THE INDIAN FORESTER

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Deodar Growth in the Himalayas.

Photo-Mechl. Dept., Thomason College, Roorkee. Photo. by R. C. Milward.

VOLUME XXXII NUMBER 1

INDIAN FORESTER

JANUARY, 1906.

FOREST MUSEUMS.

I.—THE FORMATION OF PROVINCIAL OR CIRCLE MUSEUMS.

Perhaps no word in our language brings to the mind such a totally different series of objects or gives rise to such varied memories as the word Museum, and, unfortunately, very often the collections are of such a mixed nature and arranged with so little attention to any form of systematic classification or the position occupied by the articles exhibited, either in the world of nature or art or in man's own estimation, that a visit to a Museum not unusually results in a feeling of depression and weariness. That this is exactly the converse of what should be the case, or what can be made to be the case, is well known to those who have been in a position to understand how a large Museum is arranged and worked, when it is in the happy condition of having both funds and space available. It may be pointed out at once that any niggardliness in the latter has a great and lasting effect on the general welfare, beauty and economic uses of the Museum ; for both suffer to a much greater extent than the uninitiated would imagine

Parsimony in money aid is, of course, that which robs so many Museums of three-fourths of their usefulness; and we do not here mean that the money aid is required for the purchase of collections or individual specimens. Money is quite as necessary for the internal fittings of the rooms, in order to ensure that the objects exhibited are shown in a manner which, whilst being effective, will at the same time strike home to the mind of the visitor with sufficient force to ensure that the impression he receives through his visit is the one sought to be given and the one, perchance, which he came in search of.

To the professionally trained Forest Officer and, in fact, to all educated men, it is unnecessary to discourse upon the usefulness and educational advantages afforded to the State by Museums. That the creation of such with this object in view invariably follows close upon the appearance of a new State in the world is well known. This being so, it follows that a Museum can be made equally useful, and is, indeed, equally necessary, to any particular branch of trade, to any particular branch of art or to any specialised branch of science. We need not stay here to point out that this is now becoming fully recognised and that innumerable special collections exist in the world, each having one single object in view, *i.e.*, the education of the particular class or collection of human beings whom that trade or art or science most nearly affects in their daily life and work.

Confining ourselves to science we know that to whatever branch we may turn, we shall find that the tuition of the student is supplemented and assisted by the practical exhibition of the subjects dealt with, wherever this proves feasible. Perhaps there are few professional educations in which the Museum is so necessary an adjunct as in the case of the preparation of students for the professional charge of large forest tracts. The Forest Officer has been called a Jack-of-all-trades, the allusion being rather to the great variety of subjects he has to assimilate during his education than to a variety in the nature of his work, although this in itself is diversified enough. Not one Museum is necessary for the adequate training of the student but many, and in a properly

equipped Forestry College these will be found each in its proper place and sharply marked off the one from the other. Museums of this nature, beautifully arranged, may be seen at the Forest Institutions in Germany, (Munich, Eberswalde, Aschaffenburg, &c.), at St. Petersburg, Nancy, and elsewhere. At Dehra there are the beginnings of what should prove eventually a Museum unique, both for its variety and usefulness, in the world. Want of space has up to date hampered it. This Museum will however be, we should say, is intended to be, an Indian one, *i.e.*, it aspires to gather together collections of forest utility from the whole of the area managed by the Indian Forest Service. That one such institution is required for the Department and country as a whole is of course an unrefutable fact, and Dehra is naturally the position *par excellence* for it. But whilst such a Museum is desirable, we are of opinion that its value would be greatly intensified were it supplemented by provincial forest Museums. This idea is no new one. What may be almost termed such exist in Germany. A departure on these lines has been made in Saxony. Each Conservator has in his office a box of mounted specimens of each of the chief insect pests he has to fear in his forest, accompanied by a note describing the danger and damage to be feared from, and the immediate steps to be taken for dealing with, or preventing, sudden invasions. In India the thing has been attempted in a desultory fashion at times. Mr. A. E. Wild, when Conservator of Forests in Bengal, commenced a collection in Darjeeling, but we believe nothing definite or lasting has resulted. To Mr. Gass, Conservator of Forests, Coimbatore, Madras, the honour falls of making the first real departure in this respect. Some four years ago this officer conceived the idea of starting a collection of specimens of timber and other forest produce and set apart one of the rooms of the Conservator's office for this purpose. At that time it was intended that the collections should be limited to the Southern Circle, and, with the approval of the Board of Revenue, a Circular was issued to all Forest Officers in the Circle explaining the object and scope of the proposed institution and communicating the heads under which specimens were required. Specimens began to arrive in February 1902, and

