Madras Forest College Magazine

V.17 No.1 September 1932.

An extract from a letter dated 2-11-32 from the Honorary Editor, "Indian Forester" to the Principal, Forest College, is published below :—

"In order to encourage all officers to subscribe to the departmental Magazine it has been decided to reduce the annual subscription rates as detailed in the annnexed notice.........

These new rates will take effect as from the January 1933 issue and are for advance subscriptions only.

I should be most grateful if immediate steps could be taken to have this made known as widely as possible. 90 copies of a revised circular* are being sent herewith for distribution among the Forest Rangers and Extra Assistant Conservators serving under you."

* NOTICE.

Reduction in "Indian Forester" Subscription Rates.

As from the issue of January, 1933, the subscription rates for the *Indian Forester* will be reduced as follows :—

For all Forest Officers drawing less than
Rs. 250/- per mensem, Rs. 6/- per annum.

For all Forest Officers drawing more than
Rs. 250/- but less than Rs. 500/- per mensem,
Rs. 10/- per annum.

These rates apply to subscriptions for a year paid in advance. Subscriptions should be forwarded to :—

The Manager,
C. & M. GAZETTE PRESS.
P. O. Box 36,
LAHORE.

The Rs. 6/- rate is considerably below cost price and the reduction has been made with the object of including all rangers and junior officers to purchase their own copy of the Forest Service Magazine.

R. MACLAGAN GORRIE,
Hon. Editor,
Indian Forester.

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(Assistant Editor.)

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THE

Madras Forest College Magazine.

(PUBLISHED QUARTERLY.)

Vol. XVII. SEPTEMBER 1932. No. 1.

The Managing Committee do not hold themselves responsible for opinions expressed by contributors.

"Correction-slip" for the names of the more important trees and shrubs of the Madras Presidency.

BY, G. VISWANATHAM,
Curator, Forest Museum.

In continuation of the note on the international rules of botanical nomenclature, published on pages 101–105 of the December 1931 number of the *Madras Forest College Magazine*, the annexed list showing the names of the more important trees and shrubs (of this presidency) that have suffered a change by the application of the rules, should, I think, be useful for reference. It has been prepared in alphabetical order from the nine parts of Gamble's "*Flora of the presidency of Madras*" issued so far, and certain other recent publications (including the "*Indian Forester,*" October 1931). Only the more important woody species of forest importance, and of this presidency are listed. In accordance with the present practice in the Forest Research Institute, Dehra Dun, and the circular of the Chief Conservator of Forests, Madras, based on it, ***all*** specific names are begun with a small letter. Though this has not been sanctioned by the international rules of nomenclature the vexed question of the spelling of specific epithets is much simplified by this method.

To make the list more useful, a few synonyms recorded even before the publication of Gamble's flora are also included, and shown in brackets.

The chief rule that has caused so many corrections of name is the "principle of priority." In order to find out the "correct" name of a species all the binary names which it may have received from 1753,—the year of publication of Linnaeus' ***Species Plantarum***, Ed. I, and the starting point of our modern "binary" system of nomenclature,—are arranged in chronological order, and the ***earliest*** specific epithet available under the present generic name is accepted as "correct." The present confusion is the direct result of the non-observance of some such rules in the past, and the present day tendency to accept smaller units as genera and species. The same species came to be known by different botanists under two or more different names, some retaining the earliest given name, and others choosing to adopt later ones. Soon it was realised that the stability of a name was far more important than its appropriateness, with the result that it has been now decided to adopt the first validly published name. A strict adherence to this rule may cause confusion, one lasting for years, but the inconvenience caused is temporary, and pales into insignificance before the eventual stability of nomenclature achieved. Whenever one refers to a plant that has had a revised name under the rules, it is suggested that its former name or synonym be tacked on and put in brackets.

This will have to be done till people get used to the revised nomenclature. Thus the black-plum tree must be referred to as: Syzygium jambolanum, ***DC.*** (Eugenia jambolana, ***Lam.***) Again, the emblic myrobolan tree as: Emblica officinalis, ***Gaertn*** (Phyllanthus emblica, ***Linn***), and so on.

A factor which has contributed to swell the list of corrections in no less degree than the rule of the "principle of priority" is the growing tendency to split up hitherto accepted species into smaller units, thus considerably increasing their number. Many varieties have been recently elevated to specific rank. The wholesome Linnaean conception of a species as covering a fairly wide range of forms grouped around a mean type has now given place to a tendency to draw hair-splitting differences, and tear up a species into smaller units, the latter also being dubbed as such. It is said that many new species have been founded on minute differences, and created for single specimens extracted from the herbarium. There are, as it were, "compound species" supplemented by the 'micro-species' (the units of which the former is made up), 'hybrid swarms' making the skein more tangled! No wonder the recently issued seventh ***supplement*** of the "***Index kewensis***" has an array of some 33,000 ***new*** specific names! More are on the anvil, and will figure in the eighth under preparation. It is hoped that the taxonomist or any other botanical busy-body will not aggravate the situation by elevating more of the 'varieties' to specific rank, in his desire to immortalise himself!

Two lists are published below. List A shows the former names of trees alphabetically arranged, with the correct name against each, while list B shows the correct names in alphabetical order with the equivalent indicated by its serial number appearing in list A.

LIST A.

Former name.	Correct name.
1. Acacia caesia, *W. & A.*	Acacia torta, *Craib.*
2. Acacia catechu, *Willd*, var *sundra.*	Acacia sundra, *DC.*
3. Aglaia roxburghiana, *Bedd.*	Aglaia bourdillonii, *Gamble.*
4. Agrostistachys longifolia. *Benth.*	Agrostistachys meeboldii, *Pax.*
5. Alangium lamarckii, *Thw.* A. decapetalum *Lamk.*	Alangium salvifolium, *Wang.*
6. Albizzia stipulata, *Boiv.*	Albizzia marginata, *Merr.*
7. Allophyllus cobbe, *Bl.* (in part).	Allophylus serratus, *Radlk.*
8. Anthocephalus cadamba, *Miq.* (Nauclea cadamba, *Roxb*)	Anthocephalus indicus. *A. Rich*
9. Antiaris toxicaria, *Les.*	Antiaris saccidora, *Dalz.*
10. Ampelideae (*Gen. Pl.*)	Vitaceae (*Engl.*)
11. Ardisia humilis, *C. B. Clarke.* Ardisia polycephala, *Wt.*	Ardisia littoralis, *Andr.*
12. Artocarpus integrifolia, *L.*	Arotocarpus integra, *Merr.*
13. Baccaurea sapida, *Bedd.*	Baccaurea courtallensis, *Muell.*
14. Balsamodendron berryi, *Arn.*	Commiphora berryi, *Engl.*
15. Baliospermum axillare, *Bl.*	Baliospermum montanum, *Muell.*
16. Bassia, *Koenig.*	Madhuca, *Gmelin.*
17. B. latifolia, *Roxb.*	M. latifolia, *Macbride.*
18. B. longifolia, *Linn.*	M. longifolia, *Macbride.*
19. B. malabarica, *Bedd.*	M. malabarica, *Comb. nov.*
20. Berrya ammonilla, *Roxb.*	Berrya cordifolia (*Willd*), *Burret.*
21. (Bignonia suberosa, *Roxb.*)	(Millingtonia hortensis, *L*).
22. Bocagea dalzellii, *Hk. f.*	Sageraea dalzelli, *Bedd.*
23. Bombax malabaricum, *Dc.* Bombax ceiba, *Linn.*	Gossampinus heptaphylla (*Houtt*), *Bakh.*
24. Boswellia serrata, *Roxb*, var. *glabra.*	Boswellia glabra, *Roxb.*
25. Bruguiera gymnorhiza, *Lam.*	Bruguiera conjugata, *Merr.*
26. Buchanania latifolia, *Roxb.*	Buchanania lanzan, *Spreng.*

Former name.	Correct name.
27. Bursera serrata, *Roxb.*	Protium serratum, *Engl.*
28. Caesalpinia bonducella, *Flem.*	Caesalpinia crista, *L.*
29. Calamus fasciculatus, *Roxb*	Calamus viminalis, *Willd.*
30. Calophyllum tomentosum, *T. Anders.*	Calophyllum elatum, *Bedd.*
31. C wightianum, *Wall.*	C. decipiens, *Wight.*
32. (Calosanthes indica, *Bl.*)	(Oroxylum indicum, *Vent*).
33. Canthium, *Lamk.*	Plectronia, *Linn.*
34. C. didymum, *Gaertn.*	P. didyma, *Kurz.*
35. C. parviflorum, *Lamk*,	P. parviflora, *Bedd.*
36. Cerbera odollam, *Gaertn.*	Cerbera mangas, *L.*
37. Chickrassia, *W. & A.*	Chukrasia, *A. Juss.*
38. Cipadessa fruticosa, *Bl.*	Cipadessa baccifera, *Miq.*
39. Cordia myxa, *Roxb* C. obliqua, *Willd.*	Cordia dichotoma, *Forst*
40. Dalbergia latifolia, var *sissoides, Bak.*	Dalbergia sissoides, *Grah.*
41. (Dichopsis elliptica, *Benth.*	Palaquium ellipticum, *Engl.*)
42. Diospyros embryopteris, *Pers.*	Diospyros peregrina, *Gurke.*
43. D. microphylla, *Bedd.*	D. buxifolia, (*Bl.*) *Hiern.*
44. Dolicandrone crispa, *Seem*	Dolichandrone atrovirens, *Spr.*
45. Dracaena terminalis, *Wt. Ic.*	Dracaena terniflora, *Roxb.*
46. Dysoxylum glandulosum, *Talb.*	Dysoxylum malabaricum, *Bedd.*
47. Elaeagnus latifolia, *L.*	(Split into E. conferta, *Roxb*, and E. kologa, *Sch.*)
48. Evodia roxburghiana, *Benth.*	Evodia lunar-ankenda, *Merr.*
49. Eriodendron anfractuosum, *Dc.* E. pentandrum, *Kurz.*	Ceiba pentandra, *L.*
50. Eugenia arnottiana, *Wt.*	Syzygium arnottianum, *Walp.*
51. E. calophyllifolia, *Wt.*	S. calophyllifolium, *Walp.*
52. E. gardneri, *Duthie.*	S. gardneri, *Thw.*
53. E. hemispherica, *Wt.*	Jambosa hemispherica, *Walp.*
54. E. jambolana, *Lam.*	Syzygium jambolanum, *DC.*
55. E. jambos, *Linn.*	Jambosa vulgaris, *DC.*
56. E. laeta, *Ham.*	J. laeta, *Bl.*
57. E. microphylla, *Bedd.*	Syzygium microphyllum, *Gamble.*

Former name.	Correct name.
58. Eugenia montana, *Wt.*	Syzygium montanum, *Gam*
59. E, mundagayam, *Bourd.*	Jambosa mundagayam, *Gamble.*
60. E. munronii, *Wt.*	J. murnonii, *Walp.*
61. E. rama-varma, *Bourd.*	J. rama-varma, *n. comb.*
62. Frenela rhomboidea, *Endl.*	Callitris rhomboidea, *Br.*
63. Garcinia xanthochymus, *Hk.f.*	Garcinia tinctoria, *Dunn.*
64. Glycosmis pentaphylla, *Corr.*	Glycosmis cochinchinensis, *Pier.*
65. Grewia asiatica, *Mast.*	Grewia subinaequalis, *DC.*
66. Grewia columnaris, *Sm.*	Grewa orientalis, *Linn.*
67. Grewia laevigata, *Vahl.*	Grewia disperma, *Rottl.*
68. Grewia orientalis, *W. & A.*	Grewia rhamnifolia, *Heyne.*
69. Grewia populifolia, *Vahl.*	Grewia betulaefolia, *Juss.*
70. Gyrocarpus jacquini, *Roxb.*	Gyrocarpus americanus, *Jacq.*
71. Hardwickia pinnata, *Roxb.*	Kingiodendron pinnatum, *Harms.*
72. Hemigyrosa canescens, *Thw.*	Lepisanthes tetraphylla, *Radlk.*
73. H. deficiens, *Bedd.*	L. deficiens, *Radlk.*
74. Heptapleurm wallichianum, *C.B. clarke.*	Schefflera Wallichiana, *Harms.*
75. Ilicineae, (*Gen. Pl.*)	Aquifoliaceae, (*Engler.*)
76. (Inga dulcis, *Willd.*	Pithecolobium dulce, *Benth*)
77. Lagerstroemia flos-reginae, *Retz.*	Lagerstroemia speciosa, (*Linn. Pers*)
78. L. microcarpa, *Wt.*	L. lanceolata, *Wall.*
79. Lantana camara, *L.*	Lantana aculeata, *L.*
80. L. indica, *Roxb,* var, *albiflora.*	L. wightiana, *Wall.*
81. Lawsonia alba, *Lamk.*	Lawsonia inermis, *Linn.*
82. Limonia acidissima, *Auct.* (*not Linn*).	Limonia crenulata, *Roxb.*
83. Litsea tomentosa, *Heyne.*	Litsea deccanensis, *Gamble.*
84. L. wightiana, *Hook. f.* (*in part*).	L. floribunda, *Gamble.*
85. L. zeylanica, *Nees.*	Neolitsea zeylanica, *Merr.*
86. Macaranga roxburghii, *Wt. Ic.*	Macaranga peltata, *Muell.*
87. Maesa indica, var. perrottetiana, *C. B. Clarke.*	Maesa perottetiana, *A. Dc.*
88. Melia azadirachta, *L.* M. indica, *Br.*	Azadirachta indica, *A. Juss.*

