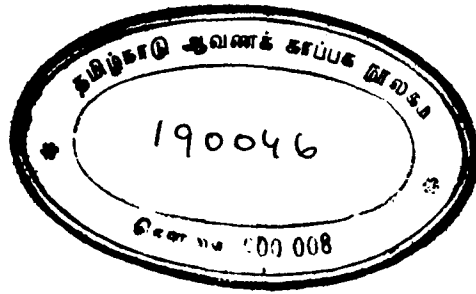
reddish gum; sapwood whitish ...

Reddish grey; coarse; pores often with a white deposit; no distinct h.w. ...

... (28) *Pterospermum*

... (29) *Eugenia jambolana*.

SL
JB, d. m 21, n 16
N 28



- B. Pores appear as minute flecks—coloured points, (with halo fairly thick, if present) eye or x 3.
 (a) **Rays** clearly visible to the naked eye (and of two kinds): ... (30) *Dipterocarpus indicus*.
 (b) **Rays** barely visible to naked eye, but clearly visible with lens:
 Dark claret-red to almost black; alcoholic extract orange-red and fluorescent ...
 Bright-red; Pores filled with reddish resin, and in not radial chains ... (31) *Pterocarpus santalinus*
 Wt. 50—56 ... (32) *Gluta travancorica*.
 Bright-red to brownish red; Pores often filled with a yellow deposit, and in radial chains; par. metatracheal, (as fine wavy lines), very prominent and visible to naked eye. Wt. 65—75 ... (33) *Mesua ferrea*.
 Dark reddish brown: Pores filled with light pink deposit, in short concentric chains; par. metatracheal, very obscure and in very short concentric lines Wt. 59—60 ... (34) *Pæciloneuron indicum*.
 Yellowish brown to reddish brown, with a satiny lustre and curly grain Par. terminal (as a sharp dark line). Wt. 45—59 ... (35) *Chukrassia tabularis*.
 Olive-brown, smooth grained, par. terminal, average weight 54 ... (36) *Vitex pubescens*.
 Yellowish-red to brick-red, darkening to bright reddish-brown, Par. paratracheal connecting pores into concentric festoons and seen on radial face as whitish long streaks Wt. 60—72. ... (37) *Cassia fistula*.
 Yellowish grey with an irregular very scanty h.w. of a dirty grey colour. Par. paratracheal, as wavy concentric bands, with the pores imbedded in them ... (38) *Terminalia belerica*.
 Yellow or cream coloured, with a satiny lustre; par. Terminal ... (39) *Chloroxylon siselenia*.
 H.W. sometimes very scanty, dark greenish brown; pores scanty, often subdivided and resinous. [S.W. white, much less hard, with pores nearly all empty; should come under I A (c)] ... (40) *Boswellia serrata* (heart wood).
 Pale brown (darkening to brown):—
 Remarkably coarse-and cross-grained; radial face showing a "ribbon-grain"; Rays run through groups of pores; pores filled with resin. Wt. 50—60 ... (41) *Shorea robusta*.

- Smooth, close-and even-grained: Rays generally bent near pores; pores ringed. wt. 57—68 ... (42) *Hopea parviflora*.
 Straight-grained, with a long fibre; radial face showing a silver grain; par. terminal, as a light brown line bordering the growth rings which are distinct; a white deposit common in pores ... (43) *Grewia tiliaefolia*.
 Scented :
 Scent strong, wood oily, yellowish brown, close and even-grained. Par. metatracheal, not prominent ... (44) *Santalum album*.
 Scent feeble, wood not oily to touch, pale yellowish white, with an interlocked (ribbon) grain; Par. terminal and distinct as sharp brown lines ... (45) *Lansium anamalayanum*
 Non-scented :
 Dark red with black stripes, often with a purplish tinge; Rays fine, bent near pores; radial face showing silver grain; extremely hard and heavy; cross-grained ... (46) *Hardwickia binata*.
 Light pinkish brown; Rays very fine and very numerous; very hard and heavy; cross-grained ... (47) *Schleichera trifuga*.
 Yellow, moderately hard, even grained, no h.w. ... (48) *Adina cordifolia*.
 Reddish brown, pores in short oblique or echeloned radial strings; Par. "metatracheal zonate" forming a reticulum with the rays; straight-grained ... (49) *Dichopsis elliptica*.
 H.W. very scanty, purplish brown, irregularly shaped, and very much harder than s.w; pores in concentric chains; para. paratracheal as in No. (23). ... (50) *Anogeissus latifolia*.
 H.W. normal, dark grey; pores in short radial chains; par. metatracheal zonate, forming a close reticulum with the rays; close and even grained. ... (51) *Hemicyclea elata*.

Eng.=English. *Tam.*=Tamil. *Mal.*=Malayalam. *Tel.*=Telugu. *Kan.*=Kannarese. *Hind.*=Hindustani. The figures in brackets at the end of the botanical names refer to the page in my "Handbook of Forest (Systematic) Botany" wherein will be found notes on the distribution, diagnostic characters relating to habit, bark, leaves, flowers, fruit, etc. of the tree in question. The values of W. and P. are generally the *average* ones.

I.A.(a).

1. *Cedrela Toona*, Roxb. (31.)

Eng. The Toon; Red cedar. *Tam.* Cevvagi; செவ்வகி; Deva-daru. *Mal.* Mathagiri vembu; vedi vembu; mala veppa. *Kan.* Kempu gandagheri. *Hind.* Tun.

Brick-red; fragrant, soft. Pore-rings distinct, pores prominent on vertical section. Rays distinct, giving a marked silver-grain. W : 35. P : 465. Does not split or warp; white-ant proof; largely used for Cigar boxes, door panels etc.

2. *Tectona grandis*, Linn. (82).

Eng. Teak. *Tam.* *Tel.* and *Mal.* Thekku. தேக்கு. *Kan.* Tega. *Hind.* Sagun.

Pale brown, or dark golden yellow, darkening with age; with an odour not unlike that of old leather; feel greasy; moderately hard; Pore rings distinct; Par. paratracheal as concentric belts with pores imbedded. Rays giving a handsome silver grain. W : 45. P : 600. Very durable; white-ant proof; unsurpassed for doors, windows and furniture; largely used for ship-building, and railway carriages.

3. *Givotia rottleriformis*, Griff. (94).

Tam. Vellai-Thanku; Butalli (புத்தாலை); Vendale. *Tel.* Tella punki, Tella puliki.

Grey-white, exceedingly light and soft; even grained. Pores moderate-sized to large, very scanty, prominent on radial face, sub divided. Par. terminal, as a dark line. W : 17. (14 to 20). Used for toys, imitation fruit and other fancy articles which are finished with saw dust and glue and lacquered and painted.

4. *Tetrameles nudiflora*, R. Br. (115).

Tam. Chini. சீனி. *Mal.* Chini; vella-chini.

Greyish-white, rough and soft. Pores large, often sub divided, and in short chains. Rays white W : 12—24. P : 321. In Travancore, dug-out canoes and small boats are mostly of this wood and mango. (rubbed with fish oil.)

5. *Artocarpus hirsuta*, Lamk. (101).

Eng. Wild Jack. *Tam.* Aini-pila (அயிணிப்பிலா) Anjili. *Mal.* Ayani. *Kan.* Heb-halasu.

S. W. White; h. w. brownish yellow darkening to dark brown; moderately hard. Pores large; often with a white deposit (more abundant than in Jack.) prominent on radial face as white streaks.

Shows a silver grain. Growth rings indistinct. W : 35 (32 to 38) P : 644. White-ant proof, does not warp or crack, stands contact with water, obtainable in large size, largely used for boat-building.

6. *Arotocarpus integrifolia*, L. (102).

Eng. The Jack. *Tam.* and *Mal.* Pila. (பிலா). *Tel.* Panasa. *Kan.* Halsu. *Hind.* Kanthal.

Bright yellow, darkening to an orange-brown, moderately hard: Pores sometimes filled with a yellowish deposit (aqueous extract yielding a yellow dye). Par. paratracheal, as aureoles round pores or as concentric bands. Annual rings indistinct. Rays conspicuous. W : 39. (33 to 44). P : 793. Largely used for boxes and furniture.

7. *Gmelina arborea*, Roxb. (83).

Tam. Gumadi, Kumil. (கும்மிர்). *Mal.* Kumbil. *Tel.* Gumudu. *Kan.* Kuli. *Hind.* Gumhar.

Greyish white with a glossy lustre, smooth and even-grained; Moderately hard. Par. often terminal as white lines. Rays white; giving a silver grain. W : 35 (30 to 40). P : 523. Very durable especially under water; highly esteemed for planking, furniture etc. Said to be proof against insect attack.

8. *Vateria indica*, L. (13).

Eng. The Piney varnish, or Indian Copal tree; white dammar. *Tam.* Dhupa, Vellai-Kungiliyam. வெள்ளைக்குங்கிலியம். *Mal.* Payin. *Tel.* Dupada. *Kan.* Gugle.

Rough, moderately hard. Pores large; subdivided. W : 39. P : 415. "Too heavy for tea boxes; appears not to be bored by beetles; might be serviceable for shelves, rough doors etc"—Bourdillon.

I. A (b).

9. *Bombax malabaricum*, Dc. (15)

Eng. The (red silk) cotton tree. *Tam.* Mul-ilavu (முல் இலவு). *Mal.* Pula. *Tel.* Burga. *Kan.* Buruga. *Hind.* Semul.

Grey-white, turning to brown. Pores very prominent on radial face; par. metatracheal-diffused. No. h. w., no distinct growth rings. W : 24—29. P : 519. Perishable, but lasts longer in salt water. largely used for matches, tea-chests and packing cases.

10. *Calophyllum tomentosum*, Wight (8).