the numbers increased so rapidly that it soon became evident that a most interesting and instructive Forest Museum could be formed if its scope were extended to the three circles of the Presidency. This has since been done and the usefulness and value of the Institution has become so evident that His Excellency the Governor, Lord Ampthill, who was himself the first to sign the visitor's book, has sanctioned the erection of a special building for housing the exhibits on up-to-date lines. We propose dealing with the contents and arrangement of the Coimbatore Forest Museum, or to give it the name which has recently received official sanction, the Gass Forest Museum, in a subsequent article, but we would here heartily congratulate its originator both on its inception and upon the lines upon which it has been worked up, it having been our privilege to inspect the collections in 1902.

It is the purpose of this article to point out the great advantages accruing from the formation of such provincial Museums and to suggest the desirability of their creation in all the other provinces of the Indian Empire. In the cases where there is but one Circle in a province the Museum should be at the head-quarters of the Conservator. Where there is more than one Circle, the Museum would naturally be situated at that Circle's head-quarters which is at the same time most accessible and most advantageous climatically for the preservation of the exhibits. Such Museums would be a valuable acquisition to a province, since it would be possible for officers to visit them and so make themselves practically acquainted with the more valuable timbers, with the appearance and nature of valuable minor products, with the appearance of the different soils, rocks, &c., with the botanical appearance of the chief trees and their seeds, fruits, &c.: in fact, with the importance, economic and scientific, of the products of their forests as well as with the various pests; all of which information can at present be only learnt by slow degrees and, even then, very imperfectly.

In advocating the formation of such Museums, and we would wish to point out to Local Administrations the extreme value of such from every point of view, we would strongly deprecate any

attempt to go beyond the strict province and limits for which they are formed. Any thing like specialisation in any line or department or attempts to procure rare or unique specimens should be most strongly discountenanced. The Museum should also be strictly confined to the Province to which it appertains and whose Government pays for its upkeep. This tendency to specialisation is the danger, the grave danger, which faces and tempts all Museums which are of purely local interest and whose upkeep was, in the first instance, sanctioned with this sole idea in view. We read that amongst the collections in the Gass Museum there is an extremely rare badger skin. Further 'the collection of snakes is also small at present, but such specimens as there are appear to be uncommon.' The Madras Government pay a considerable sum of money annually for the unkeep of a Central Museum at Madras in which the 'rare badger skin' would find a much more fitting, and probably a safer, resting place than in the Forest Museum at Coimbatore. Again, what real good can be attained by collecting together, in a Museum essentially kept up for the *practical* instruction of Forest Officers, a number of snakes most of which are *uncommon*. The Forest Officer interested *practically* in snakes would not visit the Coimbatore Museum to study the uncommon ones found in the Madras Presidency ; his object would be to study the common ones likely to be met with in his daily journeys in the forest, both poisonous and non-poisonous, and we think that this one illustration will serve to point our moral, and contains in a nutshell the whole crux of our advocacy of the Circle Forest Museums. The sole aim and object of such should be their *practical usefulness* to the forester in his every day life and work. The Conservator, under whose charge the Museum would be, is not a Museum specialist. To attempt to be such will and must result in one inevitable ending, the decadence and ruin of the Museum. If rare specimens are sent in to him by Forest Officers, as they will be sent in, let them by all means be entered in the Museum register, since this register will for all time show the value of the scientific work which the Museum has been a participator in, but let the entry be followed by the despatch of the specimens to the Museum kept up by the State for

this purpose. The Forest Museum we advocate, and the possibility of whose formation has been so adequately demonstrated by Mr. Gass, is one for the practical Forest Officer, and the greatest care should be taken to keep it free from the specialisation of the Museum proper.