Former name.	Correct name.
89. Melia dubia, *Hiern.*	Melia composita, *Willd.*
90. Memecylon amplexicaule, var, malabarica, *C. B. Clarke.*	Memecylon malabaricum, *Cogn.*
91. (Monosis wightiana, *Wt.Ic.*	(Vernonia monosis, *C. B. Clarke.*)
92. Moringa pterygosperma, *Gaert.*	Moringa oleifera, *Lamk.*
93. Myristica attenuata, *Wall.*	Knema attenuata, *Warb.*
94. M. canarica, *King.*	Gymnacranthera canarica, *Warb.*
95. M. laurifolia, *Hook.*	Myristica Beddomei, *King.*
96. Myrsine, *L.*	Rapanea, *Aubl.*
97. M. capitellata, *Wall.*	R. capitellata, *Mez.*
98. Nauclea cadamba, *Roxb* & Anthocephalus cadamba, *Miq.*	Anthocephalus indicus, *A. Rich*
99. Nauclea purpurea, *Roxb.*	Neonauclea purpurea, *Merr.*
100. Odina wodier, *Roxb.*	Lannea grandis, *Engl.*
101. Pandanus odoratissimus, *Roxb.* P. fascicularis, *Lamk.*	Pandanus tectorius, *Sol.*
102. Phoenix pedunculata, *Griff.*	Phoenix humilis, *Royle.*
103. Peltophorum ferrugineum, *Benth.*	Peltophorum inerme (*Roxb*) *Llanos.*
104. Phyllanthus emblica, *Linn.*	Emblica officinalis, *Gaertn.*
105. Pithecolobium saman, *Benth.*	Enterolobium saman, *Benth.*
106. Podocarpus latifolia, *Wall.*	Podocarpus wallichiana, *Presl.*
107. Poinciana elata, *L.*	Delonix, elata, *Gam.*
108. P. regia, *Boj.*	D. regia, *Raf.*
109. Pongamia glabra, *Vent.*	Pongamia pinnata, *Linn.*
110. Protium caudatum, *W.&A.*	Commiphora caudata, *Engl.*
111. Randia dumetorum, *Lamk.*	Randia longispina, *W. & A,*
112. Rhododendron arboreum, var. nilagirica, *C. B. Clarke.*	Rhododendron nilagiricum, *Zenk.*
112a. Sapindus erectus, *Hiern.*	Thraulococcus erectus, *Radl.*
113. S. trifoliatus, *Hiern.*	Split into : S. laurifolius, *Vahl.* & S. emarginatus, *Vahl.*
114. Sarcocephalus missionis, *Hav ?*	Nauclea missionis, *W. & A.*

Former name.	Correct name.
115. Schleichera trijuga, *Willd.* }	Pistacea oleosa, *Lour.*
116. S. oleosa, (Lour) *Merr.* }	
Sonneratia acida, *L.*	Sonneratia caseolaris, *Engl.*
117. Spermacoce, *L.*	Borreria, *G. F. W. Mey.*
118. Spondias mangifera, *Willd.*	Spondias pinnata, (*Linn*) *Kurz*
119. Stephegyne, *Korth* (1840)	Mitragyna, *Korth* (1839).
120. Stephegyne parvifolia, *Korth.*	Mitragyna parvifolia, *Korth.*
121. Sterculia alata, *Roxb.*	Pterygota alata, *R. Br.*
122. S. colorata, *Roxb.*	Firmiana colorata, *R. Br.*
123. Stereospermum chelonoides, *C. B. Clarke.*	Stereospermum tetragonum, *Dc.*
124. Stereospermum xylocarpum, *Benth.*	Radermachera xylocarpa, *K. Schum.*
125. (Terminalia tomentosa *W. & A.*)?	(Terminalia alata ? *Heyne.*)
126. Terminalia tomentosa : var. coriacea, *C. B. Clarke*	Terminalia coriacea, *W. & A.*
127. „ crenulata, *C.B. Clarke*	T. crenulata, *Roth.*
128. „ typica, *C. B. Clarke.*	T. tomentosa, *W. & A.*
129. Thespesia lampas, *Dalz & Gibs.*	Hibiscus lampas, *Cav.*
130. Toddalia aculeata, *Pers.*	Toddalia asiatica, *Lamk.*
131. T. bilocularis, *W. & A.*	Vepris bilocolaris, *Engl.*
132. Turpinia pomifera, *Dc.*	Turpinia nepalensis, *Wall.*
133. (Ulmus integrifolia, *Roxb*)	(Holoptelea integrifolia, *Pl.*)
134. Ventilago maderaspatana, *W. & A.*	Ventilago calyculata, *Tul.*
135. Viburnum punctatum, *Ham.* var. acuminatum, *C. B. Clarke.*	Viburnum acuminatum, *Wall.*
136. Viburnum capitellatum, *W. & A.*	V. coriaceum, *Bl.*
137. Webera corymbosa, *Willd.*	Chomelia asiatica, *O. Kze.*

LIST B.

Acacia torta, *Craib*	1
A. sundra, *DC.*	2
Aglaia bourdillonii, *Gamble.*	3
Agrostistachys meeboldii, *Pax.*	4
Alangium salvifolium, *Wang.*	5
Albizzia marginata, *Merr.*	6
Allophylus serratus, *Radlk.*	7
Anthocephalus indicus, *A. Rich.*	8
Antiaris saccidora, *Dalz.*	9
Aquifoliaceae, (*Engl.*)	75
Ardisia littoralis, *Andr.*	11
Artocarpus integra, *Merr.*	12
Azadirachta indica, *A. Juss.*...	88
Baccaurea courtallensis, *Muell.*	13
Baliospermum montanum, *Muell.*	15
Berrya cordifolia, *Willd.*	20
Boswellia glabra, *Roxb.*	24
Broreria, *G. F. W. Mey.*	117
Bruguiera conjugata, *Merr.*	25
Buchanania lanzan, *Spr.*	26
Caesalpinia crista, *L.*	28
Callitris rhomboidea, *Br.*	62
Calophyllum elatum, *Bedd.*	30
Calophyllum decipiens, *Wt.*	31
Ceiba pentandra, *L.*	49
Cerbera mangas, *L.*	36
Chomelia asiatica, *O. Kze.*	137
Chukrassia *A. Juss.*	37
Cipadessa baccifera, *Miq.*	38
Commiphora caudata, *Engl.*...	110
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College Notes.

The following extracts from letters from some of the past students,—the latest batch, will be of interest.

(i) ***Mr. P. M. Taggarse*** writes to say (in a letter dated 17-7-32) that he has been appointed as a Ranger, Sandal Wood Depot at Dharwar, and after some four months he is to tour in the Bijapur district to carry out sandalwood extractions. He adds that the kind of training he had received in the Coimbatore college stands him in good stead.

(ii) ***Mr. R. A. Mandke*** has been posted as special duty ranger, Shirpur, West Khandesh. He writes:—

"...............I am posted here as a special duty ranger, under a Range Forest Officer. I have to get a general idea of office-work, and in addition to that, I am asked to check grazing, and look after the plantations. I am getting on well with my work.

"...............The forests of this locality are situated in the Satpuras, on the southern slopes. These are deciduous forests, identical with our Walayar forests, and with practically the same climatic conditions. The more important species are: Tectona grandis, Terminalia tomentosa, Gmelina arborea, Hardwickia binata, Petrocarpus marsupium, Acacia catechu, Adina cordifolia and Stephegyne parvifolia. Out of these, teak is considered as a timber species, the others as fuel species. In some parts Teak is growing in abundance.

"The area is dided into two circles: pole working circle and fuel-working circle. Coppice with standard is the system adopted here. Species more than 12 inches in girth are felled. The felling and further operations are done by contractors.

"*Regeneration*: Mainly coppice (natural). Artificial regeneration is done by dibbling Teak seeds with a certain mixture of fuel species. The spacing is 6 ft. × 6 ft. This year we have begun stumping and I looked after it. I am glad to say I was asked to give instructions to the subordinates about stumping.

"*Grazing*: A part of the area is set open for grazing. Professional graziers who are locally called "Vanjaris" and "Mavatees" bring cattle from central India for selling. They graze their cattle here. There are also village cattle.

"*Labour*: Plentiful; locally obtained................"

* * *

(iii) *Mr. G.P. Tiwari* has been posted to Rahatgaon range Hoshangabad division, Central Provinces. He writes :—"................I was given a work of road alignment for a distance of about twelve miles............In September, I did thinning in mixed teak forest. This was pronounced to be quite satisfactory............I offer my hearty thanks to the instructors of the college where I was trained to carry out such works most satisfactorily............ I am also making progress in studying the working plan of the Division................"

Grigg Memorial Sports, Coimbatore District, 1932.

The annual Grigg Memorial Sports were held on 26th and 27th August 1932. Fourteen different institutions took part in the sports, and the total number of entries was 160. Heats were held on the 26th, and there being not many entries for the open events there were no heats for them. There was a keen contest in many of the events.

The Forest College had entered in all the four open events. The agregate cup was won by the Forest college with a total score of 45 points, the second being the

Peelamedu Industrials with 15 points. The open championship medal was won by N.D. Kalbag, Athletic Captain, Forest College.

It is pleasent to record that this is the third successive year, that the Forest college has won the aggregate cup for open events, the Jubilee Municipal Cup for open Hurdles, and the medal for individual championship.

The following were the results in the various open events :—

Open 100 yards. (Ramaswami Sivan cup).
1st. R. Krishnaswami (Government College).
2nd G. Seshagiri Rao (Peelamedu Industrials).

Open Hurdles. (Jubilee Municipal cup).
1st J. C. Sarwate (Forest College).
2nd N. D. Kalbag (Forest College).

Open mile. (Sengottiah cup).
1st B. H. Patil (Forest College).
2nd N. D. Kabbag (Forest College).

Open cycle race. (Stadium cup).
1st G. D. Saranjame (Forest College).
2nd N. P. Chirukandan (Forest College).

R. Krishnaswami was better than any of the competitors for 100 yds. He being a good sprinter, deserved the Ramaswami Sivan cup for 100 yds.

It had rained on the 26th night and the spike shoes, which were used by Sarwate and Kalbag helped them to a great extent in securing the first and the second places respectively in the open hurdles.

It was decided that Kalbag should take the lead for the first lap in the mile race and tire out the other competitors and also that, Patil should run with his usual speed, without trying to follow Kalbag. This was a successful plan. Patil was able to finish the run first, and he is to be congratulated on his successful effort. Kalbag, who was tired, due to his fast running in the first lap, was the third man till the middle of the last lap. But after that he gave a nice dash and overtook the man who was ahead of him. Hence he was able to secure the second position in the open mile race.

In the open cycle race G. D. Saranjame was leading for the first lap. In the second lap, he was closely followed by one of the competitors from the Peelamedu Industrials. Unfortunately both the competitors from the Peelamedu Industrials fell down from their cycles in the second lap only. Then there was a keen competition between Seranjame and Chirukandan. In the end both of them finished the race at the same time.

The last event was the Tug-of-war between the Forest College and the Police Recruit school. The Forest College team was not able to pull the Police Recruit school team Still the college team gave them a very nice stand.