Eng. The Poon spar tree. *Tam.* Kattu-pinnai கட்டுப்பினை. *Mal.* Katta pinna. *Kan.* Sri-honne.

Brownish-pink with dark-brown streaks; fading on exposure; ribbon-grained; Pores in short radial chains; par. metatracheal as wavy interrupted concentric dark brown lines, prominent on radial face as undulating vertical lines with the pores appearing as long streaks between them. W : 32—38. P : 532—640. Yields the 'poon spars' of Commerce. Not white ant proof.

11. *Acrocarpus fraxinifolius* Wight. (45).

Eng. The Pink Cedar? *Tam.* Malai-Konnai. (மலைக்கொண்டை). *Kan.* Hantige.

Moderately hard. S.W. white; h.w. bright pink. Pores medium to large, often subdivided (2-5), very prominent on radial face; often in more or less concentric festoons. Rays rather scanty, and wavy. W : 39.

For shingles, furniture, building etc.

12. *Albizzia Lebbek*, Benth. (56).

Eng. The Siris tree. *Tam.* Vagai. வாளை. *Mal.* Vaga. *Tel.* Kat-vage. *Kan.* Kal baghi. *Hind.* Siris.

Hard. S. W. yellowish; h.w. pale brown with darker stripes. Growth rings indistinct. Pores scanty, large, with a rather thick halo; in oblique strings. Rays (and pores) conspicuous on radial section. W : 47. (39-55). P-820. Varies greatly in weight and strength. "Seasons, works and polishes well., fairly durable; used for furniture, boats, house-posts etc" (*A. odoratissima* is superior to this, and a fuller utilisation of it for furniture etc was advocated by the Forest Department in the recent exhibition at Madras, by a display of some furniture made of it).

13. *Bischofia javanica*, Bl. (91).

Tam. Milachadayan, மிலாசடயன். *Mal.* Thirippu, chola veng.

Dark claret-red, rough, moderately hard. Pores moderately large, often subdivided and resinous. Rays of 2 kinds; several fine rays between each pair of broad ones. W : 45. P : 617. "Although above ground it warps and crack and white ants attack it, in wet-ground or under water it is almost imperishable; particularly suited for pile-foundations.

14. *Hardwickia pinnata*, Roxb. (49).

Eng. Malabar Mahogany. *Tam.* Kolavu. *Mal.* Koda pala. *Kiyavu.*

Moderately hard, S.W. large, whitish, h.w. brownish red to red; pores scanty, often subdivided. Par. metatracheal as in No. 10. Rays fine, bending near pores. W : 46. P : 640. Of late, coming into use on a large scale for furniture in Malabar, under the name of 'Malabar Mahogany.'

15. *Acacia arabica*, Willd. (52).

Eng. The Babul. *Tam.* Karuvel. கருவேல். *Tel.* Nella tuma. *Kan.* Karrijali. *Hind.* Babul.

Hard. Pinkish brown, darkening on exposure. Mottled with dark streaks. Pores medium-sized. Par. as a halo, or connecting pores into short concentric chains. Rays very variable in breadth. Radial face with a distinct silver grain. W : 54 P : 880. Extensively used for wheels (especially hubs), well-curbs, agricultural implements etc.

16. *Eugenia Gardneri*, Thw. (66).

Tam. Nir-naival. நீர் நாவல். *Mal.* Kari-nyaral. Moderately hard. Brownish pink with pale yellow streaks. Pores very small, often with yellowish contents. Par. metatracheal (much as in No. 33, but less prominent,) as numerous irregular wavy yellowish lines. Rays very fine and close. W : 60 P : 805. "sometimes used for beams in house-building; a strong serviceable wood"—Bourdillon.

17. *Canarium strictum*, Roxb. (26).

Eng. The black-dammar. *Tam.* Karun-Kungiliyam கருங்குங்கிலியம். *Mal.* Kunthirikka payin. *Kan.* Manda dhup.

Moderately hard. s.w. greyish white, h.w. pinkish, Pores scanty, often sub-divided. Rays fine. Pore rings absent. W : 38. P : 523. Might do for packing cases.

18. *Callenia excelsa*, W. (15).

Tam. Vedapla. வெடப்பலா. *Mal.* Kar aini. Pale brown, to reddish-brown. Soft, straight grained. Pores medium sized, scanty. Rays pink, numerous. W : 31-43. P : 508. Not durable in moist situations.

19. *Mangifera indica*, L. (33).

Eng. The Mango. *Tam.* மா. *Tel.* Mamadi. *Hind.* Am. Young trees soft and grey, adult ones hard, and dark-brown, mottled with black; Pores medium size to large, scanty, often sub-divided. Rays fine, wavy, closely packed. W : 42. P : 514. Rough planking, doors and window-frames.

20. *Dysoxylum malabaricum*, Bedd. (28).

Eng. White Cedar. *Tam.* and *Mal.* Vellai-agil. வெள்ளகில். yellowish white to light-orange, hard, close grained. Sweet-scented. (sometimes showing a ribbon grain). Pores medium, numerous, often in radial chains of 2-5. Rings indistinct. Par. either terminal or metatracheal, as white lines. Rays fine, numerous. W : 58 P : 992. An excellent timber for purposes where strength and elasticity are required; but not available in quantity.

I.A.(c). 21. *Dalbergia latifolia*, Roxb (39).

Eng. Rose wood; Black-wood of Bombay. *Tam.* Itti ஈட்டி. *Mal.* Karu-vetti. *Tel.* Jitegi. *Kan.* Biti.

Very hard, close grained. Pores medium to large, often sub-divided, scanty. Paratracheal par. as halos round pores and joining them into wavy short concentric festoons. Rays fine, numerous, W : 50 P : 950. One of the most handsome of furniture woods.

22. *Dalbergia sissooides*, Grah. (61).

Eng. Malabar Black-wood. *Mal.* Vel-vetti. W : 52. P : 721, Not so susceptible of a good polish as No 21.

23. *Terminalia tomentosa*, W & A (61).

Eng. The Indian Laurel. *Tam.* and *Mal.* Karumarudu கருமருது. *Tel.* Nalla maddi. *Kan.* Kari matti.

Hard; somewhat coarse but some times very beautifully mottled. Pores medium to large. Rings indistinct. Rays very fine, often

wavy. W : 65 P : 808. The timber is at times so attractively mottled that it fetches 3—4 times the price of the normal type, and is then preferred even to Rosewood for furniture etc. (The Madras Forest Department received orders for large quantities of the figured type at a high rate during the last Madras Exhibition in which it was kept on show).

24. *Terminalia paniculata*, W and A. (62).

Tam. and Mal. Pilla-marudu பில்ல மருது. Tel. Ncomeeri. Kan. Honal.

Very hard. Pores medium to large, numerous, connected into more or less concentric bands. Rays fine, numerous. Rings indistinct. W : 57 P : 636. Said to be improved by being kept under water. Makes good planking and building timber, if thoroughly seasoned.

25. *Pterocarpus Marsupium*, Roxb, (41).

Eng. The Kino tree. Tam. Vengai வேங்கை. Mal. Venga. Kan. Honne, Tel. Yegi. Hind. Bijasal.

Very hard, but rather rough due to interlocked (ribbon) grain. Yellowish brown with darker streaks. Pores medium to large, often sub-divided, scanty, resinous. Par. paratracheal as whitish wavy bands. Rays very fine, numerous. W : 55 P : 718. The most important tree of S. India after Teak and Rose-wood.

26. *Xylia xylocarpa*, Roxb (51).

Tam. Irul இரூல். Mal. Irumulla, Tel. Tangedu. Kan. Jambe. Hind : Jambu.

Pores large to moderate sized, resinous often sub-divided, (2-5), prominent on radial face as short streaks with the shining red resin showing. Halos round pores sometimes so thick that it might as well come under I B; paratracheal par. often joining the pores into oblique chains. Rings indistinct. Rays fine and very numerous. W : 59 P : 847. Largely used for Railway sleepers, paving blocks, piles, bridge and house construction. (*X. dolabriformis*, the Pyinkado or iron wood of Burma, is said to be stronger and more resinous).

27. *Lagerstroemia lanceolata*, Wall. (68).

Eng. Venteak. Mal. Tam. & Tel. Venthekkku வெந்தேக்கு. Kan. Billi nandi.

Pores large, to medium, often sub-divided, prominent on radial face as long straight streaks. Par. paratracheal as narrow wavy bands. Rings not very distinct. Rays very fine and v. numerous. W : 43 P : 596. Good for planking, rough cases etc.

28. *Pterospermum rubiginosum*, Heyne (21).

Tam. Chittilai-pulavu சித்திலைபுலவு. Mal. Malam thodali.

Moderately hard. Pores medium, in groups of 2 or 3. Rings fairly distinct. Rays very fine and numerous, brown. W : 43, P : 603. Very handsome; used for buildings and boats.

29. *Eugenia Jambolana*, Dc. (66)

Eng. Black plum. Tam. Naval நாவல் Mal. Naga. Tel. Neredu. Kan. Narala. Hind. Jaman.

Moderately hard. Pores numerous, medium and small. Par. paratracheal as pale wavy bands. Rays fine, numerous. W : 48 P : 589. Fairly durable; house building, well-works etc.

I.B.(a). 30. *Dipterocarpus indicus*, Bedd. (10)

Eng. Wood oil tree of Malabar. Tam. Ennai-maram எண்ணெய் மரம். Mal. Kalpayin. Kan. Guga.

Greyish red, rough, moderately hard. Pores medium to large, numerous, ringed, often resinous. Rings indistinct. Rays of 2 kinds, each pair of broad ones enclosing a large number of fine; prominent on radial face. W : 47 P : 695. "Will not stand exposure; too coarse for furniture."

I.B.(b). 31. *Pterocarpus santalinus*, L (41).