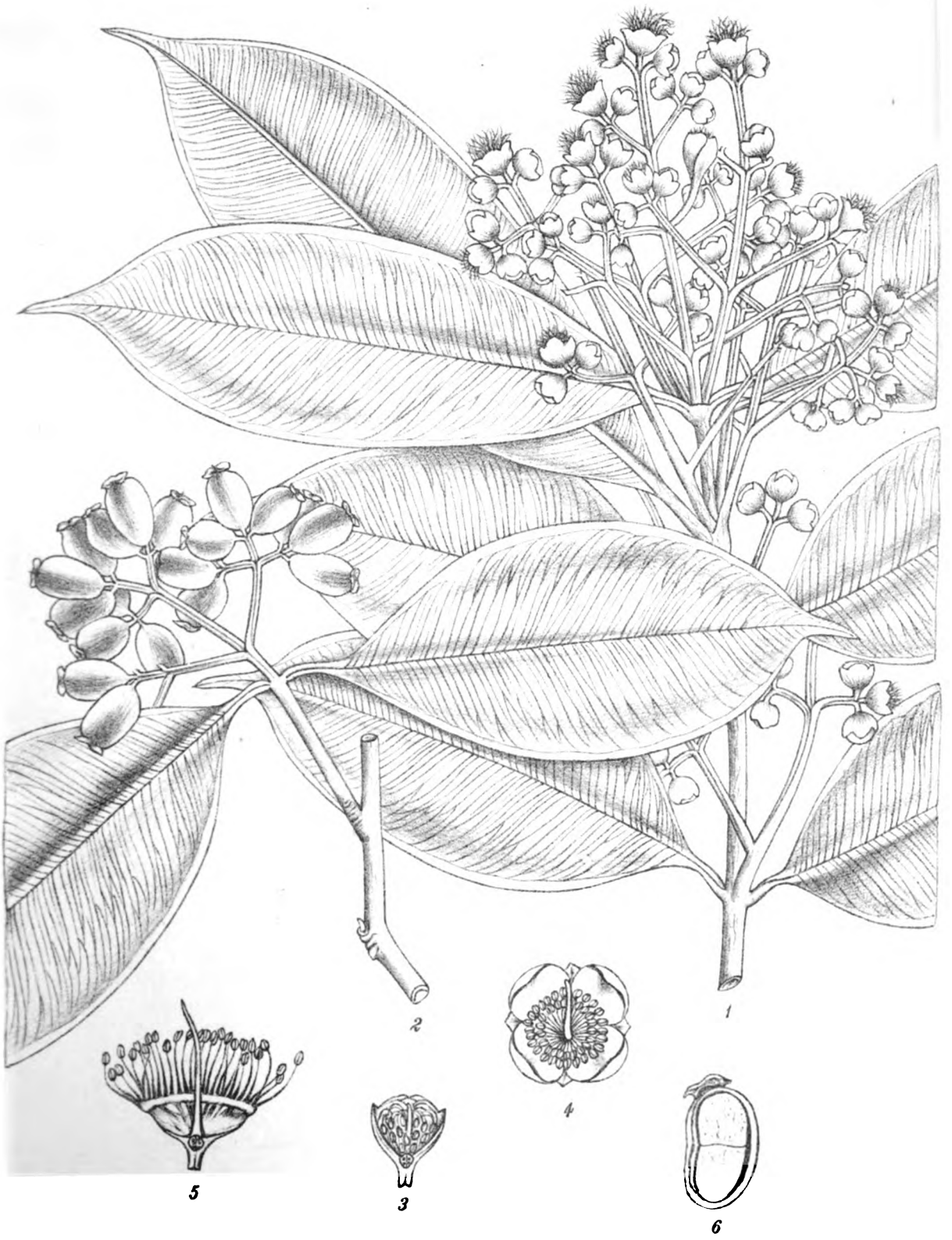
Further, it should be confined entirely to the area comprised in the Circle, or the series of Circles, for the instruction of whose officers it has been formed. We have already pointed out that the General Indian Forest Museum is in process of formation at Dehra, and it will be a simple matter for Conservators to depute promising officers to supplement their study of the local provincial Museum by a further period at Dehra Dun, in cases where they are of opinion that such study will be of advantage to their Governments.

SCIENTIFIC PAPERS.

EUGENIA PRÆTERMISSA—A HITHERTO UNDESCRIBED SPECIES FROM ASSAM AND BURMA.

BY A. T. GAGE.