It is rather poor that more institutions had not taken part, this year, in the open events. There were only three institutions, this year, who had given their entries for these.

—A Competitor.

EXTRACTS.

1. Forest Products Research :

By, Frank P. Cartwright.

Chief Engineer, National Lumber Manufacturers Association. Washington. D. C.

The manufacturer of lumber and lumber products does not have as full control over the properties of his materials like steel, ceramics and concrete. He must take wood as nature gives it to him and can vary its properties only between relatively narrow limits. The author, with much experience in the problem of keeping wood in favor as a construction and industrial material, recognizes its limitations but is hopeful that, through a better knowledge of its properties and uses based on research, and a modification of our conservative attitude towards it, wood will not continue to remain on the defensive.

The forest, as a natural resource, has reached a crisis in its history. Either it will become increasingly a winter silence and a summer playground, or it will combine these desirable aspects with growing utility, to become our universally and only renewable, and therefore our most valuable natural resource.

Much of the forest research up to date has had to do with the "nature of the animal," how it grows and where it grows, how much there is of it, and how it can be protected from its natural enemies. What kind of trees are in it, and their properties; what is wood, chemically and physically, and how does it act under different circumstances.

A wise foundation, and one that will become more and more useful as time goes on. On it may be built progress, not only in forestry but in the utilization of forest growth. If an amateur may presume to point out aspects in which it has not advanced proportionately, he might mention first the problem of more rapid tree growth and second the gaps in our knowledge of the chemical and physical properties of wood. Cell formation is a deliberate process in some plants; far more rapid in others. What is to prevent some forest Burbank from breeding a species that will grow four times as fast as trees do now? On the chemical side our utilization studies lack fundamental facts by which to guide their development.

Wood must prosper or fail in market competition with other materials in the measure that it meets use requirements. It is a little handicapped in such competition, but not fatally so. The makers of other and competing materials can and do alter their products practically at will to meet specific situations. A little more carbon, and steel is stronger; a little more nickel and it is tougher; add some chromium and it will resist rust. Set the rolls a little father apart and it comes in just the width or thickness desired. By selecting his clays or varying his firing heats, the ceramics manufacturer can at will achieve a wide variety of appearance and physical properties. Variation of formulas makes aviation metals stronger, stiffer, more malleable, or more corrosion resistant, as these properties become most important.

With wood it is different. Wood comes to us with its physical properties fixed in the tree. With one or two important exceptions its adaption to special use requirements has so far been limited to a choice of species. It has been partly protected against decay, and its moisture content in part placed under control. Beyond this the lumber producing industry holds out to its users merely a variety of sticks, inviting them to choose that which most nearly meets the purpose. It is not surprising that the prospective purchaser often goes away and uses something else.

Obviously, there are two general lines of attack on this situation. (1) properties of wood can be influenced by physical or chemical measures or more closely con-

trolled by selection, to offer the user a greater variety of choice or a more uniform product for his purposes. (2) The user can be shown how to adjust the material more economically or more effectively to his purposes.

Much of course has been done along both these lines but much more remains to be done. Take the airplane, for example. Years of work at the Forest Products Laboratory have so developed the possbilities of glue that wood aircraft frames are put together without a nail. Companion efforts have discovered the strongest and lightest forms for wood beams and struts. Careful methods of selection have developed airplane lumber grades of high strength and uniformity. All this is not enough. For every dollar the government (not the industry) has spent to improve the use of wood in airplanes the producers of aviation metals have spent ten. They have vastly improved *both* the material and its utilization, and the market trend is at present away from wood.

Take another example. Light floor construction for generations consisted of thin wood joists with lath and plaster below and a sub-and finish floor of inch lumber above. It had its disadvantages and limitations, and lumbermen seemed satisfied. Steel producers were not. Through fifteen years of trial and error they strove and at last succeeded in putting on the market a light steel joist that might compete effectively with wood for the purpose, that, finished with the metal lath and plaster, substitutes a one-hour fire rating for the uncertain resistance of the wood joisted floor, and that affords wider spans and lesser depths and greater stiffness. The steel joist employs discoveries in rolling mill operation; it takes advantage of a previously unknown method of attaching part to part (electric welding) and it provides carefully detailed instructions to users, to bring about success.

As a result, lumbermen are mightily concerned about the steel house. Yet the answers to this aggressive development work have laid at hand for several years. The user could have been supplied with dry and suitable graded lumber and taught to require it. He could have been told that shear stresses, twice those ordinarily applied, are perfectly safe for thin joists. The deflections in long spans could have been overcome with double-length, semi-continuous joists, with glued-up laminated joists cambered for stiffness, with restraint over supports, with floor thicknesses that efficiently distribute load. Fire resistance requirements could have been met with other types of floors, just as economical and more serviceable.

Much work is necessary before we can commercially modify the strength and stiffness of wood, make it plastic to pressure, increase its hardness or density, coat it with a moisture excluding surface, inhibit shrinkage, or bring about the various other changes that will increase its range of use.

Still more progress must be made before the area of complete chemical transformation that undoubtedly will turn forest waste into materials now unimagined. Such efforts should be pressed industriously, but what can be done in the meantime? We can help users to appreciate and make the most of the wood as we now offer it.

Working stresses for wood of structural sizes have so far been more a matter for inter-species discussion and building code give-and-take than a strong consideration in the choice of materials. Usually the decision between wood and other materials is determined by other characteristics. The stresses in use today are

complicated by many factors besides the strength of the wood, and they are predicated on a viewpoint which is fundamentally unlike that underlying working stresses for other materials, i.e. that the material may be insufficiently conditioned for its purpose; that the individual pieces may be used to the worst possible advantage as regards their inherent defects; that skilled design and competent supervision of construction and careful selection of material may be lacking. All these contingencies are probably present under present conditions and all of them are avoidable if timber construction receives intelligent consideration from engineers. Where would reinforced concrete, with its infinitely more complicated technique, be now as a construction material if its proponents had assumed that it would always be used with the average skill and intelligence of a workman? And with timber design limited, as it now is, by working stresses based on such a conception, what incentive is there for users to design carefully, to demand high grade material and to use it skillfully and economically?

It is true that strength is not often a controlling factor, at present, in deciding for or against the use of wood for the structural framing. It is just as true that wood's entry into markets not now open depends on a better recognition of its strength and in capitalization of improved technique in more economical design. The development of these possibilities involves numerous major problems of research, both in the laboratory and in field application.

For example, the two characteristics in which wood excels are compressive strength and tensile strength parallel to grain, yet we are just beginning to experiment with wood arches, which take fullest advantage of the former and we have just now secured worth while information on the holding power of bolts, which enables us to take advantage of the latter. We take too conservative a view of the strength of timber columns and we are too cautious in assessing the strength values of a grade under intelligent usage.

Automobile body manufacturers use screws to attach one piece of wood to another. So do many other fabricators of wooden articles. But does anyone know of a thorough investigation of the holding power of screws in wood, their effective spacing, the best relationship of pitch and shank and depth of thread for different species?

The insulating value of wood is one of its important advantages in competition with other materials. Only recently, however, has this property been investigated and the results secured in systematic form for the different commercial species.

That the information wood users need is only partly available is by no means a reflection on established research agencies. With limited facilities they have accomplished much in a vast field which includes many other phases beside user's information. Most of what has been accomplished they have done for the lumber industry. Much more remains to be done,—and continues to remain so. The job involves not only research, but also pains-taking, sincere collaboration between producers, laboratory staff and users in the interpretation of results, and efficient education of users to take advantage of them. —*Journal of Forestry*, May 1932.

2. Treated Timber for Economy:

The following is the resume of the address delivered by Mr. S. Kamesan, Wood Preservation Officer at the Forest Research Institute, Dehra Dun, to the Thomasonian Society of the Civil Engineering College, Roorkee, on the "Relative economy of treated timber in structural engineering, with special reference to India":—

The indispensable qualities for structural materials are strength and durability. For the same weight, wood, practically irrespective of the species is stronger than steel or reinforced concrete in the form of columns and beams so that a pound of strength with timber beams, posts or columns, should, within the ordinary range of loading, cost less than steel. As regards durability, sleepers treated with arsenic by a process which does not guarantee any considerable degree of arsenic fixation in wood have given an average life of 15 to 18 years even in moderately moist localities in India; the sleepers were, in over 90 per cent of cases, rejected, even after this period owing to mechanical reasons or splitting of the sleepers and not due to want of durability, with a process, which guarantee a nearly 20 times better fixation of arsenic in wood than that obtained in the sleepers above referred to, one can assume the average life of treated timber, if not destroyed owing to mechanical or physical causes, to be above 25 to 30 years. In the United States of America parts of which are more severely infested with fungi and white ants than in India, the average life of treated wood has been taken to be as 30 to 40 years.

Coming to the question of cost assuming the rate of interest and amortisation to be 6½ per cent (the rate of interest offered by the Government of India for their last loan in December 1931), and taking the average durability life of treated timber in structures to be 25 years whereas that of steel or reinforced concrete to be 50 years, ignoring maintenance costs and scrap value, the cost of the so-called "permanent" material structures of steel aud reinforced concrete should not be more than 1½ times that of treated wood structures for being able to compete with them in the long run. There are few structures in which case reinforced concrete and steel structures cost less than 1½ times that of treated wood,

Though it sounds almost axiomatic, it is well to remind engineers that a properly designed wooden bridge is as strong as a properly designed steel or concrete bridge!

Before referring to the approximate initial and annual economic costs of different structures, it may be stated that the major portion of the timber resources of the country belong to the Government of India *i.e.* the tax-payer. Also, the majority of the public utilities of the country like the railways, posts and telegraphs, some of the electric transmission and distribution schemes ports and harbours, etc., belong to the Government of India.

At present, the major part of the structural timber fetching a high royalty is in the form of railway sleepers. Owing to specification for sleeper sections enforced by the Indian railways, not only trees or tree portions below 18 inches in diameter cannot be economically utilised, the efficiency of conversion in the larger logs is not more than 60 per cent. According to the writer's scheme, all the trees (the thinnings, etc.), varying from 5 inches in diameter to 18 inches in diameter must have a definite place, after suitable treatment, in the structural engineering economy of the country. Poles between 5 inches and 8 inches in diameter may be used for telegraph and telephone poles and electric distribution poles. Poles, 8 inches to 10 inches, may be employed for heavy power distribution poles, bridge, marine or foundation poles. The branch wood may be used for fence posts. Trees from 10 inches to 18 inches in diameter may be utilised for railway sleepers, planking, scantlings, etc. All the timber must be antiseptically treated under pressure before use. When it is realised that over 90 per cent of the utilisable trees or tree portions in our forests are

under 18 inches in diameter, and hardly 10 per cent of these trees are at present utilised for sleepers under the existing specification (which insists on sleepers having a rectangular cross-section), it will be realised what great urgency there is to make our forest utilisation practices more efficient and systematic. We are passing through a period of severe financial stringency and we must utilise our smaller sized trees and tree portions on as large a scale as possible instead of using them only for cheap structural timber or for fuel. When the trees of smaller diameter find a definite and proper position in the scheme of our public utility construction and maintenance, trees over 18 inches in diameter will be regarded as a costly luxury as they are considered in Europe to-day. If such a position is created by the iuauguration of a scientific policy of timber utilisation, the period of rotation for the different Indian species in our forests may perhaps be reduced, and better dividends naturally obtained from our timber resources.

The following few facts, based on estimates of typical designs of competitive structural materials, may be found interesting.

By using properly designed and treated wooden poles, cross-arms, insulator pins, etc., in the telephone and telegraph systems, instead of the Hamilton poles used at present, the annual saving that will accrue to the Government will, it is expected, be of the order of about 20 to 30 lakhs of rupees. The treated wooden poles of the same strength as the steel Hamilton poles cost only about 30 per cent as much as the latter; poles of treated Indian woods are also much more economical than steel tubular poles in the long run, on the basis of annual economic cost. The Indian public must remember that vast savings can be effected by using treated wooden poles of proper design instead of steel poles for electrical transmission and distribution purposes. They are more economical than steel poles even in the long run. Similarly treated wooden cross-arms, insulator pins are more economical, besides costing less initially, than steel ones.

Road bridges of steel and reinforced concrete, for average conditions and moderate spans, cost about twice to thrice as much as those of treated wood; railway bridges of steel and concrete are also about twice as costly as treated wooden bridges. If about 20 miles of bridges are built in India annually, a saving of about a crore and a half will, probably, result without even losing in the long run.