Eng. The Red sanders. Tam. Chenchandanam செஞ்சந்தனம். Tel. Erra Chandanam. Kan. Honne.

Extremely hard; Pores medium, scanty. Rays fine, numerous. W : 75. P : 975. For house posts, carvings, toys etc. Shavings yield a valuable pink dye. (Santalin).

32. *Gluta travancorica*, Bedd. (34).

Eng. The Tinnevely Red wood. Tam. Cenkurinji. Mal. Thodappei.

Very hard and close-grained, very handsomely mottled with blackish, and orange streaks. Pores medium, scanty. Rays very fine and numerous. Par. metatracheal as pale wavy lines. W : 53 P : 734. A very attractive furniture wood, but not abundant.

33. *Mesua ferrea*, L. (7).

Eng. Iron-wood. Tam. Suruli, Vainavu சூரூலி. Mal. Nanga. Tel. Naga Kesara. Kan. Naga-Sampige.

Extremely hard; sometimes with a ribbon grain. Rays extremely fine and very numerous. W : 65-75. P : 1020. Largely used for railway sleepers; (sometimes riddled by borers or attacked by dry rot).

34. *Pocillonacron indicum*, Bedd.

Tam. Puthangkoli. புதங்கோலி. Mal. Vayila. Kan. Kirballi. P : 928. Beams, joists, rice-pounders etc.

35. *Chakrasia tubularis*, A. Juss. (31).

Eng. The Chittagong wood. Tam. Devaganni. தேவகன்னி. Tel. Madagari vembu. Kan. Dalinara.

Hard. Pores scanty, uniformly distributed. Rays fine, and rather wavy. W : 45 P : 514. An excellent furniture wood.

36. *Vitex pubescens* Vahl. (84).

Tam. Mayiladi மயிலாடி. Mal. Atta Mayila. Tel. Nemili-adugu. Very hard. Pores small to medium, scanty. Rays fine, equidistant. W : 54. Durable; for building, construction of carts etc; better than *V. altissima*.

37. *Cassia Fistula*, L (47).

Eng. The Indian Laburnum. Tam. and Mal. Konnai கோனையி. Tel. Reylu. Kan. Kakke. Hind. Amaltas.

Pores medium to large, often sub-divided and resinous, scanty. Halo of pores fairly thick. Rays very fine and numerous. Rings indistinct. W : 60-72 P : 1047. Excellent for posts, Carts etc.

38. Terminalia belerica, Roxb (59).

Eng. The beleric myrabolan. Tam. and Mal. Thani. தானி. Tel. Tandi. Kan. Santi. Hind. Bahera.

Pores very scanty, large, prominent on radial face, often sub-divided. Rays fine, clearly visible in the darker parts of the wood. Rings indistinct W : 42 P : 720. Not durable, but rendered fairly durable after being steeped in water.

39. Chloroxylon swietenia, D.C. (32)

Eng. Satin wood. Tam. Purasu, Vemmorai புரசு. Tel. Billu.

Very hard; no distinct h.w. Pores very small with a white deposit. Rings distinct. Par. terminal as white lines. Rays fine, uniform, and numerous, conspicuous on radial face. W : 60. P:1000 Cabinet work, picture frames etc. Good specimens, especially 'figured' ones can be had from Ceylon.

40. Boswellia serrata, Roxb (25).

Eng. White Dammar. Tam. Vellai Kungiliyam வெள்ளைக்குங்கிலியம். Kan. Chitta. Tel. Anduku. Hind. Salai.

Moderately hard. Pores medium, often sub-divided, and with white resin. Rays moderately broad. S. W. 28. H.W. 36—42. H. W. fairly durable.

41. Shorea robusta, Gaertn, (12)

Eng. Sal. Tel. Gugal. Hind. Sal.

Very hard. Pores medium to large, often with whitish resin and in short oblique chains. Par. as in 37. Rays mod. broad, pink. W : 55. P : 790. The teak of North India.

42. Hopea parviflora, Bedd (11).

Eng. The iron wood of Malabar. Tam. Kongu கோங்கு. Mal. Thambagam. Kan. Kiralboghi.

Light brown, darkening with exposure. Very hard. Pores medium to small, numerous, ringed. Growth ring indistinct. Par. paratracheal as a thin halo, also metatracheal as in Calophyllum but very faint. W : 63 P : 800. "White-ant proof. Used for house and bridge building; for beams and rafters superior to teak"—Bourdillon.

43. Grewia tiliaefolia, Vahl. (23).

Tam. and Kan. Thadasal. தடசல். Mal. Chadicha. Tel. Charachi. Hind. Dhamin.

Pale-brown, moderately hard. Pores medium, numerous. Rays fine. Rings distinct. W : 46 P : 766. For shafts, shoulder poles, masts, tool-handles, oars, axe-handles; for all purposes for which elasticity strength and toughness are required.

II. 44. Santalum album, L. (87).

Eng. Sandal. Tam. Chandanam. Hind. Chandan.

Very hard. S.W. white non-scented; h.w. yellowish brown, strongly scented. Pores very small, numerous, slightly larger in spring wood; with white contents. Rings fairly distinct. Par. metatracheal, but indistinct. Rays fine, numerous, distance between them greater than diam. of pores. W : 60. (56—63) P : 876. Carved boxes, frames, distillation of oil etc.

45. Lansium anamalayanum, Bedd.

Tam. Chandana-virai. சந்தனை வீரை.

Hard, pale yellowish-white. lustrous, slightly scented. Pores scanty, very small, often in radial chains of 2-5, filled with a white substance. Rings marked by a sharp brown par. line, and by the harder autumn wood. Rays very fine and numerous; distance between them greater than diam. of pores. W : 62. P : 1041. An attractive and fairly durable wood; resembles white cedar, but differs from it in having scanty and very small pores and less strong scent. (and a paler colour).

46. Hardwickia binata, Roxb (48).

Tam. Acha. ஆச்சா. Tel. Yepi. Kan. Kamra. Hind. Anjan.

Pores small. filled with a reddish resin. Rings indistinct. W : 82 P : 942. The hardest and heaviest wood in India. Extremely durable, liable to split, but does not warp; valued for naves of cart-wheels and ploughshares, pestles etc.

47. Schleicheria trijuga, Willd (114).

Tam. Puvan. புவன். Mal. Puvam. Tel. Pusku. Kan. Sagdi. Hind. Kosum.

Pores scanty, medium, sub-divided. Par. paratracheal, as pale wavy lines connecting the pores. Rays extremely fine and numerous. Rings indistinct. W : 66 P : 725. Very strong and durable. Rice pounders, oil mills, carts, agricultural implements etc.

48. Adina cordifolia, Hook (70).

Tam. and Mal. Manjakkadambu மஞ்சக்கடம்பு. Tel. Paspu Kadambe. Kan. Hedde. Hind. Haldu.

Yellow, moderately hard, very even-grained; no h. w. Pores small, numerous. Rings faint. Par. metatracheal, but very indistinct. Rays fine, numerous. W : 45. P : 621. Durable, but rather apt to warp and crack. Suited for turning, cots, door-panels, writing tablets, combs etc.

49. Dichopsis elliptica, Benth (76).

Tam. Palai பாலை (or, பால் வழந்தான்). Mal. Pala. Kan. Pauchonta.

Mod. hard. Rings indistinct. Rays fine, numerous. W : 44. P : 472. Well adapted for shingles.

50. Anogeissus latifolia, Wall. (62)

Tam. Vel-nagai வெள் நகை. Mal. Mala Kanjiram. Tel. Yella maddi. Kan Dinduga. Hind. Dhaura.

S. W. grey, hard. (Yellowish white in young trees). Pores small, very numerous, often sub-divided. Rays extremely fine and numerous. W : 60 P : 857. Very strong and tough; not very durable in contact with water or moisture. Well suited for axe-handles, axles of carts, agricultural implements etc.

51. Hemicyclia elata, Bedd. (92)

Tam. Konamaram; vellelumbu? கோணமரம். Mal. Kona; Vella Kasavu?

Grey, mottled with slightly darker stripes. Pores small numerous. Rings fairly distinct marked by brown narrow harder bands. Rays, fine, numerous. W : 51 P : 726. "Strong; much used for building"—Beddome.

Is Sylviculture a Science ?

It is very difficult to answer this question directly. But I shall try to discuss it in a general way. Let us begin by answering another question. What is Science? Systematic study or knowledge of any subject is science. Sylviculture mainly deals with, broadly speaking, growth and protection of Forest trees. By growth I mean growth in height and girth during the life time of the tree. The term 'protection' includes mainly protection from climatic and atmospheric agents and to a great extent from insects fungi, etc. What a wide field it covers !

It should be borne in mind from the very beginning that I am only considering the upkeep of an already created forest. I won't discuss 'exploitation', though to exclude exploitation from this will be well nigh impossible, because creation and exploitation go hand in hand. And it is difficult to study one ignoring the other.

Now taking up Sylviculture we find that one requires at least an elementary knowledge of Botany, Physics, Chemistry, Entomology and something about soil. Given this knowledge and regarding it as a science we find that we still require something in the shape of theories and laws to work upon.