In the course of a botanical excursion made by the writer in 1899 to the South Lushai Hills, which fill up the southern apex of Assam, a species of Eugenia in fruit was found in fair abundance in the neighbourhood of Fort Lungleh at altitudes of 1,000—3,000 feet. The fruit is appreciated for its edible qualities by the Lushais, who at the time of the writer's visit were to be seen collecting it in characteristically careless fashion by cutting down large branches to allow of the fruit being picked at leisure. The writer was informed that the Lushais made a sort of jam of the fruit. In 1899 the species was not identified with any in the Calcutta Herbarium, but in 1902, when the writer had occasion to incorporate in the Herbarium the Malayan species of Eugenia which had been elaborated by Sir George King, he discovered examples of the same species in flower, which had been collected in



A.N. Banerji del. h.

EUGENIA PRAETERMISSA Cage.

Assam by Griffith and by Mann and in Burma by Prazer. Materials for a description of the species being thus available, the writer prepared a description of the species in 1902, which—hitherto unpublished,—is given below. The writer is indebted to Sir George King for having kindly compared the species with the collection of Eugenias at Kew.

Eugenia prætermissa.—A tree 12—16m. high. Young branches as thick as a crow-quill, terete, pale brown, glabrous. Leaves coriaceous, opposite, glabrous above and below, lanceolate or ovate-lanceolate, acute or acuminate, base cuneate, shortly petioled, upper surface of lamina shining dark olivaceous, under surface rusty brown; main nerves very numerous, somewhat faint, running closely parallel and somewhat forward to end in the intra-marginal vein; length of lamina 6·5—10·6 cm., breadth 2·5—4·3 cm.; length of petiole 1·2 cm. Flowers in axillary cymes as long as the leaves or half as long. Peduncles 1·2 cm. long, usually bearing two to three flowers. Flowers 6·5—8 mm. in diameter; calyx tube 6·5 mm. long, widely campanulate, passing into a very short pseudo-stalk, epedicellate, lobes four, broadly triangular, slightly inflexed; petals suborbicular, white, dotted. Stamens 8·4 mm. long. Fruit about the size of a small cherry, 1·2 cm. long, 8 mm. in diameter, oval, smooth, dark red, black when dry, crowned with the calyx.

Assam—*Griffith!* Khasia Hills—*Griffith! Mann!* Kendat in Upper Burma—*Prazer!* S. Lushai Hills, Assam—*Gage!*

This species has been confused with *Eugenia Griffithii*, Duthie, from which, however, it is distinguished by its oval fruit and smaller much less coriaceous leaves. Its nearest affinity is with *Eugenia chlorantha* Duthie.

DESCRIPTION OF PLATE.

Fig. 1, flowering branch; Fig. 2, fruiting branch; Fig. 3 longitudinal section of bud; Fig. 4, opened flower; Fig. 5, longitudinal section of mature flower, calyx and corolla not shown; Fig. 6, fruit, with half of pericarp cut away. Figs. 1 and 2, *natural size*. Figs. 3—6, slightly magnified.

ORIGINAL ARTICLES.

THE DISTRIBUTION OF THE FOREST FLORA OF THE BOMBAY PRESIDENCY AND SIND.

BY W. A. TALBOT, CONSERVATOR OF FORESTS, BOMBAY.

The Bombay Presidency including Sind extends from 28° 47 and 13° 53′ north latitude and from 66° 43′ to 76° 30′ east longitude, and contains an area of nearly 196,000 square miles.

Generally the forests, scrub and bush woodlands of this territory form a belt of vegetation about 500 miles long and 50 miles broad, nearly parallel with the Western Peninsular coast line, from 200 miles north of Bombay to the Mysore frontier in the south. The wooded areas extend over the hills and valleys of the great mountain chain of the Sahyadris, usually called the Western Ghats. These run from the Tapti river to the Bhatkal sub-division of North Kanara, and traverse the Bombay Presidency from north to south in a more or less continuous chain. This wide zone of mountainous country may be considered as a series of plateaux which have escaped denudation. In its northern half and as far south as Malwan in the Ratnagiri district, almost horizontal layers of trap, cut into steep scarp by denudation constitute the geological formation. The escarpment parallel with the coast line resembles a line of sea cliffs and is strongly suggestive of marine origin, which theory is strengthened by other evidence. The highest summits of the ghats about 4,500 feet high (one or two peaks in the Nasik district slightly exceed this height) are usually flat topped and are strong evidence of the remains of an ancient elevated plain. Geologists hold that the Western Peninsula has not been submerged since archaic times. The conformation of the continental land areas in pretertiary ages was quite distinct from what it is now. There is no evidence of ice action south of the Himalaya or other great changes in temperature later than the post-tertiary epoch. The scanty vegetation of the dry trap region consists of long grasses, deciduous, often thorny bushes and widely scattered

stunted trees. During the dry season this area presents a desolate desert like aspect, which contrasts with the bright green of the vegetation during the rains.