As regards fence posts beside the permanent way, it is estimated that there are about 25 to 30 million steel posts. Again steel poles, fence posts of bungalow and office compounds, military barracks etc., besides steel poles used by private people, may be conservatively estimated at another 35 millions. The annual renewals may be taken as about two millions. By using treated timber, an annual saving of about 40 lakhs to 50 lakhs of rupees may be expected.

With reference to railway sleepers, if "wane" and "half-round" sections are actually adopted by the Indian railways in practice (besides accepting in principle) as first class railway sleepers, as is done in Germany and other European countries, an annual saving of about 60 lakhs of rupees may be anticipated without losing in the long run using chir pine, treating it according to the method worked out by the lecturer and accepted by the Railway Department a few years ago.

There are several other avenues where treated timber structures initially cost not only less than steel and reinforced concrete structures, but are cheaper even in the long run, on the basis of annual economic cost.

The lecturer mentioned that he was engaged on a detailed examination of the question in his proposed publication of a book entitled the "Design, service and relative economy of treated timber structures with special reference to India" which will incorporate all his extensive experience in India, Europe and America with reference to the important subject on which he addressed the Thomasonian Society.

—*The Junglewallah*, May 1932.

3. Indian Timber:

BY MR. H. S. TIREMAN, C.I.E.,

Timber Adviser to the High Commissioner for India.

(a) Government Sales.

The position in the hardwood market throughout the year continued extremely difficult. It was impossible to interest Continental buyers even at cheap rates, and although there appeared at the end of the year to be a slightly better undertone in the Home market, buyers were inclined to restrict purchases to their immediate requirements. At the same time, since Great Britain went off the gold standard there has been an increasing tendency to favour Empire woods, which has been accentuated by the imposition of the tariff. This affected the Indian trade more especially in the matter of flooring woods, and a sudden demand sprang up for this class of timber in the autumn, the whole output of gurjan flooring from the Andamans up to June, 1932, being sold in a short time. Considerably larger quantities could have been sold had they been available. A further result of the "Buy Imperially" movement was the sale of some 110 loads of Andaman padauk and 28 loads of koko; no sales of these timbers had taken place for upwards of two years.

There was a decline in the quantities and values of Indian Government timber delivered during the year as compared with 1930–31, the quantities falling from 1,405 to 799 tons, and the values f.o.b. Indian port from £11,700 to £6,900. All but 9 tons (from Burma) was shipped from the Andaman Islands. Fortunately, we were able to offset this decline in respect of timber proper by a shipment of sandalwood valued at about £3,000 f.o.b. Indian port, which was far in excess of last year's shipments (aggregating £ 500 only). There is some justification for holding that this sale was instrumental in stimulating competition at the sandalwood auctions held in South India early in 1932, where the prices obtained showed a large advance over those of recent years.

Including sandalwood, the value (f.o.b. Indian port) of deliveries was thus £9,900, as against £12,200 during the previous year. The decline in the deliveries of timber was due to the falling off in sales during the previous two years caused by the general trade depression. While optimism is as yet scarcely justified, it is of interest to note that the quantity of timber due for delivery during the current year (1932–33) has already attained a volume of 685 tons valued at & 6,500 f.o.b. Indian port................

(b) Commercial Enquiries.

Apart from those which resulted in sales, the number of enquiries received from potential buyers was 20, the quantity of timber to which they related being some 1,100 tons; 8 enquiries were also received for unspecified quantities of timber.

Some 25 enquiries of a general character were received for information on the following subjects:—

The kind and quantities of timber available for export.

The possibility of using white mahogany, white bombwe, white chuglam, and Indian balsa for motor-car bodies.

Timbers suitable for flooring.

The availability of laurel and koko for the manufacture of veneers in Australia.

Hardwoods suitable for the manufacture of furniture in Canada.

The possibility of and the necessary procedure for selling privately owned Indian timber in Great Britain and Germany.

The quality of teak supplied under various trade marks.

The best methods for testing a new wood preserving preparation in the tropics.

Where certain Indian timbers can be obtained in this country.

Wood suitable for brushes for the Indian Army.

The qualities of pyinkado for flooring.

Timbers suitable for staining for exhibition purposes.

Timbers suitable for the decoration of railway coaches in this country.

Pyinkado sleepers for Palestine.

The suitability of silver-grey for a new post office building.

The possibility of obtaining of forest concession in the Andamans or Madras.

Whether gurjan flooring strips can be supplied tongued or grooved.

Several requests were also received and complied with for timber specimens for instructional purposes.

The enquiry referred to in last year's report regarding the possibility of supplying railway keys for use in this country led to no result, the prices quoted being uneconomical. The enquiry from Italy referred to in the same report has resulted in some sample squares being sent from the Andamans to Trieste.

Efforts were again made at the instance of the Chief Conservator of Forests, Madras, to interest firms in sandalwood, but no business resulted. Sales of this wood were, however, effected on behalf of Coorg.

—*The Indian Trade Journal*, July 28, 1932.

4. The Regeneration of Forests damaged by fire:

Forest fires are a cause of ever increasing risk for the preservation of the forest resources of the majority of countries. Naturally the danger for countries which have a dry climate is the greater, but it has been observed that in regions where a damp climate and a relative absence of wind affords a certain degree of protection, this safeguard may prove inadequate to check a certain lack of balance between the true possibilities of the wooded area and the actual results of the methods of exploitation adopted.

Although statistics of forest fires for the various countries are generally far from complete, they show clearly enough that the increase of fires in certain districts always bears a certain relation to faulty methods in the utilisation of the forests. After a fire temporary cropping and excessive pasturing on the burnt surface tend increasingly to reduce the vitality of the stands, thus diminishing their power of resistance to fire. As a result fires recur in the same localities, the result being very serious hindrance to all forms of regeneration work.

Forestry specialists and scientists are agreed that fires always have prejudicial effects on any plan of regeneration of burnt over forests with high class trees. In this connection sooner or later the results of the fire will be shown but they are in any case bound to appear. For whole regions the preservation of *climatic forests* which have become established after a long period of years becomes jeopardized.

It is recognised by the experts that fire by itself is a serious cause of deterioration in the local climatic flora; on the other hand the trouble caused in this way alone to the forest milieu may be set off by the operation of natural reconstituent forces where other influences, generally due to human action, do not intervene to increase the difficulties of the situation. Apart from such influences the regeneration of burnt over forests with valuable species would simply be a slow process. On the other hand, if the troubles are allowed to continue, far reaching changes in the ecological sense will begin to operate more quickly that natural recovery. Such changes would be manifested externally in the establishment in districts specially liable to fires, of a substituted flora which might be of a very enduring

order. As a rule however such flora would not be particularly fire resistant, a fact which would tend to postpone the return of the more valuable species. The idea of "fire zones" or "fire districts", which is frequently met in the literature on forest fires may well have its origin in sources of this order.

ROGER DUCAMP (France), in his investigation of the district of the Esterel and the "Mountains of the Moors" which have for a long time past been subject to extensive forest fires, was struck by the external aspect of the stands still remaining in the area. He endeavoured to trace specific existing characteristics from which he might be able to reconstruct the features of the original forests. He however found only a kind of anarchic disorder and the plant growth was no longer in any sense analogous or similar to the original *sylva*.

Is it therefore necessary to conclude that every kind of forest fire necessarily involves these grave consequences? To this question no general answer can be given for forest fires fall into a number of classes (including surface fires, ground fires, fires in the tree tops and general fires on a large scale) and the results are related to the parts of the stand affected. In general however it may be stated that fires which are not due to natural causes in virgin or well preserved forests of long standing must be considered as foctors which always bring about a weakening in the predominance of the forest in a district. It is well known that fires due to lightning or spontaneous combustion have occurred in the course of centuries during the life of primeval forests, but such fires have never been able to check regeneration with the better types. Scientists have attempted to determine the influence of fires on regeneration in virgin forests. Thus according to MULLER (Germany) the homogeneity in composition as also the similarity of age shown in the primeval forests in Bulgaria, which have been the object of his special study, are due to fires which have occurred in the same localities in these forests approximately at intervals of a century. Regeneration of the stands with fine trees would be likely to take place relatively rapidly as a result of the period of complete repose of the areas traversed by the fires, though naturally the rate of regeneration would not be identical for all kinds of trees.

RUBNER and HESMER (Germany) do not share the views of MULLER, and certainly do not think that any generalisation can be fairly deduced therefrom. They admit that surface fires on peat soils have been a contributing factor in the disappearance of the forests that formerely grew there. On the other hand they consider that the effect of fire on the very acid soils of primeval forests is not sufficient to explain the reproduction of fire ridden forests by trees of a single type.

BRASWAT (Great Britain) has observed, in connection with the regeneration of the cedar in districts in Kenya which are particulaly liable to forest fires, that as a rule the flora which grows after a fire consists of *Juniperus*, *Olea*, *Podocarpas* and *Hemamelis*. The fallen leaves, twigs, etc. of these trees are even more highly inflammable than those of the cedar and hence there is frequently a recurrence of fires in the same areas. Homogeneous regeneration of the cedar after burning over has however been observed but such cases are exceptional.

DUNDMAN (Sweden), in discussing the less directly noticeable influence of fires on forest regeneration, has expressed the view that even simple surface fires which are generally looked upon as harmless always in fact have certain effects upon the normal life of tree roots which probably results in a general weakening of the reproductive capacity of the whole stand. He also believes that after serious damage by fire on afforested lands, the ordinary level of the underground water table is frequently raised. HAGLUND has also noted the same phenomenon and has come to the conclusion that the development of a large part of the peatlands in Sweden must have some relation to the fires which, at certain times, have caused the complete disappearance of the forests previously to be found in these areas. LUNDMANN states that the chief difficulty found in the regeneration of burnt over forests with the finer trees is the marked change in soil conditions after a fire. Even the highest class of seeds, after germination in such soils suffer sooner or later from frost.

On steeply sloping lands erosion is the principal factor in causing a prolongation of environmental conditions unfavourable to forest regeneration. According to recent research, erosion does not merely bring about the mechanical dislocation of the surface soil layers but causes a general stoppage of the processes concerned with the circulation of air and water in the soil layers that have been evolved and the filtration capacity in burnt over lands is very markedly diminished. LOWDERMILK (United States) has succeeded, after very careful experimental work, in demonstrating that the principal function of the dead leas soil covering is to maintain on wooded lands the infiltration profile which is locally the most advantageous. As it is well known that an intimate connection must exist between this profile and the plant growth of a climatic character established in a locality, it is easy to understand the importance of the fire factor among the other influences which contribute to a set back in the evolution of the soils and to a corresponding regression of the climatic plant growth therein developed.

COVENTKY (England) is of opinion that the disappearance of primeval forests in the Punjab (British India) and also the decline of well established species in the still existent forests cannot be properly attributed to any variations in climate which have become characteristic in the areas under observation, for such fresh climatic characteristics can only become evident after long periods of time. Consideration should rather be given to the results of forest fires which render the soil liable to erosion. In the Punjab the annual rainfall from July to September is usually abundant and this rainy season occurs immediately after the season of the forest fires. Chiefly as a consequence of accelerated erosion, climate or primitive forests are replaced in the most favourable cases by forests which CONENTRY calls "colonisation forests", and these substituted forests show increasingly poor resistance to fire havoc.

LAVANDAN (France), who has studied the results of fires in the forests of North Africa, the Sahara and Madagascar also holds the view that falling off of the forests in these countries is mainly the result of fires in the original forests where degenerate stands showing poor resistance to external risks have taken the place of the original forest and by their continued presence prevent the return of superior species and also frequently compromise any re-establishment of conditions reosonably favourable to any form of satisfactory forest regeneration.

In Australia too it has been observed that the flora which springs up on burnt over forest lands only rarely produces stands that are worthy of the name, this being also the case where the fire has spared the mother trees of the better kinds. Reproduction by means of transitory species on fire swept areas is by no means satisfactory, the result being often an abundant development of undergrowth such as is very liable to catch fire.

Taking a summary view of the opinions expressed by specialists as regards the results of fire in forests worked under management schemes or relatively scientifically exploited, the conclusion is reached that the unfavourable influences, theoretically adduced for the cases of primitive or natural forests, remain valid to-day. In the State of Montana (United States) it has been observed that, when in the same area fires recur at intervals of not less than fifty years, regeneration of fire ravaged forests with trees of superior quality depends solely upon the fundamental soil characteristics, for in such periods a single fire would not have any very material effect. Naturally in such cases the best method of effecting regeneration is with the aid of the local trees, of which the seeds may be wind borne to the fire damaged areas.