What is a theory and what is a Law? Law is a statement governing a phenomenon fully satisfying all the aspects of it. Theory is that which attempts to explain a phenomenon. Newton's Laws of gravitation and motion are laws. The explanation about propagation and transmission of light is a theory. It does not satisfy all the features of light propagation. Of course there are exceptions—Charles' Law and Boyles' Law about gas. But once these laws were established the defi-

nition of gas had to be changed so that a perfect and true gas is that which obeys Charles' and Boyles' Laws. If we can't fix any law we must at least have some working hypothesis to go upon. A hypothesis is quite acceptable as long as it does satisfy every condition. It has to be modified if it doesn't. Let us take some concrete examples. Formerly, water was believed to be an element. It satisfied the chemist for the time, but later on it was realised that the chemical combination of Hydrogen and Oxygen produced water and proved it to be a chemical compound. Electrolysis of water confirmed this. Again Oxygen was known to be the acid forming element and it is Oxygen which gives acid reaction with alkalies and litmus. This hypothesis was quite good until chemists came upon some acids HCl, HCN, HFl without Oxygen which responded to every reaction which an acid should respond to and the Oxygen theory had to be given up. A hypothesis is a working scheme in the absence of a better or absolute reason. In this way a Science is evolved. Summing up what do we find? That Science aims at, and works its way to, a mathematical precision. Dubious, probable reasons have no place in Science. In this category we class Chemistry, Physics, Geology, etc. Always of course accepting the exceptions we can safely take these as definite and exact sciences.

But will this hold good in the case of Sylviculture? In Sylviculture every view—I don't use the word 'theory'—is to be modified at almost every step. A strong light demander turns into a shade bearer at a later stage. It does not remain a 'Light demander' in every state and phase of its life. Can this kind of change take place in any chemical reaction? We know that in a chemical reaction heat is either evolved or absorbed. It does never change.

Let us consider the growth of a tree. The same tree will grow on slightly different kinds of soils. The tree grows, it does not refuse to grow on another kind of soil. Two teak seeds from the same tree, given the same conditions of germination, same vitality, same soil condition in the same locality, will not behave identically. The wind, shade, light will act differently on the two plants and make them different. We see that whichever point we may consider plants won't obey any definite formula with mathematical accuracy. Why do they differ? Why do plants behave like this? They behave like this because of their living and 'irritable' protoplasm. It is a living thing. What is the property of a living thing? Adaptability to its environments; i.e., it shows fight. To quote Emerson, "Life is at its best and highest when it adapts itself to its new environments."

Seeing that the plants are reacted upon by various agents and show certain effects and also that these effects are not the same in every locality, we conclude that Sylviculture—dealing with these—can't be a definite science. Every tree requires a different treatment. Every treatment differs from locality to locality and from aspect to aspect. The subject is too large and broad to be reduced to an exact science. Even the 'treatment', fellings etc. when exploiting will vary from place to place. The uniform method of Europe won't be the same uniform method of India. The outline may be the same but the details will vary. The protection of forests save, I think, fire protection and insect protection can be more easily formulated.

Then, if 'Sylviculture' is not a Science what is it? It is a collection of data, a collection obtained from observations. It is well said that Sylviculture is best learnt in the field. We must not assume that the things laid down in books are absolute facts, and too well established to be

contradicted. Very often we have seen two authorities differing in their opinion about one and the same thing. Contradictory theories about one and the same point are not uncommon. It is quite possible as it depends upon varied experiences.

H. MUKERJI,
M. F. C. 1927-29 Dn.

EXTRACTS.

1. Wood-pulp in Australia:

When ground wood or mechanical pulp was first introduced, the paper industry received considerable impetus in countries where soft-wood was easily obtained, and the later development of the sulphite process, or the chemical conversion of wood to pulp, brought about an even greater expansion. In Australia, however, the industry has developed slowly, for owing to the absence of suitable indigenous material, nearly all the pulp has had to be imported. Experiments have been carried out with the view of utilising indigenous Eucalypts, etc, in order to establish the industry on an independent footing. It has been found that by employing certain modifications of the soda process a pulp suitable for the important type of papers classed as 'book and fine printing' can be produced from the Eucalypts. The quick-growing candlenut (*Aleurites moluccana*) is also promising but since the pulp is bleached with some difficulty, it is recommended for use in the manufacture of brown paper. There seems little prospect of being able to utilise the indigenous grasses or sedges. With regard to other methods of pulping, the sulphate process has hitherto been considered uneconomic in Australia but it is of great

importance in the production of strong (Kraft) pulp. Laboratory and mill trials, however, have shown that it can be successfully used with exotic conifers such as *Pinus insignis*, the results comparing favourably with the pulp from spruce or firs, for which the climate is unsuitable. The possibility of producing a long-fibred sulphite pulp is still under investigation. × × × Under special grinding conditions, immature Eucalypts have yielded very promising results on a laboratory scale, a paper stronger than the standard newsprint being obtained.

—*Nature*. April 14, 1928.

2. "Flame of the Forest."

G. R. E.—Some take it to be the well-known Royal Gul-Mohur (*Poinciana regia*, Boj), others *Butea frondosa* Konig.

The Gul-Mohur is a native of Madagascar, and has been introduced into India about 100 years ago. Mr. W. S. Millard remembered Birdwood maintaining that the "Flame of the Forest" was the name for *Poinciana regia* in the Madagascar forests. But in his catalogue of the Flora of Matheran and Mahableshwar (1887, p. 11) Birdwood calls *Butea frondosa* "Flame of the Forest". The fact alone that *Poinciana regia* is not a forest tree in India makes it very unlikely that anybody should have thought of calling it Flame of the Forest. But anybody who has seen *Butea frondosa* cannot help being struck by the resemblance of its flowers to flames, whilst the Gul-Mohur can scarcely produce that impression.

If we are not mistaken J. D. Hooker was the first to mention that resemblance. Lindley and Moore (*Treasury of Botany*, Part I.) refer to him when they say: Dr. Hooker states that when in full flower the Dhak tree (*Butea frondosa*) is a gorgeous sight, the masses of flowers resemb-

ling sheets of flame, their bright orange red petals contrasting brilliantly against the jet-black velvety calyx."

Troup says in his *Sylviculture of Indian Trees*, "The blackish flower-buds appear on the bare branches in January and from the end of that month, and through February and March the trees herald the hot weather by bursting forth in a blaze of scarlet blossoms, presenting a gorgeous sight which if once seen can never be forgotten: the tree (*Butea frondosa*) is on this account appropriately termed the "flame of the forest."

—*Bombay Natural History Society Journal*. Sep. 1928.

3. Fourth Forest Panchayat Conference:

The following were among the resolutions passed by the fourth Conference of the Forest Panchayats held at Ongole on the 15th January 1929 :—

(1) The Forest Panchayats should be placed on a statutory basis

(2) Government be requested (a) to authorise all Forest Panchayats to compound offences with due provision for prevention of abuse of such powers.

(b) to credit to Panchayats the income derived from compounding fees for offences committed in their respective areas even in cases where the offences are compounded by Tahsildars or other agencies, and also the sale proceeds of forest produce being the subject of forest offences.

(c) to order a reclassification of forests, and include under "Local Forests" all areas classed hitherto as class IV Forests, and also such portions of Provincial Forests as are contiguous to villages or cultivable lands.

(3) The conference is of opinion that the rents now fixed for Panchayats are in the majority of cases, high and require to be revised, and reduced, and requests the Government to place such rent on permanent basis so as to secure to the Panchayats the benefit of all improvements made by them in the forests.

(4) The conference requests that (a) in years in which Panchayat forests do not yield sufficient revenue to pay the lease amount after meeting incidental charges a rebate be allowed to cover the loss.

(b) the Government be pleased to order that grazing fees collected for excess cattle should be handed to the Panchayats concerned, for effecting improvements to Panchayat Forests and not credited to Government.

(c) Government directs that Panchayats only should grant permits for quarrying in their respective areas and for tapping trees for toddy, and that no permits for such purposes be given by the Tahsildar or other authorities and that all income derived therefrom should go to the Panchayats concerned.

(5) The conference requests Government to give financial help to the Forest Panchayat's Union Ltd. to do propaganda work for the uplift of the rural population just as they have been doing in the co-operative line.

(6) The conference is of opinion that locating coupes close to villages is prejudicial to the ryots and so requests the Government to establish coupes in such proximity only after consulting with the ryots concerned and their representatives.

(7) The conference protests against (i) the raising of the fees for sheep from two annas per head to four annas in 76 Panchayat in Vinukonda Taluq, Guntur District, and (ii) the Government's decision to abolish some forest panchayats in Narasaraipet and Palnad taluqs and to allot the land for assignment and requests the Government to consider their orders and direct panchayats to be reconstituted for these areas.

(8) The conference requests the authorities that in all cases where the areas in existing Panchayats are clubbed together, or, are divided, or where parts of such areas are proposed to be removed from such Panchayat areas, the authorities should consult the Panchayats concerned, and consider their objections, if any, before passing final orders.

—“*The Daily Express*,” January, 18, 1929.

4. Singampatti Forests :

Particulars are to hand of the arrangements that are proceeding apace which will result in a large area of the ghat forests in the Tinnevely District being brought under the cultivation of rubber in the next few years. The Zamindar of Singampatti owns an extensive area of rich forests in Western Ghats in Ambasamudram, and is said to be considering schemes for their development. It has been found that about 75,000 acres of the said forests are fit for cultivation of rubber and negotiations have been going on between the Zamindar and some firms for developing the area for rubber cultivation. It is understood that already 10,000 acres have been let on lease for a period of 99 years to a firm experienced in plantation work for rubber cultivation, the Zamindar getting a lump sum of about 3 lakhs at the beginning, and an annual rent of about Rs. 20,000. The remaining area also it is understood,

will be let to firms, who undertake to cultivate rubber, on terms favourable to the Zamindar, and if all the area is to be so let, the Zamindar is expected to realise a large fortune. New roads also will be laid on the forests to facilitate transport of forest produce.

• • • • •
5. **The Leaf Butterfly** :—[A mistake and an example].