South of Malwan on the 16th degree of north latitude the igneus rock disappears and metamorphic schists with intrusive crystalline gneiss and granite are the principal constituents of the range. The soil from these formations is often deep and fertile and on the humid well drained slopes of the southern ghats, both the evergreen tropical and deciduous high timber forests attain great perfection. High level laterite caps many of the Western Ghat hills. A similar rock sometimes called low level laterite, usually of detrital origin, covers large areas of the low-lying country from the coast inland. The vegetation on the hard ferruginous clay soil or bare laterite itself of the region with a heavy rainfall is characteristic. There are two geological formations further inland under a very diminished rainfall and of minor importance from a forest point of view; the first or Dharwar system consisting of crystalline schists, conglomerates and quartzites. The dry barren Kuput hills in the Dharwar district and the country round the town of Dharwar itself belong to this system. The trees and shrubs of most of this region are small and stunted; only a restricted number of species can resist the periodic seasons of drought. The flora is therefore poor and semi-desert in character. On the southern border of the Deccan trap area about the latitude of Vengorla we find a second system; a series of hard crystalline rocks, cherty breccias, sandstones, limestones and schists, known as the Kaladgi series which occupies most of the forest area of Bijapur. In the dry eastern part of the Belgaum district small tree forests with a characteristic flora are situated on this formation. The tree vegetation along the banks of the Indus and Tapti river grows on the recent and sub-recent alluvium carried down by these great streams.

The mass of the forests lies on the slopes of the ghats and between the chain of hills and the sea. The south-west monsoon rainfall which is the principal climatic factor affecting the type of vegetation reaches a maximum on the tops of the highest hills and

diminishes rapidly in intensity towards the north and east. This forest zone, influenced by the diminishing humidity of the climate, comes abruptly to an end towards the east about 50 miles from the sea. The hill ranges in Mysore, far from the sea coast, attract a varying rainfall which grows in intensity from the lower to the higher elevation, the Bababuden hills for example. Below 25 inches annual rainfall, the Western Peninsular tree vegetation scarcely merits the name of forest, and in the Sholapur, Bijapur and eastern parts of the Belgaum, Dharwar, Deccan and Konkan districts the woodlands degenerate into small scrub jungles. Further east these jungles give place in favourable situations to small trees and shrubs which, however, do not group together into forest, in the strict sense of the word. Owing to the continuous seven months' drought of the dry season, when for a considerable period the mean daily temperature exceeds 100° F., differences of several inches in the annual rainfall do not materially influence the type of the vegetation. It is only when the fall reaches 70 inches that a distinct change in the flora is observed.

In the Bombay Presidency the highest peaks of the Sahyadris do not exceed 4,500 feet; a few points attaining that altitude near Mahableshwar in the Satara District. In the Nasik Collectorate away towards the east are one or two isolated peaks about 5,000 feet in height. The comparatively high altitude of these latter hills does not apparently affect their flora. The mean general height of the great Indian plateau to the east of the main axis of the ghats is about 1,800 feet above the sea level. The vegetation is therefore tropical in the areas under consideration. Very few species of the sub-tropical Nilgiri "Shola" type are found within the Presidency limits. Further south in the Bababuden hills of Mysore at a distance of about 90 miles from the sea the Nilgiri Shola forest makes its first appearance, between 4,500 and 6,000 feet elevation. However in the north with the exception of one or two species of Rubus, Rhamnus Wightii, Crotalaria Leschenaultii, two species of Carex, and possibly two or three other species of the southern "Shola" type, the vegetation of the entire Bombay Presidency is strictly tropical.