In the Punjab, the suspension of the fire protection burnings that had been carried out for 20-30 years consecutively in the warm damp areas, made it possible for fires to invade large continuous tracts and the result has been that fine forests have been replaced by stands of poor heavily foliaged varieties with no market value. Such growths have been a serious hindrance to spontaneous regeneration with the sal tree (*Shorea robusta*) and teak (*Tectona grandis*) which were hitherto locally dominent.

In Norway it has been remarked that the most marked effects of forest fires as regards regeneration are chiefly to be observed at the upper limits of forest vegetation. This is a matter of very great importance in respect of the ecological conditions of these areas and is a factor in causing the limit of forest growth to recede. Apart from the question of altitude, the forests re-established on poor, shallow soils are threatened with extinction as a result of fires. The question of regeneration, even of the artificial kind, in such forests, is particularly difficult for the effects of fire on poor soils often lasts for a very long period.

Turning to the question of the means available to the forestry expert for reducing the disastrous effects of fires on forest stands, LARSEN of United States is of opinion that only the careful observation of the true conditions of the soil which has to be restored can lead to practical results in the very different circumstances of individual cases. He recommends that an excact account should be kept of : (*a*) local conditions and elements in regeneration which were effective before, during and after the fire, i. e., the topographical conditions, the fundamental composition of the soil and the characteristics of the local climate ; (*b*) the age, the composition and the density of the burnt over forest. The age of the forest has a very marked influence on forest regeneration, by reason of the fact that the best germinating seeds come from fully mature trees and hence the escape of a few mother trees in good condition would in itself represent a reconstituent factor of first rate value. The season when the fire takes place also requires attention, for if a fire occurs at the time when the mother trees are bearing fully matured seed, it is quite possible that a large number of seeds will be productive after the fire ; (*c*) the complex consequences deriving from the increased penetration of air in the soil after a fire, including the rapid changes in the temperature of the surface and of the upper layers and the radiation phenomena connected therewith, the chemical and biochemical effects of daylight on soil which has for a long time been completely in shade, etc.

These observations should make it possible for the forester to have a knowledge in advance of the means at his disposal which will enable him to neutralise the factors which retard and to utilise those which are favourable to regeneration. In the light of these observations he should be able to judge which is the most suitable time for making a first clearing of the burnt over areas with the object of releasing the seedlings of suitable species, which have sprouted on the soil surface of the undergrowth or of the young temporary stand. LARSEN emphasises the necessity for a careful treatment of this temporary growth so that it may be utilised for assisting in the reconstruction of the type of stand which had formerly naturally established itself on the spot. As this growth should he regarded as a parenthetic phase in the life of the permanent stands, it must not be allowed to exhaust all the resources of the soil. Where circumstances are favourable it is also possible to hasten artificial regeneration in forests which have been damaged by fire by means of seeds, especially those of trees which in the early years of their existence serve to maintain the leaf canopy.

As regards the regeneration of burnt over coppice, the experts advise distust of the sprouts which sometimes grow strongly and freely on stumps in the first years after the fire. In order fairly to estimate the true results of the fire, it is necessary to await at least a complete rotation and to compare the growth of the burnt over copice regenerated by stump sproutings with that of the coppice. Experiments carried out in Switzerland by WILLIAM show that the loss of increment in fire ravaged coppice is felt for a long time after the

occurrence of the fire, even in cases where the burning was confined to the tree tops and the stocks did not appear to have been damaged. For this reason it is recommended that a general cutting back of burnt over coppice should be made immediately after a fire. It is also highly desirable, after a coppice fire, to strengthen the reserve of saplings directly produced from seed, and intended at the time of the second revolution after the fire to replace to a large degree the earlier stocks. The same results for the trimming of coppice can be obtained by cutting the stocks below the level of the soil, thus assisting the production of sprouts independent of the parent stock at the ends of the horizental roots. This system however can only the followed in the case of certain species.

In the present state of knowledge regarding the regeneration of burnt over forest it is only possible to arrive at a single positive conclusion and that is that absolute repose is an elementary necessity if the difficulties of reconstruction work are not be to unnecessarily increased. In many cases these difficulties can be reduced by careful observation of the capacity for recovery still possessed by soils which have suffered from fire, but in any case repose is absolutely essential. The recurrence at brief intervals of fires in the same localities serves as a general indication that the process of deterioration in the original stands is still at work. S. CABIANCA.

—*International Institute of Agriculture*, May 1932.

5. Relation of fires to water conservation in Los Angeles County :

BY, S. C. EATON.

Chief Engineer, Los Angeles County Flood Contol District.

Engineers and foresters are at variance as to the value of watershed cover for water conservation and for the control of storm damage. However Mr. Eaton an eminent hydraulic engineer and in charge of what is perhaps the largest single water conservation and erosion control project in the world, believes that vegetation covering the watershed surfaces is the most valuable ally of the engineer and that artificial works simply supplement the natural cover for the control and conservation of water. This declaration suggests that foresters and engineers should work together in water conservation problems. This brief paper covers a large field of study and represents a series of cunclusions of more extensive investigations.

Fires and their bearing on water conservation have such a close relationship in our mountain drainage areas that it is of the utmost importance that all possible means be taken towards their complete control. The relationship is of such importance that the absence of fire denotes the increase of water conservation while the occurrence of fire practically eliminates such conservation. There are two possible means of water conservation. That provided by nature and that provided by man and both are seriously affected by fire.

In the State of California nature has prodigally given cover to the majority of the mountainous areas, either in the way of tree growth such as occurs in the northern parts of the state, or in chapparal growth which covers the mountain ranges of the southern counties. However, man has caused the depletion of this original heritage through destructive logging methods and carelessness in the matter of fires and their control, so that to-day we are face to face with a problem that faced China many hundreds of years ago, and one that, if met with no more of a correcting policy than the Chinese used, will result, in time, in a situation very similar to that country's at the present time—a high mountainous back country devoid of cover, creating at intervals floods of great destructiveness to the populous plains areas, accompanied by sterility of eroded slopes and debris-covered valleys.

That mountain vegetation, whether of an herbaceous nature such as covers grazing areas, brush cover such as grows so densely over the Sierra Madre Mountains, or heavy tree growth such as occurs on the western slopes of the Sierra Nevada Mountains, acts as the most efficient and effective means of water control and conservation, is a fact that has been established beyond question.

Man's works of conservation, such as dams and spreading grounds are supplementary to nature's methods of conservation, and from the standpoint of economics are dependent upon the efficient functioning of natural conservation through mountain vegetation.

Where artificial work can only be placed in stream channels and control can be obtained equal only to the

capacity of such works, the natural cover of vegetation applies those same principles of retardation, storage and percolation to the entire area that artificial works afford to a limited extent.

The action of vegetation in these respects is accomplished by the following means:

1. The rain falling on vegetation loses its impact before reaching the soil, and thus reduces erosion.

2. A certain amount of the rain itself is intercepted by the vegetation before it reaches the ground which reduces both erosion and run-off.

3. The root systems absorb a portion of the moisture in the soil before a rain thus allowing a greater percolation capacity than would otherwise be possible.

4. The vegetation increases the humus content which in turn increases the porosity of the soil and results in a greater percolation and holding capacity.

5. The vegetation spreads out the run off by the interposition of leaves and stems, which results in less erosion and run-off than would otherwise occur. The debris of dead vegetation furthers this action by piling up against the live vegetation, thus acting on the principle of minute check dams and terraces.

6. The leaves and stems of vegetation tend to reduce the soil material content in water which increases its ability to percolate into the soil.

7. The root systems of vegetation tend to bind the soil together which reduces the amount of erosion taking place.

Los Angeles County has about twenty-five of the larger watersheds of Southern California ranging from 200 to 25 square miles individually but has many hundreds of small watershed areas ranging from 1 to 5 square miles each.

On the larger watersheds flood control and conservation requires artificial structures such as regulating dams in addition to the protection afforded by the natural forest cover. In the smaller individual watersheds of from 1 to 5 square miles each, the treatment for flood protection and conservation is more difficult and very expensive, and in these cases,, as a practical matter, dependence must be largely placed upon preservation of the natural cover as being the best and most feasible solution of the problem.

The Flood Control District maintains an emergency fund under which check dams can immediately be constructed on such an area which has been denuded by fire, but the fullest possible number of such structures cannot duplicate the protection afforded by the natural vegetation. This is particularly true where " sheet erosion ", or land slips, from large areas may occur.

On a burned-off watershed it it not uncommon to have 25,000 cubic yards of debris from one square mile of burned-off area. This is equivalent to about fifteen and one-half acre feet. When it is realized that the average cost of providing storage in our mountains is over $ 200.00 per acre foot, the economic importance of preserving the natural cover to prevent the filling up of valuable storage space is evident.

Fire, one of the most destructive forces to all vegetation can immediately turn a natural water basin of vegetation covered slopes into an area whose potential possibilities of damage and destruction if a heavy rain follows, are only limited in extent by the values of real and personal property below the outlet.

The removal of debris from our streets and roads, including the hauling away, averages $ 1.00 per cubic yard.

The district estimate that within the areas not now fully protected there lies property valued at $ 300,000,000. The extent to which this property is subject to destruction will depend not only upon the amount and rate of rainfall in a major storm but also upon the condition of the watershed cover. A major amount of destruction will occur should a major flood happen within two years after a major fire.

That the run-off increases following a severe fire and water percolation and conservation decrease is well evidenced by many experiments and field observations. The results of an experiment conducted by the California Forest Experiment Station on a chapparal-covered plot and on a burned-off plot located in the San Bernardino National Forest showed that during the season of 1927-28 the ratio of run-off from the brush-covered plot to that from the burned-off plot was 1 to 3.7. This ratio however, during a storm of 4.34 inches, when a maximum rate of rainfall was reached, amounted to 1 to 66.5. The rate of erosion was also determined to be 1 for the brush-covered plot against 18.1 for the burned-off plot.

An experiment conducted by the Los Angeles County Flood Control District this year on a model watershed of an area at first covered with brush and then burned-off gave, for a rate of rain fall of 1.36 inches per hour a run-off equal to 0.42 inches per hour for the brush-covered area and 1.01 inches per hour for the burned-off area, a ratio of 1 to 2.4. The rate of erosion for the brush-coveered area was 400 cubic yards of debris per square mile for the burned-off plot after an hour's run, a ratio of 1 to 30.

That a severe fire on even a very porous soil mountain area can produce damaging floods is evidenced by the storm of 1914 and its effect on Haines Canyon, in the Sierra Madre Mountains. In 1913 this watershed of 1.2 square miles was burned over very severely. The ashes filtered down and sealed up the pores and fissures in the ground.

The artificial measures taken by man to conserve water are, because of the vast detrital flow following a severe burn, susceptible to rapid silting up and covering over with a consequent loss of effectiveness. Every dollar expended for water conservation works is therefore jeopardized by fire.

Spreading grounds as a method of conserving flashy peak flows and returning them to the vast underground basins in our alluvial plains has been adopted by many conservation bodies as the cheapest and most efficient way that man has yet devised of building up over water table. The principle of spreading grounds is based upon the ability of these alluvial deposits to absorb water at a feasible rate of percolation. The average run-off from brush-covered mountain areas is free enough from silt by the time the water reaches the spreading grounds so that percolation takes place by keeping the water moving enough to scour the channels of the spreading system. The immediate and great increase in detrital matter brought down following a severe burn could not be taken care of before reaching the spreading grounds. The result would be any immediate clogging up of the surface of the spreading grounds and a consequent reduction and eventually complete elimination of any percolation.

Any one, therefore, who is interested in water conservation should be vitally interested in protecting to the utmost the most valuable ally we have to the conservation of our water supply—our chapparal—and tree-covered slopes.

(Presented at the 4th annual meeting of the California Section, Society of American Foresters, at San Francisco, Calif, Decr. 1931. (From Vol. XXX No. 5—Journal of Forestry.)

6. Recent Studies in Sandal 'Spike':

Biological Chemists' Meeting.