The "leaf butterfly" or *Kallima* is invariably shown in all museums mounted on a twig and posing as a dead leaf. Even the British museum has fallen into this error. The laboratory worker noticing the close resemblance of the shape of the wings of this butterfly, and of the colouring of the undersides to that of a dead leaf, comes to a fallacious conclusion that the butterfly when alarmed immediately settles on a twig and assumes the role of a dead leaf. Specimens of the insect are thus mounted and exhibited to the public as examples of protective mimicry. A little reflection ought to show us that it would be difficult for the insect when suddenly alarmed, to find at a moment's notice a suitable twig and shape of leaf in which to merge itself. As a matter of fact the truth is stranger than the laboratory worker's fiction. I have studied *Kallima* on the Nigiris, and find, that when alarmed it darts into the jungle, closes its wings and drops to the ground, at the same time falling over on to its side, and such a position looks exactly like a dead leaf. It matters not whether the leaves around match it or not, for in the average jungle you will invariably find an odd lot of foliage decaying on the ground. I may add that this habit is not confined to *Kallima* alone so that there is less excuse for the perpetuation of the fraud. Incidentally I may mention that I have frequently noticed *Kallima* fly to, and settle on the trunk of a tree when alarmed in which

position its colouring merged with the colouring of the bark. A smiliar habit is indulged in by the Vanessidae.

—Lt. Col. F. C. FRASER,

—*The Hindu Illustrated Weekly*.
Jan, 20, 1929.

6. **The greatest geyser of the world** :—

In yellow-stone Park in the U. S. A., a new geyser has been active since August last. Its crater is elliptical measuring 100 by 120 ft. and is 8 ft. deep. It suddenly bursts forth into furious activity hurling hot water in all directions upto a height of 100 ft. These outbursts occur at intervals of 15 to 20 seconds and continue for about three hours followed by a dead period of 9 hours. During this quiet period the crater is practically dry.

• • • • •
7. **Unseen life in drinking Water** :

Besides the bacteria which can be seen only under high power microscopes, Prof. G. C. Whipple has been able to calculate 187 genera,—108 plants, and 79 animals in drinking water. These include organisms like algae, fungi, protozoa, rotifera, crustacea, bryozoa, and sponges. All these organisms make the water unsavoury; nevertheless it must be noted that they do not thrive in polluted water, i. e. water polluted by sewage. In the study of the life history of these organisms it is interesting to notice that many of them lead a symbiotic life i. e., living one upon the other, thus crustacea live upon rotifera and protozoa, these again upon algae and bacteria and so on. These organisms are found on the surface layers of tanks and lakes generally, obviously because of the sunlight that can be obtained.

—*The Journal of the Madras Agricultural Students' Union*.

8. The following amendment will be issued to the Forest Manual :—

Page 106 of the Forest Manual.—Substitute the following for condition (b) of the special conditions :—

6. No one shall shoot Malabar squirrels, nilgai, or the females or immature males of bison, sambhur, chital, antelope, four-horned antelope, munt-jac or jungle sheep.

The expression 'mature males' in the case of sambhur and chital shall mean stags in hard horn measuring 30 inches or over in the case of sambhur, and 28 inches or over in the case of chital. (The measurement should be taken along the outer curve of the longer horn from the burr to the point.)

A bison is defined as immature unless its horns' measurements reach at least one of the limits specified below:

(1) A span of 33 inches, the measurement being taken horizontally between the outer edges of the horns at their widest spread.

(2) A girth of 16 inches at the base of one horn.

(3) Four inches of corrugation at the base of one horn.

An ibex is defined as immature if the saddle mark is not well defined.

A black buck is defined as immature if neither of its horns measure 14 inches.

—Fort Saint George Gazette, 11-12-28.

8. Insect Orchestra :

The monsoon is the season when our insect orchestra is heard at its best. The whole air at dusk seems to tinkle and murmur with a medley of sound produced by its musicians. They are all members of four insect families :—The short-horned grasshoppers, the long-horned grasshoppers or Katylids, the crickets and the Cicadas. The shorthorned grasshopper is a fiddler. His fiddles are his front-wings and his bows are his hind legs. On the inner side of each hind thigh certain grasshoppers carry a ridge armed with fine teeth which is scraped against a sharp edged vein on the fore wings. This produces his chirping note. The finest insect musicians are to be found amongst the long horned grasshoppers or Katylids. The latter are *the virtuosus* of the insect orchestra. Their musical instruments are carried on the bases of their front wings. The right wing carries a drum and a sharp ridge, the left wing bears a file which is used as a bow to play on the ridge on the right wing, the bow scrapes on the ridge, and the tone and volume of the sound are controlled by vibrations set up in the drum. The methods of sound production differ. The loud notes of the Cricket are working over the left, the edge of one acting on the file of the other to give out a shrill long-sustained note. The musical instruments of the cicadas are the most marvellous sound producing organs in the animal Kingdom. On the underside of his body the cicada carries a pair of drum heads generally protected by flaps set in solid rims of the body wall. The cicada does not beat his drums. They are set into intense vibration by a pair of great muscles attached to them from within the body. Air cavities and accessory vibrators beneath these drums help to increase or diminish the sound which is also influenced by the hollow abdomen and the

position of the covering flaps. Why do insects sing? In some cases it is to attract or advertise their presence to the female of the species. In the majority of insect performers the females are dumb. They are relegated to the role of appreciative listeners. This discovery caused Xenarchos, a Greek poet to exclaim "Happy the Cicadas' lives for they have voiceless wives." Again it would seem that in many cases the voice of the insect is the voice of mirth—an expression of his feelings, an outlet for pent-up emotion; like into the voice of a man singing in his bath, and it is certain that no sane man hopes to impress his wife by the performance.

—*Journal of the Bombay Natural History Society.*
September 1928-

9. Tapping 'Hardwickia pinnata' for wood oil:

The ghat reserves of South Kanara contain *Hardwickia pinnata* trees in fairly large numbers. Only stems of and above 5 feet girth at breast height may be tapped. A hole three quarters of an inch is bored into the stem about three feet above ground by means of an auger. The hole should reach the pith and be slightly slanting, with the pith end higher. A lip is fixed immediately below the hole and a kerosine oil tin placed beneath the lip to catch the oil.

The oil if thin flows out entirely in one day. When the flow stops the tin is removed and the hole plugged tightly with a piece of wood. In the course of a year the hole is usually occluded. Trees are tapped all the year round except during the rains from June to September.

A tree yields from one to four kerosine oil tins of oil. A tree yielding the most oil usually gives thin oil. Thick oil is better than thin oil and it is said that some trees do

not yield any oil at all. The oil is sold in Mangalore at Rs. 12 to 14 per tin of 4 gallons. The South Mangalore Dn. derives a revenue of Rs. 300 to Rs. 500 from this source at present, and the industry is capable of expansion. The oil is used locally as a wood preservative. × × × It is believed that trees will be ready for tapping again after 10 to 15 years.

—*Indian Forester, November 1928.*

10. Dry-rot in wood:

(1) Heat, air, and moisture are necessary for the growth of all dry-rot fungi (2) the fungi will not thrive when a great excess of one of these agencies is present. (3) Although a fungus may be killed by excessive heat, it is probable that no extreme of natural cold will kill it, although its growth may be restricted; and (4) speaking very generally, soft woods are more frequently attacked than hard woods, sapwood more frequently than heartwood, and quick growing timber more frequently than slow growing. * *

Fungi cannot attack and digest all kinds of wood with equal facility. In the first place sapwood is more readily attacked and more perishable than the heartwood of the same timber, in those species which show a clear distinction in colour between sapwood and heartwood, as is the case with oak, red deal and pitch pine. It is necessary to emphasise this statement as it is sometimes alleged that the sapwood of the most important building timber in Europe red deal, is quite as durable as the heartwood, the well preserved sapwood of this timber in old beams, joists and rafters being pointed to in support of this contention. The fact is that the sapwood as long as it is dry, resists decay, but when moistened it rots much more readily than heartwood.

Again some kinds of fungi can set up dry rot only in certain kinds of timbers, soft-woods (ie, coniferous timbers), for instance; whereas other kinds, including *Merulius lacrymans*, can destroy timbers ranging from soft-woods to such durable hard-woods as oak, teak and mahogany.

Very important in facilitating the spread of dry rot is the fact that the fungi responsible can live at the expense of organic materials other than wood. They can feed on paper, potatoes, jellies containing extracts of fruits or meats, and above all, at least some of them can grow on moist garden soil. The result is that a house can become infected with *Merulius lacrymans* through the agency of the soil.

During the process of removal of infected timber it is important to follow up all visible signs of the fungus, which may be found penerating through the joints of brick walls and even between successive layers of plaster. x x x x x

—*Indian Forester, December, 1928.*

11. Forest facts :

Canada is the only substantial source of Coniferous woods in the British Empire.

Ninety two out of every hundred acres of forest land in Canada belongs to the people of Canada.

The forest is second only to agriculture in the value of its products ; in production it furnishes twice the value of the mines, and ten times the value of the fisheries.

Ninety one per cent of all newsprint paper, and 51 per cent of all manufactured lumber made in Canada are disposed of in markets outside of Canada.

In their surveys during the past two years, Canadian aviators have travelled distances equal to eight complete flights around the world.

In the last two years 200,000 square miles of formerly inaccessible territory have been photographed from the air. From these aerial photographs maps are produced which are much more accurate and complete than was possible under the old system.

—*Forest and Out-doors, October, 1928.*

Additions to the M. F. C. Library.

1. 'Stream-guaging.'—By William A. Liddell.
2. Progress report of the Forest Administration in Coorg for 1926-27.
3. Report on Sylvicultural Research in the Madras Presidency—1926-27.
4. Burma Forest Bulletins Nos. 17 & 19.
5. Progress report on Forest administration in the N. W. Frontier Provinces for the year 1926-27.
6. Administration report of the Forest Department of Madras Presidency for the year ending 31st March 1927. Vols. I & II.
7. Forest Research in India 1926-27.
8. Revised working Plan for the Mudumalai Forests 1927-37.
9. Working Plan for the Bolampatti valley.
10. Proceedings of the World Forestry Congress, Rome, Vol. I.