The term "Forest Flora" applies in this article to the indigenous ligneus vegetation covering the areas under consideration. Incidentally reference will be made to the herbaceous undergrowth and epiphytic flora. Descriptions of the indigenous ligneus species found in the forests of the Bombay Presidency and Sind are contained in my "Trees, Shrubs and Woody Climbers" published in 1902. Hitherto several sketches of the distribution of the various floras of the Indian Empire have been attempted. S. Kurz, Curator of the Herbarium Royal Botanic Gardens, Calcutta, published in the introduction to the "Forest Flora of British Burma" an account of the distribution of the forests of that Province. As this work appeared in 1877 the great regions of Upper Burma had not been added to the Empire and only the forests of Lower Burma were considered. Sir D. Brandis (late Inspector-General of Indian Forests) contributed an excellent account of the general distribution of the forests in India to Ocean Highways (an ephemeral publication which appeared in 1870 or thereabouts). Mr. Gamble in the introduction to his "Manual of Indian Timbers" divides India into eight forest regions, designated by letters for convenience of reference. The distribution of different floras is not considered in detail. Of the general sketches of the Indian Empire flora the latest is by Sir Joseph D. Hooker and is included in the descriptive volume of the Indian Empire Gazetteer. The Bombay Presidency proper is here included in and forms the greater part of the 5th and 6th Indian Botanical Provinces or the Malabar and Deccan respectively. These provinces correspond in part with the areas of comparative dryness and humidity the "India vera" and "India aquosa" of Lieut.-Colonel Prain's "Plants of Bengal." Outside the Presidency proper Sir J. Hooker's Indus Plain Province includes Sind, Cutch, and Guzerat and corresponds with Prain's "India deserta." Mr. C. B. Clarke, the eminent Indian botanist, in an article in the 34th volume of the Journal of the Linnean Society of London, divides British India, considered as a sub-area of the Indo-Chinese area, into 11 sub sub-areas for purposes of botanical reference. As Mr. Clarke restricts his divisions to 11, these sub sub-areas are sometimes necessarily

artificial: for example, all Malabar and the Konkan, as well as a large proportion of the Deccan, are included in his sub sub-area No. 3 which contains two if not three floras of different origin.

The Bombay Presidency and Sind belong to three of the nine botanical provinces into which British India has been divided by Sir J. Hooker, *viz.*:—

I.—INDUS PLAIN PROVINCE.

"India deserta" of Prain and sub sub-area No. 2 of C. B. Clarke. This Province includes Sind, Cutch and Guzerat.

II.—MALABAR OR 5TH PROVINCE.

"India aquosa" of Prain and part of C. B. Clarke's sub sub-area No. 3, includes the Konkan and the N. Kanara and western parts of the various districts in the Presidency as far north as Thana.

III.—THE DECCAN OR 6TH PROVINCE.

"India vera" of Prain and western part of Clarke's sub sub-area No. 3, includes the eastern parts of the Presidency districts north of Belgaum and altogether the Bijapur and Sholapur Collectorates.

The forest flora of the Panch Mahals, Surat and Khandesh Dangs and the Mandwi sub-division of the Surat district is a mixture of two floras, the Indus plain and Deccan, but the Deccan element is preponderant. In the introduction to the "Flora Indica" of Hooker and Thomson, Khandesh is included in the 5th or Malabar Province, but this view should however be modified according to our present better knowledge of that district, which possesses nearly throughout a flora of the Deccan type. The division of the Indian botanical province into a number of great territoral sub-divisions depends principally on the general consideration of species in the herbaria described in the "Flora of British India." There is no difficulty in recognising the wide differences between the floras of the moist tropical evergreens, the dry Deccan plains and the Sind desert existing in the Bombay Presidency. An attempt at a general description of the forests of this region requires however, besides a consideration of the somewhat scanty existing herbarium material, a fairly intimate knowledge of the ligneus vegetation of the

forest-clad districts within the Presidency limits. Most of the North Kanara evergreens are difficult of access, particularly so during the rainy season, these and many of its deciduous forests having been rarely if ever visited by botanists. In this and the western parts of the two neighbouring districts of Belgaum and Dharwar there is, besides the two principal forest floras, a very distinct intermediate one which contains a number of species not found in either the very moist tropical Malabar evergreens or the drier Deccan deciduous forests. The three floras are :—

I.—MALABAR FLORA.

The great evergreen forest flora, containing many genera and some entire orders of distinct Malayan origin.

II.—INTERMEDIATE FLORA.

The intermediate or high deciduous and evergreen mixed forest flora of the Western Ghats and Konkan, containing elements of different origin and without the Malayan characteristics of the former.

III.—DECCAN FLORA.

The deciduous, small tree forest flora of the dry eastern zone, mostly of gregarious species in which the African element preponderates.