Under the auspices of the Society of Biological Chemists (India) Mr. M. Srinivasaya, Chief Spike Investigation Officer in the Indian Institute of Science, delivered a lecture on "Recent Studies in Sandal Spike" on the 6th June last,............in the Biochemical Lecture Theatre of the Institute.

The lecturer began with an outline of the three main factors in disease, the host, the causative agent of the disease and the vector that is, the carrier. In the spike disease of sandal two of these three factors were known, namely, the host and a virus that causes the disease. But the insect carrying the disease is yet unknown. In other similar virus diseases like curly top to beets, and leaf roll of tobacco the insect vector, i. e., that which causes the disease is known. Entomological studies have been undertaken with a view to trace the insect vector of sandal spike. In all these diseases there is an incubation period which is the time taken for the virus to become active in the body of the vector. Also there is the time taken between infection by the insect and the manifestation of the disease. Various experiments conducted in affected areas and in the Indian Institute of Science showed that in sandal the time taken between the infection and manifestation may vary anywhere between 41 and 775 days. Although the dosage of the infection and the condition of the host were maintained at the same level the period of manifestation of the disease varied enormously. In the course of observations, it was noticed that an apparently healthy tree which was broken by a wind suddenly showed symtoms of disease within a few days of its break in the wind. This led to the possibility of forcing out symptoms of disease, which might have been masked by unknown causes, by defoliating the tree. In several experiments that were tried, it was found that this "pollarding" i.e., defoliating the tree by cutting away its top proved very efficient in showing the diseased trees. The economic importance of this discovery cannot be over-emphasised. In an affected area unless the diseased trees are known they prove a treacherous source of infection, although for all appearances they are quite healthy. This pollarding forces out the symptoms of the disease and thus helps the marking out of affected trees. Also this has proved a fairly effective means of reducing infection.

It has been found that the maximum incidence of disease occurs in the month of May and also between September and October. These are the months when the sandal puts on vegetative growth.

Sylvicultural study has shown that it is possible to avoid incidence of disease and also reduce it by providing a large number of suitable hosts, good root aeration and plenty of sunlight. The lecturer then described some observations made with regard to the growth of the tree after the onset of infection and disease. The effect of the sandal on the soil profiles was then described. It was pointed out that while in a sandal tree area the roots of trees extended well below 6 ft., in areas where sandal is growing, the roots of the host trees scarcely go below 4 ft., and in areas where the sandal is affected by disease the roots never go below 2 or 2½ ft. The importance of these observations in the growing of sandal were discussed. —*The Hindu*, 7-6-32.

7. Empire Timber Push:

Forest Products Research Laboratory's Intensive Campaign.

Great efforts are being made at the Forest Products Research Laboratory to promote the greater use of Em-

pire woods, including the dissemination of vital information concerning suitability for specific purposes, strength, durability, where obtainable, regularity of supply, etc. In this respect a most interesting demostration of Empire woods, both home and overseas, was held at Princes Risborough, on Tuesday, being attended by an assembly representative of Government departments, railways timber growers and, most important, timber buyers and users, upon whom in the end rests the decision whether to try new timbers grown on British soil or to continue utilising the old proved favourites.

So thorough, in fact, is the Laboratory officials' campaign that visitors no sooner arrived at the administrative block at Princes Risborough than they set foot on Empire woods used as experimental flooring.

Other departments in the main building, such as timber physics, dry rot exhibits, mycology, etc., were inspected and it was evident that in all sections of the laboratory work on Empire woods is now in progress in one way or another. One of the most important sections is that devoted to kiln drying, several types of kilns being in operation. This was of particular interest to members of the timber trade, for many complaints against the use of artificially seasoned wood have been found on investigation to be due to lack of essential knowledge on the part of firms' employees operating drying plants, and not to the principle itself, which is considered better than the natural method for various reasons, such as a vast saving in time, with a consequent early release of capital that would otherwise be locked up for perhaps a couple of years. In the manufacture of many articles it is important to know the definite moisture content, which depends, among other things, on species, and in this respect alone the Laboratory is performing a valuable service.

Research in wood preservation is another important branch of the activities at Princes Risborough. In this division there are six tanks, each with a capacity of 1,600 gallons of creosote, and timber can be impregnated with the preservative by means of an experimental plant by the Ruping, Bethel or other prosses.

Demonstrations of woodworking by modern electrically driven machines made by wellknown British firms were also witnessed, including recessing, sawing, crosscutting, mortising, thicknessing, turning, planing, etc. Considerable interest was evinced in the timber machanics' department. Here Empire, including home grown, timbers were seen subjected to all kinds of tests, for strength, impact, bending, static bending, cleavage, toughness, compression parallel to grain, etc. One machine tested poles in order to ascertain the strength of different woods and the effect of creosote, with special reference to their use for transmission and telegraph purposes as substitute for imported poles. This machine is designed to reproduce in the pole the system of stresses to which it is liable in service. A further machine is intended to determine the effect of knots, checks, diagonal grain and other defects on the strength of timber. On the data collected will be based a system of grading structural timbers. Further experiments are to determine toughness, specific gravity, and other characteristics.

Not every timber merchant knows that he can erect in his own office at a few shillings' cost an "oven" for drying small samples of wood with a view to ascertaining the moisture content. Such an "oven" seen in one of the rooms consisted of an asbestos box heated by means of a couple of electric light bulbs. In the same department some wood panels have been treated with paint, oils, etc., in order to see how coatings of these liquids influenced the moisture content. Other depart-

ments in which the visitors exhibited keen interest were those devoted to pathology, chemistry, technology, etc.

It is the part of the work of the Forest Products Research Laboratory to investigate and prescribe for difficulties which invariably attend the introduction of little-known timbers, and to investigate the properties and uses of new timbers, and is its share of a task which involves also the organisation of regular supplies and their efficient manufacture and marketing.

The importance of the possibilities for inter-Empire trading in timber is probably by no means generally realised. As to suitability, the Empire has a range of timbers to meet all purposes. Regarding volume, runs a statement issued from the Laboratory, the Empire could probably not in normal circumstances, supply more than about 20 per cent. of her needs in softwoods, but could in hard-woods.

Excluding manufactured and semi-manufactured goods, the average annual value of foreign timber, including sleepers and pit-props, on the Empire's market is roughly :—

	Softwoods.	Hardwoods.
United Kingdom	£ 29,030,000	£ 7,000,000
Rest of Empire	10,000,000	3,000,000

For the United Kingdom the figures represent about 96 per cent. and 86 per cent. respectively of her total requirements.

Important foreign hardwoods, and their approximate percentage of the foreign import to this market, are :— Oak 46 per cent., ash 11 per cent., American "soft hardwoods" 8 per cent., mahogany 8 per cent., walnut 3 per cent., beech 1 per cent., miscellaneous 23 per cent.

Because of its qualities and the sentiment attaching to it oak is difficult replace. Australian substitutes are gaining ground, and further search will no doubt reveal others. Partial substitutes have been found for ash, which with others likely to be found, may between them fulfil requirements, even if no complete substitute appears. The home grown supply is insufficient. In both oak and ash there is, however, room for more intense organisation of home-grown supplies. The "soft-hardwoods" include American whitewood, magnolia, satin walnut, and hazel pine for furniture and joinery. British West African obeche is making headway in this class and abura may do so.

Requirements in mahogany could all be supplied by the Empire. They are now supplied principally by America, who imports much of it from British Honduras in log form, saws it there and sells the sawn product to the United Kingdom. French West Africa, by reason of very low labour and freight costs, can under-cut mahogany prices against British West Africa. Walnut comes chiefly from America, but is becoming expensive, and substitutes from Austrlia and British West Africa are obtaining the market for decorative purposes. Australia has a possible substitute in coachwood for rifle stocks. Beech is being imported from continental Europe in increasing quantities at a very low price for motor car body building. Canadian birch is a substitute and, but for cost of transport, New Zealand beech. Bigger home grown supplies should be available with better organisation, but price is the difficuliy. The miscellaneous timbers include Finnish birch; American hickory (in the same category as ash); the Philipine timbers (about £ 100,000 worth), which we also have in Malaya and British North Borneo, and a host of other speciality timbers of which the Empire has supplies.

It is clear that the main difficulties in competing with the foreigner are two, namely, (1) Price, and (2)

backward state of Empire production. These two difficulties are inter-dependent. Production, manufacturing and marketing cannot be expanded and improved without protection from uneconomically low foreign competition, to provide for a reasonably sure volume of trade. On the other hand, no advantage in tariffs will avail permanently unless the shelter is made the opportunity for increasing efficiency. But undoubtedly the present low price level is the great stumbling block to Empire timber development. The measures towards greater efficiency include an adequate survey of tropical timbers; adequate and regular shipments at competitive freight rates; where sawn timber is shipped, its manufacture to the excellent standard set by America; a close study of market requirements; and intensive investigation to solve difficulties.

A full range of samples of Empire timbers now available is on view at the Laboratory.

—*The Timber Trades Journal*, July 16, 1932.

8. The Protection of Wounds:

By A. D. C. Le Sueur, F.S.I.

The following notes are compiled as the result of practical experiments made on various species of trees in order to gain further information as to the protection of wounds from weather, insects and fungal spores. The period of experiment has been from five to two years and check wounds have been utilised or made in order to make results more definite.

Tree wounds divide themselves into two groups, transverse wounds made by pruning branches, and longitudinal wounds made by bark damage on trunk or branch. Of the two, the latter are by far most difficult to protect successfully, Wound dressings in the ordinary way, to be thoroughly satisfactory, must have five outstanding points:

They must be: (*a*) easily applied, *i.e.*, fluid or semi-fluid. (*b*) weatherproof. (*c*) elastic. (*d*) antiseptic. (*e*) to a certain extent penetrative.

The ideal protection is, of course, "callus," but this takes time, and even if it completely covers the wound there is sure to be some infection somewhere. An artificial dressing is, therefore, always necessary except where wounds are small.

The dressings experimented with were as follows :—

(1) Paint. (2) Varnishes. (3) Tar. (4) Asphalt (5) Waterglass. (6) Fluid bituminous compounds. (7) Light preparations of the creosote type.

(1) PAINT.

Ordinary oil paint and a type known as "creosote paint" were tried on both transverse and longitudinal wounds, the latter being one fresh and moist and two dry. The results of several trials were practically similar.

After one Season.—Transverse Section.—Covering cracked and definitely broken. In some places the wood appeared to have shrunk longitudinally quite unevenly, being possibly a difference between spring and summer wood. There was in such places a skin of paint that flaked off at the slightest pressure.

Longitudinal Wound.—*Dry*: Covering definitely cracked. *Wet*: Gaping cracks where the timber had opened.

After two Seasons.—75 per cent. of longitudinal wounds attacked by rot fungi and insects.

The conclusion drawn was that, except perhaps for small branch prunings, which may be expected to occlude rapidly, the application of paint is not only useless but dangerous. Paint, as a matter of fact, fulfils one condition only, *i.e.*, that it can be easily applied.

(2) VARNISHES.

The only heavy varnish that appeared worth trying was one described as "heavy and bituminous." This was tried six times. On fresh wounds it did not even follow out condition (a). On dry wounds, four experiments were riddled with bore holes, there were, in fact, more holes through the varnish than on the untreated check surfaces left on the same tree. After three years rot fungi were actually growing through the varnish in two cases. When applied to the edges of the cut, it appeared to have a very definite and damaging effect to the cambium layer, growth at these points being much slower than at untreated points.

Applications of colourless ordinary varnish to cut edges gave excellent results as regards prevention of damage to cambium by "drying out," and this especially on beech, the cambium layer of which is notoriously delicate.

(3) TAR.

This being the medium usually recommended, extensive experiment was made with it, both hot and cold. The average results are as follows :—

Transverse Cuts—Absorption rapid, so much so in the case of hot tar that the outer surface appeared untreated after a year or two. This was also the case to a certain extent in topped trees. In the latter case, several cases on fungal growth were noted within two years of application.

Longitudinal Wounds.—*Fresh*: Difficult to apply and apt to blister up. Absorption very poor.

Dry: Absorption better, but dressing cracks as the wound dries out.

Second applications appear to be very necessary after the first season. On wounds facing north in exposed positions this appeared satisfactory, but on sunny aspects there appeared to be movement even after four years and three dressings did not make the wounds (fairly large ones on oak) completely watertight.