11. "How a tree grows"—By William Somerville.
12. Annual Forest Administration report for the Bombay Presidency for 1926-27.
13. Forestry technique (Broad leaved trees of India.)
—By Messrs. C. G. Trevor, H. G. Champion,
and R. N. Parker.
14. Forest technique—Conifers of India—By C. G. Trevor.
15. Note on Indian hardwoods—By C. C. Wilson.
16. Note on minor Forest Products (India)—By,
Messrs C. C. Wilson, and F. D. Ardagh.
17. Note on Forest Entomology in India—By, Dr.
C. F. C. Beeson.
18. Note on timber testing—By L. N. Seaman.
19. Note on Forest Utilization Research in India—By
C. C. Wilson.
20. Popular hand-book of Indian birds—By Hugh
Whistler.
21. Forestry and Forest Resources, Western Australia
for 1928.
22. The principles of Kiln seasoning of timber. Part I.
Types of Commerical Kilns in use.
23. Commercial timber trees of the Malayan peninsula
—By Foxworthy.
24. Flora of the Presidency of Madras, Part VIII
—By C. E. C. Fischer.
25. Fauna of British India—Birds. Vol. V. (Second
Edition)—By Stuart Baker.

26. Physics for Colleges—By H. Horton.
27. Forest Products research . Special Report No. 1.
—The air seasoning and conditioning of
Timber.
28. The seasoning of Western Australian Hard-woods.
Bulletin No. 40.
29. Forest Products Research—Bulletin No. 1 Dry
rot in wood.
30. Forest Products, their manufacture and use.—By
Brown.
31. With a Camera in Tiger land—By, F. W.
Champion.
32. Note on weight of seeds—By S. H. Howard, and
H. C. Champion.
33. Report on the operations of the Forest Dept;
Western Australia, for the year ending June
1928.

Additions to the Forest Museum.

Contribution.	Contributor.
1. Hand specimens of forty four native timbers in common use in Australia.	Commonwealth Forestry Bureau, Australia.
2. A toy cart made at Kondapalle, (of <i>Gyrocarpus jacquini</i> and <i>Givotia rottileri formis</i> .)	
	I. Sambasiva Rao Naidu.

OCEAN OF NECTAR
 IS THE TRUE MEANING OF
AMRITARNAV AVALEH,

The use of which purifies the blood, imparts strength, dissipates the weakness of the brain as well as the excess of heat in the body, and strengthens the memory.

Rs. 2 per tin containing half a pound.

For a detailed list write to :—

Madras Office: } **ATANK NIGRAH PHARMACY JAMNAGAR,**
 26 Broadway. } **(KATHIAWAR.)**

Gazette Notifications.

16—10—1928. Mr. D. F. Stileman, Deputy Conservator of Forests, leave on average pay for six months, and in continuation thereof leave on half average pay for six months with effect from 1st Dec. 1928 or date of relief.

M. R. Ry. E. V. Padmanabha Pillai Avl., E.A.C., D.F.O., Palghat is granted leave on average pay for twenty two days from 1st December 1928, with permission to affix the Christmas and New Year holidays.

Saiyed Riazuddin Sahib Bahadur E.A.C., Nilambur, is posted to act as District Forest Officer, Palghat, during the absence of Mr. Padmanabha Pillai on leave.

Mr. M. S. Rangasami, E.A.C., of Forests, granted extension of leave for three months, and twenty nine days with effect from 16th December 1927.

Mr. N. S. Ghate, A.C.F., granted leave on average pay for two months from 16th October 1928 and on half average pay for seven days in continuation thereof. He is also permitted to affix the Christmas and New Year holidays.

23—10—1928. Mr. E. B. Ramachandra Rao, E.A.C., Special Forest Officer, Parlakimedi maliahs, granted extension of leave on average pay for one month with effect from 24—10—1928.

M. B. Ry. S. Ramasami Ayyar Avl, E.A.C., will on the expiry of his leave be attached to the Madura Division.

Mr. E. M. Crothers, D.F.O., Nilambur granted leave on average pay for one month with effect from 11—12—1928, or date of relief.

Mr. A. L. Griffith, A.C.F., Madura will act as D.F.O., Madura in relief of Mr. D. F. Stileman, granted leave, until further orders.

30—10—1928. The leave for one month granted to Mr. E. M., Crothers, D.F.O., Nilambur, is cancelled.

ii.

M. R. Ry. V. N. Seshagiri Rao Avl., D.F.O., Vizagapatam, will on relief by Mr. Raju Nayakar, resume his special duty in Rampa.

13—11—1928. Mr. A. A. F. Minchin, Conservator of Forests leave on average pay for two months and twenty days, and in continuation thereof leave on half average pay for one year and one month and ten days with effect from 1st September 1929 or date of relief.

Mr. C. S. Martin, Chief Forest Engineer, to be in charge of the duties of the Forest Economist in addition to his own with effect from 10th October 1928 afternoon.

Mr. W. F. Chipp, Forest Engineer in charge of Saw Mills and Extraction Division on return from leave to resume charge as Forest Engineer, Saw Mills and Extraction Division.

Mr. J. A. Wilson on relief by Mr. Chipp to be attached to the Forest Engineer, Saw Mills and Extraction Division.

M. R. Ry. P. Govinda Menon Avl., E.A.C., Ganjam Division will be attached to the District Forest Officer, Wynaad, with effect from 1st Dec. 1928.

The posting of M. R. Ry. S. Ramaswami Ayyar Avl., E.A.C., attaching him to the Madura Division is cancelled. He will on the expiry of his leave be posted as the Special Forest Officer, Parlakimedi Maliahs.

20—11—1928. Mr. R. S. Browne, Dy. Conservator of Forests, on return from leave to be D.F.O. Nilambur.

Mr. E. M. Crothers, Dy. Conservator of Forests, on relief by Mr. R. S. Browne to be D.F.O., Chittoor.

Mr. H. A. H. G. Hicks, Dy. Conservator of Forests, granted extension of leave on half average pay for two months and nine days from 23rd December 1928.

iii.

Mr. M. S. Rangaswami, E.A.C., granted extension of leave with effect from 16th December 1927 as follows:—
Leave on average pay on medical certificate for one month and four days followed by leave not due on half average pay (on medical certificate) for two months and twenty six days, with permission to affix Sunday the 15th April.

Mr. M. Amir Padshah Sahib, E.A.C. of Forests, and D.F.O., N. Cuddapah will be in additional charge of the current duties of the South Cuddapah Division from 20—11—28 until he is relieved of the N. Cuddapah Dn. by Mr. Abdul Karim and takes sole charge of the S. Cuddapah Division, vice S. K. Basu granted leave.

27—11—1928. Mr. W. G. Dyson, Dy. Conservator of Forests, on return from leave to be D.F.O. Ganjam.

4—12—1928. Mr. D. L. Sathe, D.F.O. Ganjam, on relief by Mr. W. G. Dyson to be D.F.O., N. Cuddapah.

Md. Abdul Karim Sahib Bahadur, D.F.O., Guntur on relief by Mr. George Venugopal, to be attached to the Vellore Division until further orders.

The posting of Md. Abdul Karim Sahib Bahadur to be D.F.O., N. Cuddapah division is cancelled.

Mr. S. V. Devadasan, D.F.O., Chittoor, granted leave on average pay for three months with effect from date of relief by Mr. E. M. Crothers.

Mr. J. Coode, W.P.O., Wynaad granted leave on average pay for one month and fifteen days with effect from 1st December 1928 or date of relief.

11—12—1928. Mr. O. H. C. Shelswell, Dy. Conservator of Forests, leave on average pay out of India for three months and sixteen days with effect from "—1—1929.

M. R. Ry. M. H. Krishnaswami Avl., E. A. C., Wynaad Division, granted leave on average pay for two months with effect from 3rd January 1929.

iv.

18—12—1928. M. Amir Padsha Sahib Bahadur, E. A. C. of Forests, and D.F.O., S. Cuddapah, will, on relief by Mr. S.K. Basu, be attached to the W. Kurnool Division.

1—1—1929. M. R. Ry. T. V. Venkateswara Aiyar Avl., E.A.C., on return from leave to be Assistant Working Plans Officer, with effect from 3rd June 1929.

Mr. E. B. Ramachandra Rao, E. A. C., of Forests, on return from leave, to act as Personal Assistant to the Chief Conservator of Forests, with effect from 3rd Jan. 1929, vice Mr. O. H. C. Shelswell, granted leave.

Mr. A. Banerji, A. C. F. reported for duty in the S. Mangalore Division on the forenoon of 19th November 1928.

Mr. E. B. Ramachandra Rao, E. A. C., granted extension of leave on average pay for 29 days from 24—11—1928 to 22—12—28. He is permitted to affix the Christmas and New Year holidays to the leave.

8—1—1929. M. R. Ry. E. K. Krishnan Avl., E. A. C., Ganjam Dn. granted leave on average pay for two months with effect from 14—4—1929.

15—1—1929. Mr. A. Wimbush, Conservator of Forests, and acting Chief Conservator of Forests, leave on average pay for eight months and in continuation thereof leave on half average pay for four months with effect from 10th April 1929 or date of relief.

Mr. J. Coode, A. C. F., is, on the expiry of his leave attached to the Wynad Division. He will take charge of the Kenoth Range.

Mr. A. L. Griffith D. F. O., Madura, will on relief be attached to the Sixth Circle until 15th June and then to the Fifth Circle until further orders for training.

Mr. E. A. Lasrado, A. C. F., the Nilgiris Division is attached to the office of the Conservator of Forests, Sixth Circle.

v.

Notifications relating to Rangers.

30—10—1928. The following promotions of Rangers are ordered :—

With effect from 23—8—1928 in the vacancy due to the reduction of M. R. Ry. T. G. Sankaran Nair, Ranger II Grade, permanently to the III Grade.