That the Malay Peninsula, Ceylon and the Western Indian Peninsula formed during tertiary times parts of the same continent seems probable from botanical evidence, and there was a struggle in the region with a considerable rainfall, between the Deccan and Malabar floras. Whether this was the case or not does not affect the fact that these two floras are as distinct in character as any two others within the Indo-Chinese area. There is also, as I have remarked, in the moist ghat region an intermediate flora of mixed Malabar and Deccan elements, the latter preponderant, along with many peculiar well differentiated species of somewhat doubtful origin. This type of forest flora will be treated more in detail under "Deciduous forests." The forests of British Burma were classified by S. Kurz in his "Forest Flora" according to their deciduous or evergreen constituents ; he also considered in his classification their elevation above the sea level and their distance

from the sea, as well as the influence of the climatic and geological conditions and the nature of the soil on which they grew. I shall here attempt a description of the Bombay Presidency forests on a similar plan and endeavour to refer them when possible to the three floras chosen.

The ten natural orders in the Bombay forest flora with the greatest number of genera and species are in order of sequence :—

Leguminosæ	47	gen.	130	spp.
Euphorbiaceæ	31	„	73	„
Rubiaceæ	22	„	28	„
Acanthaceæ	15	„	45	„
Urticaceæ	15	„	36	„
Asclepiadeæ	19	„	29	„
Apocynaceæ	18	„	24	„
Rutaceæ	15	„	23	„
Meliaceæ	14	„	22	„
Palmæ	11	„	15	„

EVERGREENS.

I.—MANGROVE SWAMP FORESTS.

These grow on the muddy foreshores and along the banks of tidal rivers and creeks and are subject to the tides and action of salt water. The trees are never large or high and the "massif" is usually dense with one or two predominating species. The principal natural order in this class is the Rhizophoraceæ, Carallia being the only genus of the order absent. The peculiar development of the thick asparagus like breathing and aerating roots (pneumatophores), also the aereal roots raising the stems above the muddy soil, is remarkable. The small leathery simple, succulent leaves with thickened cuticle and the elongated club-shaped radicles of the Rhizophor's pendant fruit are also characteristic. These forests (the "India Littorea" of Prain's "Plants of Bengal") appear at intervals along the coast from North Kanara to the mouths of the Indus, where the conditions are favourable. As they are common to all tropical shores they cannot be referred to any particular type of flora, area or botanical province. The principal species besides those of the genera of Rhizophoraceæ, Rhizophora, Ceriops, Bruguiera and

Kandelia, found in these forests are Excœcaria Agallocha, Cerbera Odollam, Avicennia officinalis (a small tree or shrub, probably two distinct species), Carapa moluccensis, Lumnitzera racemosa, Heritiera littoralis, (rare). Two species of Sonneratia and the shrubs Cæsalpinia Nuga, two species of Scævola, Acanthus ilicifolius, Aegiceras majus and Hibiscus tiliaceus, are very common. Derris uliginosa and D. scandens are common swamp climbers.

Sonneratia acida, common along the foreshores of the Southern Konkan, is replaced by S. apetala, in the northern districts of Thana and Kolaba. Atriplex Stocksii, Arthrocnemum indicum, Sueda nudiflora, S. and maritima (Chenopodiaceæ), also coarse grasses, Cyperaceae and the fern Acrostichum aureum, form dense patches of vegetation on ground where the mud or ooze is somewhat consolidated. Neither of the palms Nipa fruticans, or Phœnix paludosa, characteristic of similarly situated forests, are found in the Western Peninsular esturial swamps.

The tall grass Oryza coarctata, is endemic in the Sundarbans and the delta of the Indus.

II.—ESTURIAL AND RIVER BANK FORESTS.

These form a fringe of vegetation along the banks of rivers and creeks on alluvial soil, which when near the sea coast is not directly affected by the salt or saline water, being above high water mark. The moist condition of the alluvial soil along the banks of rivers, nallahs and creeks and the constant seed-dispersing agency of running water are conditions productive of a varied forest flora. This river bank vegetation contains besides a number of predominent species not found elsewhere, also many of the trees and shrubs from the contiguous jungles. Cultivation has long since destroyed, in great part, the indigenous flora along the banks of the great Indian rivers flowing east across the Peninsula. Of these the head waters of the Toongabhadra and the main branch of the Krishna flow eastwards through the Satara and Poona Districts of the Bombay Deccan. The alluvium banks of these rivers are covered with isolated narrow stretches of Babul (Acacia arabica), valuable as fuel reserves, which are usually flooded once or twice during the rainy season. The principal species associated with