There is no doubt that, although it may be inconvenient, tar is best, applied warm, especially on longitudial wounds, where absorption is particularly difficult. Even when applied hot on this type of wound, the degree of penetration is, as a rule, very small and it must be kept away from the edges of the cut or the cambium will be killed back. Its antiseptic power does not appear great, as fungi of the Stereum type were flourishing on treated surfaces after a year or two.

(4) Asphalt.

This is a material of a semi-liquid type when heated and more or less solid when cold, containing a considerable amount of bitumen. It is occasionally recommended by British writers on wound protection and is frequently used in the United States. Practice shows that it is somewhat inconvenient to employ, as it has to be heated and kept hot whilst in use.

Experiments were made with this material on fairly large longitudinal wounds caused by the cutting out of beech bark destroyed by "slime flux." Two coats were given in each case, the second on top of the first after it had started to cool off. Unless the liquid asphalt was kept very hot, it was very difficult to apply. This material sets very hard and is definitely waterproof, but shows a distinct tendency to crack off at the edges. American statements regarding its lack of power to withstand frost were proved correct in this country, as after a heavy ground frost, the material

protecting a damaged root butress came away completely. Also, in places where the exposed timber had apparently been damp it could be easily prised off.

For the filling of holes or deep wounds of considerable size not too near the ground or exposed to motion, asphalt appears to be fairly satisfactory, but it requires very careful handling, must be used very liquid, *i.e.*, very warm, and those who wish to experiment with it are recommended to "try it out" first on an unimportant tree.

(5) "Waterglass."

This is a silicious fluid generally used for the preservation of eggs. Its action is a purely sealing one, practically the same as an ordinary colourless varnish. On large surfaces it appears to gradually flake and powder away. Tried on small branch cuts it has lasted for three yeare and on such places, especially where occlusion is fairly rapid, or for fruit trees in orchards, it appears to be a fairly satisfactory and cheap method for weatherproofing of a temporary nature. It was used for applying to new cuts to prevent the cambium "drying out" in several cases with success.

(6) Fluid and Semi-fluid Bituminous Compounds.

These are generally mixtures of bitumen and asbestos and are put on the market primarily for weatherproofing felts, etc., for temporary outdoor sheds and poultry houses. Several types were tried, but the most promising appeared to be a proprietory compound called "Rufmat" marketed by the Country Gentlemen's Association. This can be obtained either as a liquid or in a plastic form. Experiments lasting over five years have been carried out on the material and so far it appears quite satisfactory as regards ease of application, proof against weather and frost, and as regards elasticity. It has practically no penetrative po[illegible]antiseptic action, but it is very definitely adhesive. The plastic material can be put on with a palette knife or light trowel, and whilst a hard skin forms on the outside on exposure to air, the inside material remains soft and elastic, so that cracks, even of the largest size, remain definitely sealed up. It is easy to apply and was successfully used on deep wounds over six feet in length which had defied every other method of treatment. As a covering for the exposed surfaces of topped trees it has proved perfectly satisfactory so far and topped beeches, which start as a rule to rot away a year after cutting, appear perfectly sound three years after. It holds better than tar as a rule, but on damp surfaces should not be used until the timber dries out, otherwise water pockets form and if these break the timber is unprotected. On vertical surfaces the liquid type should be applied in at least two thick coats.

(7) PROPRIETORY FLUIDS OF THE CREOSOTE TYPE.

These fluids are really preservatives rather than actual dressings for wounds, and depend on a chemical rather than a mechanical action. Trials with various types gave very much the same results, namely, a definite power of penetration, rendering the wood distasteful to fungal life on transverse branch sections. On longitudinal wounds the penetration was much less marked, especially where the opening was more or less vertical. There was also in such cases a definite "leaching" in cases where the wound was exposed to rain. These fluids fulfil requirements (*a*), (*d*) and (*e*). Being of a definitely anteseptic nature they cannot be ignored.

The conclusions drawn up to date are therefore :— In bituminous compounds of the "Rufmat" type we have an easily applied, highly adhesive, elastic waterproof substance, which, on the other hand is non-anteseptic

and non-penetrative. In the light creosote fluids we have a material of a definitely anteseptic nature, easily handled, but not necessarily permanently weatherproof. The inference drawn, therefore, is that a combination of the two types will fulfil all requisites, that is to say, a preliminary dressing of "Presotim," Solignum, etc., at once, then, when the surface appears fairly well dried out, *i.e.*, when it is not definitely wet, a further dressing of creosote and an application overall of "Rufmat" or a similar substance.

—*Quarterly Journal of Forestry*, July 1932.

9. Mat Industry in Malabar :

Manufacture of mats from various materials such as *kora*[1] grass and screwpine leaves is carried on in almost every place in the two districts of Malabar and South Kanara and these mats are mainly intended to cater for local needs. There is some export trade in these mats, especially the finer varieties. The industry is largely dependent on the availability of the raw material near at hand. The two districts do not, however, draw their supplies of raw material from outside as both kora and screwpine are grown in the districts themselves, the former on the slopes of hills and the latter along hedges of janmi lands and banks of water courses. There are several forest tracts rich with bamboo growths near Nilambur and Shoranur which also afford material for making mats. Mats are also made from the leaves of the palmyra tree which occurs in the two southern taluks of Malabar.

"Kora" Grass Mat Industry.

This industry is found to exist on a large scale in Palghat taluk of the Malabar district and to a certain extent in Walluvanad taluk also. It is not carried on to any extent in the South Kanara district except in

Melanthabettu and Bangadi near Beltangadi where 10 or 15 families of the sect of Kijikaru make a thick variety of sedge mats.

In Palghat taluk, mats are made of *kora* grass in about twenty villages round Palghat town by a class of people called Koravans and the workers number about 730 men, 660 women and 220 children. They are all full-time workers and turn out mats of exquisite fineness and workmanship. The korai required for the manufacture is obtained from the wild growth in the neighbouring hills and river sides. During the rainy season it is available in large quantities and is collected free by the workers themselves who go in batches to the spot where it is available and bring headloads. Generally the grass grows to a height of six feet. After cutting, each blade is teased into three or four strands and then dried. Ezhavas and Mappillas also cut these grasses from the hill sides and channel bunds and sell them to the mat makers at 12 annas per headload from which three mats of 6 ft. × 2½ ft. could be made. Before the kora is dyed, it is well cleaned, preferably in running water, to remove the dirt from it and then dried. Then it is put in a kettle containing *maddichekka*[2], alum and water, or *cheppangu*[3] bark and *kasa*[4] leaves and boiled to give the reeds a red colour. To give them a black colour, the red coloured reeds are immersed for a time in a thick solution of silt earth locally available. For other colours such as green, blue, etc, chemical dyes are used. For warp both aloe fibre and cotton yarn are used, the latter chiefly for finer mats and occasionally silk threads are also used when the mats of a very high quality are made to order. Aloe fibre is extracted mostly by the womenfolk by scraping the leaves after they have been soaked in water for some days, with a cocoanut shell to remove

the pith. It is then twisted into threads by means of spindles. The looms used for the manufacture of mats are similar to those in use elsewhere and the process of weaving is also the same. A mat measuring 6 ft. × 2½ ft. ban be woven in a day and this is sold from 10 annas to 12 annas. In Perintalmanna of Walluvanad taluk and other places the weavers are nomadic tribes who have no fixed abode but move about from one place to another. They go to Nilambur forests to bring the kora grass, when they cannot get it in the neighbouring forests of their temporary dwellings. In a month, the workers are able to manufacture 10 mats of fine quality which may sell from Rs. 1–8–0 to Rs. 2 and 20 of the ordinary kind which may sell from 10 as. to 12 as. each. The Palghat workers are able to manufacture on a large scale mats of both the ordinary and superior varieties and supply them to the merchants at prices previously agreed upon, which of course, are lower than the prices which the product can fetch in the open market and the concession is shown since the merchant guarantees a regular purchase and also makes advances whenever they are in need of money either for living expenses or for the purchase of the raw material for the industry. The mats manufactured in Palghat taluk find a ready sale as they are fine and well designed. A large quantity is exported to places like Madras, Singapore, Bombay and other centres. The average earnings of a worker do not exceed 10 as. a day. The chief centres in the taluk where this industry is carried on are Kelleypulle, Vadavanur, Kannambara, Kizhamannam, Parayeri and Kothakod.

Screwpine Mats.

In the southern parts of the Malabar district especially in Ponnani, Kurumbranad and Calicut taluks where screwpines[5] abound, mats are manufactured from the leaves of this tree and used for a variety of purposes including packing. These are of a cheap make and a mat of 6 ft. × 3 ft. costs three to four annas. The raw material is available in plenty and often obtained free of any charge. The mats made in Malabar and South Kanara are far inferior to those produced in Travancore and Cochin, where very soft mats for use as bedspreads are made with double fold weaving. The stands for the upper fold are cut into small ones and well cleaned. The important centres manufacturing these mats are Payyoli in Kurumbranad taluk and Chowghat in Ponnani taluk where the Pulayas make them in considerable quantities during their half hours.

Mats are also made on a large scale of palmyra leaves intermixed with cocoanut leaves and find a sale locally. They are woven generally by the women of the blacksmith class, during their spare hours and sold at 4 as. to 6 as. a mat. A woman earns about 1 a. 6 ps. to 2 as. a day from this work.

Bamboo Mats.

Bamboo mats are manufrctured in large quantities in Palghat taluk especially in the village of Vadakkancheri and its neighbourhood and in parts of Walluvanad and Ernad taluks of Malabar where there are large private forest areas of bamboo growth. A greater portion of the demand of the southern districts for these mats is met by Malabar. Bamboo is cut from forests on payment of a certain fixed fee to the owner of the forest or to the contractor who has taken it on lease. The chief centres to which mats are exported are Dindigul, Madura, Trichinopoly, Tanjore and other places. The bulk of the mats manufactured in various places are collected at Palghat by merchants who export them outside the district. At Vadakkancheri, a village in Palghat taluk,

there are about 30 families of Kavaras whose sole occupation is plaiting of mats from bamboos. They also use bamboos for making other articles for domestic use. The raw material required for making mats, etc., is obtained from the adjacent forest in the Cochin State, the right to cut bamboo therefrom has been taken on lease by a contractor. Workers have to pay a monthly cess of one rupee to the lessee for permission to cut one headload per day. In addition to this fee, they have to bind themselves to sell him or his agent all the mats they manufacture at four annas per mat of 12 ft. × 6 ft. The 'Kavara' splits the bamboos cut by him in the forest and brings home the teased parts useful for weaving mats. Mats are woven by the womenfolk and in a day a woman can weave two mats of 12 ft. × 6 ft. A worker with his family earns on an average Rs. 10 to Rs. 12 per month. The mats that are purchased by the contractor at 4 as. could fetch, if sold in the open market, 5 as. 6 ps. or 6 as. each, and thus the difference which now goes to the middlemen if allowed to be earned by the workers themselves will add considerably to their income. But this is not an easy problem as the workers being ignorant and poor have not sufficient means to purchase bamboo coupes jointly and increase their earnings. A co-operative society at Vadakkancheri or in its neighbourhood for the benefit of these workers may prove useful.

—"*Land and Life*".

1. Species of *Cyperus.* (Reeds).
2. Bark of Morinda tinctoria.
3. Caesalpinia sappan.
4. Memecylon edule.
5. Pandanus tectorius, Sol. (=P. odoratissima, Roxb) — *Ed.*

10. Plant Products of the British Empire:

From prehistoric times, man has depended to a considerable extent upon plant products, from various economic points of view. Some such products are necessities and others are luxuries. Some which were primarily luxuries have now become, with the great changes in human civilisation and habit, quite essential to human needs.

The economic botanist seeks to satisfy our human needs, both natural and artificial, and with the tremendous modern developments in human life and habit, his work has become of primary importance. With such a widely scattered Empire, Great Britain is able to supply itself very largely from its own colonies and dominions. Two great 'cravings' of to-day—newspapers and motor cars—are resulting in the destruction of the magnificent forests of Canada and Newfoundland and the extensive plantations of *Hevea brasiliensis*, the latex of which supplies the raw rubber, in various parts of the Empire.

Fortunately for Great Britain, it is possible, to a great extent within the Empire, to meet the growing demand for various plant products, such as oils and fats, cereals, fruit, animal foods, spices and condiments, beverages, gums and resins, drugs, tobacco, clothing, timber, etc. Certain other industries are fast disappearing, owing to changes in present-day methods and fashions. For example, indigo, camphor, and vanilla are giving place to synthetic substitutes, and cotton and flax have a strong competition in artificial silk. Another group of the Empire's plant resources, often lost sight of, because it does not appear on the world's markets, is native products used chiefly by those who cultivate them. The importance of such Empire products is scarcely ever realised until such time as famine and crop failure.