(1) M. R. Ry. N. C. Madhavan Pillai from II Grade sub protem to II Grade permanent.

(2) M. R. Ry. A. K. Kandan from III Grade permanent to II Grade sub protem.

(3) M. R. Ry. C. S. Ramanathan from IV Grade permanent to III Grade sub protem.

2. With effect from 27—8—1928 in the vacancy due to the retirement of M. R. Ry. P. Miranda, Ranger III Grade.

(1) M. R. Ry. K. Tatacharya from IV Grade permanent to III grade permanent.

(2) M. R. Ry. G. Devanayagam Naidu, from IV Grade sub protem to IV Grade permanent.

(3) M. R. Ry. C. T. Thiruvengadam from V Grade permanent to IV Grade sub protem.

3. With effect from 6—8—1928 in the arrangement due to the deputation of M. R. Ry. N. K. Sarma, Ranger III Grade, to the Vizianagaram Estate.

M. R. Ry. M. N. Raman Pillai, Ranger IV Grade permanent to III Grade sub protem.

1—2—1929. The leave on average pay for three months without medical certificate granted to M. R. Ry K. K. Appiah, Ranger V Grade by the Logging Engineer in his S. O. No. 7129 dated 28—1—1929 is approved.

First Circle.

- 20—10—1928. On expiry of the leave granted to him (3-11-28) M. R. Ry. B. V. Vaideswara Iyer, Ranger V grade, is transferred from the Ganjam to Vizagapatnam District for the charge of the Palakonda Range.
- 9—11—1928. The four months leave on average pay on medical certificate granted to Mr. W. S. Fernandez, Ranger V grade is extended *subject to eligibility* by one month's leave on average pay on medical certificate.
- 11—11—1928. The leave on average pay for 4 months granted to M. R. Ry. M. Narasinga Rao Naidu from date of relief is hereby cancelled.
- 14—11—1928. Mr. I. John, Ranger VII grade in charge of Lakkavaram Range Godavari Upper is granted leave on average pay for four months with effect from date of relief.
- 30—11—1928. Mr. D. E. Lewin, Ranger IV grade, on expiry of his leave (7—1—1929) is transferred from Vizagapatnam District to Parlakimidi Maliahs for the charge of the Chendragiri Range.
- 11—12—1928. M. R. Ry. B. V. Nagaraja Ayyar, Ranger II grade, Godavari Lower, is granted leave on average pay for one month with effect from 3rd January 1929 with permission to prefix the Christmas holidays.
- 20—12—28. M. R. Ry. T. Balaramaswamy Naidu, Ranger VII grade on reversion from Parlakhimidi Estate is posted to the charge of Lakkavaram Range, Godavari Upper Division vice Ranger I. John granted leave.
- 14—2—1929. 1. On return from leave (21—2—1929) M. R. Ry. M. Subba Rao, Ranger VI grade, is posted to Berhampur Range, Ganjam District.

Second Circle.

- 14—11—1928. 1. M. R. Ry., T. K. Ramaswamy Ayyar, Ranger II grade, on return from leave (27—11—1928) is posted to Balapalle Range Cuddapah South Division.
2. M. R. Ry., T. M. Krishnamachari Supernumerary Ranger in charge of Balapalle Range on relief by No. 1 is to remain attached to Balapalle Range Cuddapah South Division for special duty until further orders.
- 19—11—1928. M. R. Ry., T. K. Ramaswami Ayyar Ranger II grade, Cuddapah South Division is granted an extension of leave on loss of pay from 27th November 1928 to 31st December 1928 in continuation of the leave granted to him for 7 months and 26 days.
- (This cancels his posting to Balapalle Range ordered in this office Service Order No. 96/28 dated 14—11—1928).
- 22—11—1928. Mr. A. Rahiman Khan, Ranger, VI grade, on special duty in Kurnool South Division is posted to the charge of Sirvel Range of the same division vice M. R. Ry., T. Venkatasubbiah Ranger reported sick.
- 22—11—1928. M. R. Ry., S. Ramachandra Ayyar, Ranger III grade is granted an extension of leave on medical certificate on full average pay for 15 days from 11—10—1928 to 25—10—1928 (both days inclusive) in continuation of the leave granted to him.
- 22—11—1928. Forester C. H. Ramamurthi (IV grade) (M.R.H. 1927) attached to Kurnool East Division is posted to the charge of Pechervu Range Kurnool West Division as a temporary measure vice M. R. Ry., K. Thiruvenkatachari Ranger suspended.
- 2—12—1928. 1. M. R. Ry., S. Ramachandra Ayyar Ranger, III grade Bukkapatnam Range, Anantapur Division to act as Senior Instructor, Vernacular Training School Session (1929)

viii.

to be held in North Cuddapah Division commencing from 16th January 1929.

2. V. N. Parthasarathy Forester II grade (M. R. H. 1928) attached to Kurnool South Division to act as Junior Instructor.

3. M. R. Ry., N. Rajagopala Chetty Supernumerary Ranger now on special duty in the Bukkapattanam Range, Anantapur Division, to be in charge of Bukkapattanam Range vice No. 1 or until further orders.

13—12—1928. M. R. Ry., T. K. Ramaswami Ayear Ranger II grade on return from leave (1—1—1929) is posted to Pecheruvu Range of Kurnool West Division.

2. Forester Ch. Ramamurthi on relief by No. 1. will remain attached to the Kurnool West Division after relief, pending further orders.

13—12—1928. In partial modification of this office Service Order No. 81/28 dated 9—9—1928 M. R. Ry., N. C. Mahadevan Pillai, Ranger, II grade, is granted leave on full average pay on medical certificate from 4th October 1928 to 1st December 1929 (both days inclusive).

19—12—1928. T. V. Venkata Subbiah Ranger V grade in charge of Siravani Range is granted leave on average pay for 1 month from 27th November 1928 to 26th December 1928.

18—1—1928. M. R. Ry. D. Venkateswaralu Ranger VII grade will be considered to have been on duty attached to Gundla-
brahmeswaram Range, Kurnool West on the 13th and 14th of October 1928.

Third Circle.

13—11—1928. M. R. Ry. S. Nageswaran, Supernumerary Ranger on Working Plans Duty in the North Coimbatore Working Plans Division, is granted leave on average pay from 21st forenoon or afternoon of November 1928 upto Xmas holidays: with permission to avail himself of Xmas holidays

ix.

and New Year holidays. On return from leave he is to report himself for duty before the Working Plans Officer, South Mangalore Division at Mangalore.

27—12—1928. M. R. Ry. M. N. Raman Pillai Ranger under the Working Plans Officer, Mount Stuart will be considered to have been on leave on average pay on medical Certificate for 4 months with effect from the 22 May 1928.

Fourth Circle.

31—10—1928. M. R. Ry., R. Manickam Pillai, Ranger III grade on return from leave is posted to the charge of Polur Range, Vellore division.

2. Mr. E. W. Fernandez, Ranger V grade is on relief by No. 1 posted to special duty for demarcating the alignment of a road from Nadanur to Mandaparnai. Headquarters, Vellore.

14—11—1928. Mr. Henry Mac Bride, Ranger IV grade is on return from leave posted to special duty under the Extra Assistant Conservator at Tirupattur.

27—11—28. Subject to eligibility M. R. Ry., A Siddhan Pillai, Ranger III grade, South Salem division, is granted extension of leave on average salary on medical certificate for 4 months from 30—11—1928 in continuation of the leave granted by the Conservator of Forests, Sixth Circle.

9—12—1928. M. R. Ry., P. K. Subbanarayana Ayyar, Supernumerary Ranger, on return from leave is posted to Central Salem division for special duty for checking patla sandal trees.

9—12—1928. Mr. Henry Mac Bride, Ranger IV grade, on special duty under the Extra Assistant Conservator of Forests, Tirupattur, is posted to the charge of Alangayam Range, Vellore division.

2. Mr. P. B. Saiyid Yabia, Ranger V grade, Alangayam Range, on relief by No. 1 is posted to the charge of Chemala Range, Chittoor division.

3. M. R. Ry., M. S. Krishnaswami Ayyar, Ranger VII grade sub-*protem*, on relief by No. 2 is posted to South Salem division for special duty for checking patta sandalwood.

13—12—1928. Mr. P. B. Saiyid Yabia, Ranger V grade, is posted to the charge of Gudiyattam Range, Chittoor division, Vice M. R. Ry., P. Mathuramuthu Pillai reported sick.

13—12—1928. The transfer of M. R. Ry., M. S. Krishnaswami Ayyar Ranger VII grade, *sub-protem*, to South Salem division, ordered in paragraph 3 of this office Service Order No. 86 of 1928, dated 9—12—1928, is kept in abeyance for two months.

19—12—28., M. R. Ry., P. Mathuramuthu Pillai, Ranger II grade, Chittoor Division is granted leave on average salary on medical certificate for 3 months from 9—12—1928.

Fifth Circle.

6—11—1928. Mr. R. Ry. P. Velayuthan Nair, Ranger I Grade, South Coimbatore Division is granted L. A. P. from 10th November 1928 to 9th December 1928. He should return to duty on 10th December 1928 without fail.

Mr. A. Culas, Ranger III will be in charge of the Range during the absence of No. I.

7—11—1928. Supernumerary Ranger S. Narayanaswamy Ayyar on special duty in Kollegal Division is posted to the charge of Cumbum Range is Madura District in relief of Ranger K. Jayarama Ayyar proceeding on sick leave. To join expeditiously.

21—11—1928. In continuation of this office S. O. No. 52 of 28 dated 16th October 1928 M. R. Ry. C. Thiruvengadam Pillai, Ranger V Grade Tinnevely District is granted extension of leave not due on M.C. for 2 months on half average pay with effect from 7th November 1928.