During the course of his address, Sir Arthur indicated the original homes, throughout the British Empire,

of some of the economic plants. Efforts are still being made to find plants of economic value which can be grown within the Empire, with the ultimate aim of making the Empire self-supporting so far as possible. With the large increase in cultivated areas, complications such as plant diseases have been set up, necessitating the creation of an army of specialists—plant pathologists, entomologists, physiologists, etc. Rust on wheat in Canada, for example, is estimated to destroy annually £5,000,000 worth of wheat. Every year, in the British Empire alone, insects destroy enough food to supply forty-five million people.

The band of scientific workers attached to the various departments of plant economic and agricultural research throughout the Dominions and Colonies seems a rather formidable one, yet their numbers and cost of maintenance are negligible compared with the toll levied by the diseases they are attempting to overcome.

Since its inception, the Empire Marketing Board has given invaluable help in the war against plant diseases, in research on plant storage, etc., and it has spent £1,235,000 in grants for research. In many cases, too, research is supported financially by firms which depend upon the various plant products for their raw materials.

The scientific problems confronting the Empire in connexion with our supplies of plant products offer a fitting outlet both for private and public munificence, and those who come forward to support the new culture of scientific research and its application to human needs will realise that they are not merely satisfying a noble enthusiasm, but are also fulfilling one of the pressing needs of the Empire. —*Nature, 10-9-32.*

Departmental Notifications.

16-7-32. With effect from 10-5-1932 vice B. Chenchurama Nayudu Ranger, Third grade, invalided :—

(1) M.R.Ry. T.D. Ponnayya from III grade sub protem to III grade (temporary) (2) M.R.Ry. K.P. Chathu Nayar from IV grade permanent to III grade sub protem. (3) Mr. S. A. Dawson from IV grade sub protem to the IV (temporary). (4) M.R.Ry. M. Rama Rao Kini from V gaade permanent to IV grade sub protem. (5) MR.Ry. S. V. Duraiswamy from V grade sub protem to V grade (temporary). (6) Mr. A. Joseph, from VI grade permanent to the V sub protem. (7) M.R.Ry. J. S. Vedanayagam from VI grade sub protem to VI grade (temporary.) (8) M.R.Ry. S. Narayanaswami Ayyar from VII grade permanent to VI grade sub protem. (9) M.R.Ry. Y. Vaidyanathan from VII grade sub protem to VII grade (temporary). (10) M.R.Ry. K. Puvappa, temporary Ranger, VII grade to VII grade sub protem. (11) M.R.Ry. A. Sitharama Sarma, Forester I grade to VII grade temporary.

2. M.R.Ry. S. Narayanaswami Ayyar who was promoted to VI grade sub protem from 10-5-1932 to 20-9-1932 having now been promoted to VI grade sub protem from 10-5-1932 in another arrangement, Ranger T. S. Sankaranarayana Ayyar will, in his place, be promoted to VI grade sub protem from 10-5-32 to 20-9-1932.

20-9-32. With effect from 22-7-1932 vice, K. Raghava Rao Ranger fourth grade, deceased.

(1) M.R.Ry. S. M. Srinivasagam Pillai from IV grade sub-protem to IV grade (temporary). (2) M.R.Ry. P.A. Venkataraman, from V grade permanent to IV grade sub protem. (3) M.R.Ry. M. Umapathy Mudaliar, from V grade sub protem to V grade (temporary). (4) M.R.Ry. K. Purushothma Rao, from VI grade permanent to V grade sub protem. (5) M.R.Ry. P. Madhavan Nayar from VI grade sub protem to VI grade (temporary). (6) M.R.Ry. T. K. Parthasarathy Ayyangar, from VII grade permanent to VI grade sub protem. (7) M.R.Ry. R. Rama Ayyar, from VII grade sub protem to VII grade (temporary). (8) M.R.Ry. A. Niladri Rao, from VII grade temporary to VII grade sub protem. (9) Mr. S. M. Ansur Ali, Forester, I grade, to Ranger VII grade temporary.

First Circle.

5-7-32. Mr. M. Subbarao, Ranger sixth grade, granted leave on average pay for 4 months with effect from 13-5-1932.

5-7-32. Mr. P. S. Varadakrishnamachari, Ranger third grade, on expiry of his leave on 17-7-1932 posted to Palnad Range, Guntur District. 2. Mr. V. N. Leapingwell, Ranger seventh grade S.P.T, on relief by No. 1 posted to river Range Godavari Lower.

11-7-32. V. Rangachari, trained Forester third grade posted to act as Ranger in Vizagapatam division with effect from 1-6-1932 vice Ranger R. Jagannadham on leave.

15-7-32. (1) Mr. T. Balaramaswami Naidu, Ranger sixth grade, Berhampur Range, Ganjam Division to Rajahmundry Range, (2) Mr. A Suryarao Naidu, Ranger fifth grade on relief by No. 1 to Russellkonda Range. He will also hold additional charge of Berhampur Range until further orders.

18-7-32. The leave on average pay for 1 month and fifteen days, from 15-5-1932 granted to Mr. A. Arogyaswami Pillai, is extended by 2 months.

2-8-32. The leave on average pay for 2 months from 8-5-32 granted to Mr. R. Jagannadham Naidu, Ranger sixth grade extended by leave on average pay on M.C. for 4 months.

11-8-32. Mr. B. Kotilingam, Ranger sixth grade, granted leave on average pay on medical certificate for 3 months in continuation of the leave for 1 month from 25-6-1932 granted.

20-8-32. Forester Y. V. Anjaneyulu, M.R.H, I grade, Lower Godavari Division posted to Devagiri Range, Parlakimidi division, vice Ranger, B. Kotilingam on leave.

3-9-32. The leave for 8 months granted to Mr. K. R. Krishna Iyer Ranger, fourth grade, extended by 6 months.

6-9-32. Mr. A. Tirupatirayudu, Ranger seventh grade granted leave on average pay for 4 months from 24-8-1932.

7-9-32. The posting of Mr. R. Jagannadham Naidu, Ranger seventh grade on leave to Kukuluba Range of Ganjam District is cancelled.

3-10-32. On return from leave, Mr. M. Subbarao, Ranger fifth grade posted to Kukuluba Range, Ganjam District.

Second Circle.

5-8-32. Mr. G. V. Subba Rao, Ranger sixth grade, Cuddapah South division on expiry of his leave on 30th August 1932 to Nandyal Range, in relief of Mr. B. Kristna Rao who has applied for leave.

10-8-32. Mr. B. Kristna Rao, Ranger sixth grade, Nandyal Range, granted leave on average pay for 6 weeks from date of relief.

16-8-32. Consequent on the demise of Ranger K. Raghava Rao on 22nd July 1932, Mr. S. Varadarajalu Reddy Forester I grade Kurnool East Division promoted to act as Ranger seventh grade on Rs. 80 (for want of trained foresters) and posted to Dornal Range of the same division to relieve Mr. B. T. Sitarama Ayyar granted leave from 7th September 1932. 2. Mr. B. T. Sitarama Ayyar Ranger fifth grade, Dornal Range Kurnool East division granted leave on average pay for 4 months from 7th September 1932.

31-8-32. Extension of leave for 3 months on medical certificate from 22nd August 1932 is sanctioned to Ranger Mr. D. N. Subramanier.

17-9-32. Mr. D. N. Subrahmanya Ayyar granted leave full average pay for 2 months 14 days from 21st April 1932 to 5th July 1932 and leave on half average pay for 4 months 16 days from 5th July 1932 A.N. to 21st November 1932.

8–10–32. Mr. S. Ramachandra Ayyar Ranger second grade Vontimitta Range, Cuddapah North division transferred to Vempalli Range in the same division. 2. Mr. Abdul Rahim Khan Ranger sixth grade Vempalle Range, transferred to Vontimitta Range.

11–10–32. Mr. B. Krishna Rao, Ranger sixth grade Kurnool West division, on expiry of his leave, posted to special duty, Kurnool South division.

Fourth Circle.

2–6–32. Mr. K. S. Ramiah, Ranger fourth grade posted to Santhavasal Range Vellore division. 2. Mr. M. B. Kalappa, Trained Forester in charge of Santhavasal Range on relief by Mr. K. S. Ramiah, Ranger fourth grade will revert as Forester I grade in Vellore division.

7–6–32. Mr. Manickam Pillai, Ranger III grade, Vellore division on return from leave posted to Anchetti Range, North Salem division. 2. Mr. T. N. Vedantaramanujam, Trained Forester, on relief by Mr. R. Manickam Pillai, Ranger III grade, will remain in North Salem division.

13–7–32. M. V, Ganasen, Ranger sixth grade, posted to Odugathur Range, Vellore division. 2. Mr. M. B. Kalappa, Trained Forester in charge of Odugathur Range, on relief by No. 1 will revert as Forester I grade and remain in the Vellore division.

15–8–32. Mr. V. Narayanaswami Ayyar, Ranger fourth grade on return from leave posted to Odugathur Range in relief of Mr. M. B. Kalappa, Trained Forester, who will remain in Vellore division on special duty. 2. This cancels the posting of Mr. M. V. Ganesan to Odugathur.

19–8–32. Mr. P. Mathuramuthu Pillai, Ranger II grade, Chittoor division on return from leave posted to Harur Range in relief of Mr. R. Thangavelu Pillai, Ranger sixth grade. 2. Mr. R. Thangavelu Pillai on relief will remain in Central Salem division on special duty for the present.

7–9–32. Mr. C. Karunakara Menon, Ranger fourth grade, granted extension of leave on average salary on medical certificate for a month and a half, in continuation of the leave granted.

Fifth Circle.

22–7–32. Mr. C. Thiruvengadam Pillai, Ranger fifth grade Kodamady Range, Tinnevelly District, granted leave for 3 months and 2 days from 27–6–1932.

29–7–32. Mr. M. P. Philip, Ranger sixth grade, on expiry of the leave granted to him posted to Ulandi Range. 2. Mr. T. D. Ponniah, Ranger III grade, on relief by No. 1 attached to Tunacadavu Range.

23–8–32. Mr. A. Kunhunni Nair, Ranger fourth grade, posted to Natham Range, Madura District. 2. Mr. A. R. Manual Ranger sixth grade, on relief by No. 1 posted to Kodamadi Range

Tinnevelly District. 3. On relief by No. 2, Forester M. Gopalaswami Naidu will be attached to Tinnevelly District until his services are required elsewhere.

1–9–32. Mr. C. Thiruvengadam Pillai, Ranger fifth grade, Tinnevelly District, on expiry of his leave, posted to South Coimbatore division.

10–10–32. Mr. M. P. Philip, Ranger sixth grade, granted an extension of leave on average pay on medical certificate for three months with effect from 28–9–1932. On the expiry of this leave he should join duty in the Ulandi Range, South Coimbatore District.

Sixth Circle.

18–8–32. Mr. K. P. Benjamin, Ranger I grade, Mudumalai Range, granted leave on average pay without medical certificate for four months from date of relief. 2. Mr. P. A. Madhavan Ranger VI grade now working on special duty in South Mangalore division is attached to Mudumalai Range for two weeks, and will then relieve No. 1.

11–9–32. Mr. T. S. Ramalinga Ayyar, Ranger seventh grade (now on foreign service in the Pudukkottai State) granted leave as follows:— 1. Leave on average pay without medical certificate for 22 days from 19th May 1932 to 9th June 1932. 2. Leave on average pay on medical certificate for two months from 10th June 1932 to 9th August 1932 inclusive.

8–9–32. Mr. K. P. Chathu Nayar, Ranger fourh grade, granted extension of leave for three months from 3rd August 1932.

NOTICE.

"The Indian Forester Prize"—1933, for past students.

The subject for essay is:—

"The Problem of Game preservation in the Forests of India."

A prize valued at about Rs. 25 will be awarded for the best essay by past students.

No award will be made unless a satisfactory standard is reached. The essay should be clearly written or typed on one side of the paper only, and should not exceed 2000 words. It should be submitted to reach the Principal between the 10th May and 1st June 1933. Only essays received in this period will be considered. The work should be the unaided work of the competitor.

J. C. WRENCH,
Principal.