8—12—1928. Forester A. Sitarama Sarma M. F. C. is posted to take charge of the Bargur Range, Kollegal Division. To join expeditiously.

2. Ranger A. R. Manuals on relief by No. 1 will take charge of the Ayyalur Range Madura District.

9—12—1928. M. R. Ry. P. Sithapathi Ayyar, Ranger V grade, Punachi Range, South Coimbatore District is granted leave on average pay for 1 month & 4 days with effect from 19—11—1928 with permission to affix the Christmas holidays to the leave:

M. R. Ry. K. R. Viswanatha Ayyar, Ranger III grade, Pollachi Range will hold charge of the Poonachi Range in addition to his own duties until further orders.

21—12—1928. M. R. Ry. C. Karunakara Menon, Ranger V Grade, Natham Range, Madura District is granted leave on average pay on medical certificate for 4 months from date of relief by Forester Maragathavelu who will be in charge of the range until further orders.

21—12—1928. M. R. Ry. K. Jayarama Ayyar VI Grade, Madura District is granted leave on average pay on medical certificate for 2 months with effect 3rd December 1928.

On the expiry of this leave he will report himself for duty as Assistant Ranger in Tunacadavu Range, South Coimbatore Division.

30—12—1928. On the expiry of his leave M. R. Ry. C. Thiruvengadam Pillai, Ranger V Grade, Tinnevely District, is posted to charge of Natham Range, Madura Division.

2. Ranger P. Sithapathy Iyer granted 6 weeks leave on Medical Certificate from 3rd January 1929, on return from leave, is posted to charge of Ramapuram Range, Kollegal Division. His transfer to Natham Range Madura District is cancelled.

xii.

3. Ranger Kondathu Goundan on relief by No. 2 is posted to charge of Bargur Range, Kollegal Division.

4. On relief by No. 3 Forester A. Sitharama Sarma will report himself for duty before the District Forest Officer, North Coimbatore.

5. M. R. Ry. M. Sankaran Nair, Ranger VI Grade will continue to hold charge of Nanguneri Range, Tinnevely District. His transfer to Ayyalur Range in Madura District ordered in this office S. O. No. 54 of 1628 dated 23rd October 1928 is cancelled.

2—1—1929. Mr. A. A. Khan Assistant Conservator of Forests attached to South Coimbatore Division is posted to charge of Udamalpet Range in the same Division with effect from 10th January 1929.

2. On relief by No. 1 M. R. Ry. P. Ramaswamy Ayyar Ranger VI Grade is posted to charge of Punachi Range to relieve Ranger K. R. Viswanatha Ayyar of additional charge.

24—1—29 M. R. Ry. P. Sithapathy Ayyar, Ranger V Grade is granted extension of leave from 23rd December 1928 to 18th February 1929 as detailed below.

L. A. P. without medical certificate from 23—12—1928 to 2—1—1929 L. A. P. on medical certificate for 6 weeks from 3—1—1929 to 13—2—1929.

M. R. Ry. C. Thiruvengadam Pillai, Ranger V Grade, is granted extension of leave not due for one month from 7th January 1929.

1—2—1929. Ranger L. J. Taylor is transferred to Natham Range, Madura district. He will hand over charge of the Kannikatty Range to Range Officer Kodamady who will hold charge of both Ranges until the return of Ranger C. Thiruvengadam Pillai from leave.

xiii.

2. Ranger C. Thiruvengadam Pillai on return from leave will take charge of the Kannikatty Range.

3. This cancels the posting of Ranger C. Thiruvengadam Pillai to Natham Range.

7—2—1929. M. R. Ry. A. M. Srinivasulu Naidu, Ranger VI Grade is posted to charge of Talamalai Range, North Coimbatore Division.

Sixth Circle.

26—10—1928. M. R. Ry. P. A. Madhavan, Supernumerary Ranger, on the expiry of his leave on 31st October 1928, is posted to the Nilambur division for special duty.

2. M. R. Ry. P. Sankunni Nair, Ranger VI grade, Assistant Instructor, Vernacular Training School, Palghat is, on the conclusion of the Vernacular Training School, posted for special duty to Mudumalai Range, Nilgiri Division. This cancels his posting to the Palghat division.

21—10—1928. M. R. Ry. M. P. Subbayya, Ranger VI grade, is granted a further extension of leave for 2 months from 9th November 1928.

6—11—1928. M. R. Ry. S. Venkatarama Ayyar, Supernumerary Ranger on special duty in the Begur Range, Wynad division, is, as ordered in Chief Conservator's L. Dis. No. 8827/28 dated 27th October 1928, transferred to the III Working Plans Circle.

10—18—1928. M. R. Ry. K. R. Krishnan Nair, Ranger II grade, at present attached to III Circle, on return from leave on 14th December 1928, to the charge of the Bolampatty Range, Palghat Division.

2. M. R. Ry. A. M. Srinivasulu Naidu, Ranger, VI grade, in charge of the Beltangady Range, on relief by No. 1 to special duty, Palghat.

xiv.

15—11—1928. M. R. Ry. A. Joseph, Ranger VI grade, is posted to the Wynad Division for duty as assistant to the Ranger of Chedleth Range. To join expeditiously.

8—12—1928. M. R. Ry. I. Z. Robert Paul, Ranger V grade, on special duty in the Nilambur division is transferred to the North Mangalore division for special duty (i. c. stock mapping)

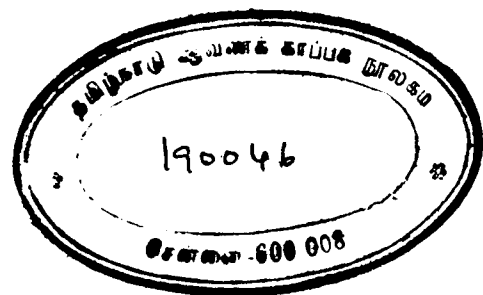
2—1—1929. M. R. Ry. N. Gopalan Nair, Ranger VI grade, on the expiry of his leave, is posted to the Wynad division for special duty.

27—1—1929. M. R. Ry. C. M. Narayanan, Ranger III grade, on special duty in the Nilambur division, is transferred to the Palghat division for special duty. To proceed immediately.

5—2—1929. M. R. Ry. M. Rams Rao Kini, Ranger V grade, transferred from the V to the VI Circle in Chief Conservator's L. Dis. No. 10465/B. 2-288 dated 30—1—1929, to the charge of the Bolampatti Range, Palghat division, vice Ranger A. M. Srinivasalu Naidu transferred to the V Circle in the above reference.

8—2—1929. M. R. Ry. A. Bama Hebber, Ranger II grade, in charge the Palghat Range, is granted leave on average pay for 2 months from 1st March 1929 or date of relief.

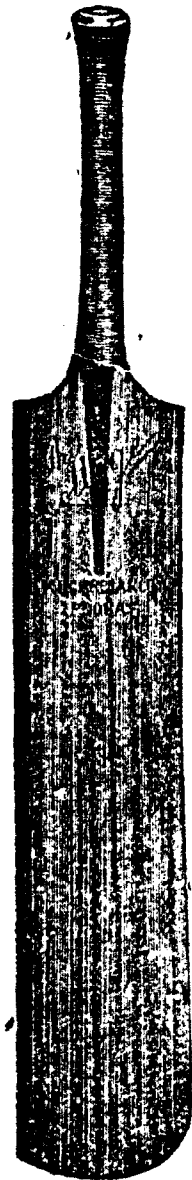
2. M. R. Ry. C. M. Narayanan, Ranger III grade, on completion of his special duty in Palghat division, is posted to the charge of the Palghat Range to relieve No. 1.



3L
DB, d, m 211. N16
N 28

KUCKREJA & CO.,

Telegrams :—"KUCKREJA



**The Leading Sporting
Warehouse in the Deccan**

Manufacturers and Direct Importers
of all kinds of sporting requisites
and stockist of Indoor and Outdoor
Games.

By Special Appointment to
H. E. the Governor of Bombay

Established 1898.

KUCKREJA & Co.,

"The Deccan Sports Works"

182, Commercial Street,

BANGALORE.

Branches :—

**SIALKOT, POONA, NAGPUR
AND MHOW.**

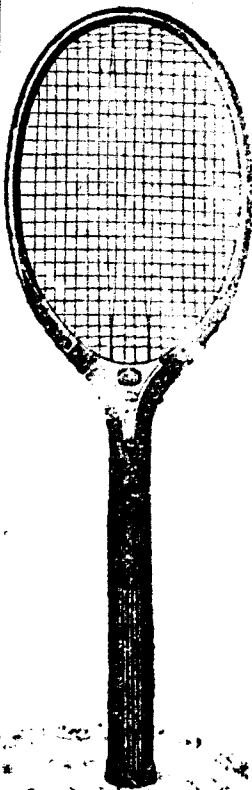
Regular Suppliers to :

**Gymkhanas, Regimental
Clubs and Institutes, Colleges
Schools, Private Clubs, &c.,**

ILLUSTRATED CATALOGUE

SENT FREE.

**FACTORY
and
HEAD OFFICE:**



SIALKOT CITY

THE COIMBATORE CENTRAL BANK LTD.

(Raja Street, Coimbatore.)

Registered capital	...	Rs. 1,00,000
Issued and paid up capital	...	" 47,325
Reserve fund	...	" 12,354
Working capital	...	" 1,20,000

Fixed deposits.

Savings fixed deposits for 2 years: Interest 9% per annum, payable monthly.

Fixed deposits for one year: Interest 9% per annum payable yearly.

Current deposits: Interest at 3% per annum.

Auction Chits

A speciality.

Rs. 5, 10, 15, 20, 25 and 30 chits respectively per month.

Coimbatore, }
15-11-1928. }

S. S. Ganesha Iyer,
Managing Director