the Babul in these forests, are Balanites Roxburghii, Ziziphus Jujuba, Capparis aphylla and Pongamia glabra. Phyllanthus Lawii, mixed with Ficus heterophylla, are sometimes found near the water's edge, and in the sandy beds of the streams the hardy Tamarisk flourishes. South of the Tapti the rivers flowing west into the Arabian Sea have a short course and the longest does not much exceed 100 miles. These rivers rise from the western slopes of the ghats, and after a rapid course interrupted by a series of high waterfalls and cascades reach the lower levels of the Konkan. The North Kanara streams, greatly swollen from June till November by the tropical monsoon rains, flow throughout their courses through mixed deciduous and evergreen forests. They sometimes broaden out, usually from 5 to 16 miles before they join the sea, into wide estuaries, and the effect of the tides is felt up stream for a considerable distance inland. In the Kalanadi, one of the principal North Kanara rivers which flows into the Indian Ocean near Karwar, the water is slightly saline as far inland as Kadra, 18 miles distant from the sea. Along the Gungawali, Tadri, Gairsoppa and other North Kanara streams the riverain vegetation is not affected so far from the mouth as in the Kalanadi, by the saline water. Some of the characteristic predominant trees in these river bank forests, affected by proximity to the sea, but not growing in the muddy mangrove swamps, are Barringtonia acutangula, and B. racemosa, Trewia nudiflora, Thespesia populnea, Hibiscus tiliaceus, Calophyllum inophyllum, Heritiera littoralis, Terminalia Arjuna and Pongamia glabra (this species throughout both the Deccan and Konkan), and Diospyros Embryopteris. Ixora coccinea, a conspicuous flowering shrub, is also found further inland along streams and in the coast mixed evergreen and deciduous forests. Entada scandens, Canavalia obtusifolia, Abrus pulchellus, Dalbergia sympathetica, D. volubilis, Acacia pennata, A. caesia and Breweria cordata are some of the more common climbing shrubs near the coast. At some distance from the sea Eugenia hemispherica, E. zeylanica, Bassia elliptica, B. longifolia and Calophyllum Wightianum with its characteristic rough conspicuous bark, are sometimes, the last mentioned very often, predominant trees. In the beds of

the North Kanara and Konkan rivers Homonoia riparia, and H. retusa as well as Rhabdia lyciodes are common shrubs. The screw pine, Pandanus furcatus, associated often with Glochidion zeylanicum, G. tomentosum, Ficus hispida, and Glycosmis pentaphylla are gregarious above ghat species. Symplocos Beddomei, Ficus heterophylla, Grewia abutilifolia, Pajanelia Rheedii, Salacia prinoides, Clematis Gouriana, C. hedysarifolia, Lagerstrœmia flos-reginæ, Millettia racemosa, Calycopteris floribunda, two species of Agrostistachys, Cratæva religiosa, Hopea Wightiana, Acacia Suma and two species of Nauclea are amongst the more common locally abundant trees and shrubs in the North Kanara and Belgaum river bank flora. Alangium Lamarkii, Mallotus philippinensis, Trema orientalis, Streblus asper, and Ficus glomerata are common near streams on the Dharwar border of Kanara. Salix ichnostachya is very abundant in the Supa sub-division of North Kanara Along the river banks close to the water's edge in the deciduous Konkan forests Phyllanthus Lawii forms dense "Tamarisk" like thickets, often bordered or accompanied by a growth of the pale green Osmunda regalis. The remarkable hepatic like Podostemaceæ cover the rocks, just above the running water, in the beds of many North Kanara and Konkan rivers.

In the South Konkan and Kanara districts are numerous streams flowing over beds of reconsolidated laterite. On the great concrete like boulders in the beds and on the banks Osmunda regaolis grows abundantly overhanging the clear water in the pools. Ixora coccinea, Strobilanthes perfoliatus and strongly scented species of Compositæ (Cyathocline, Vicoa, Blumea oxyodonta, and B. Malcolmii) are common. In damp marshy places where there is a little soil, colonies of the Aroid, Cryptocoryne Roxburghii, with long grass-like leaves and twisted spathes, are found mixed with Polygonum, Cyperaceæ and grasses. The more common trees along the banks are Calophyllum Wightianum, Hopea Wightiana, Bassia malabarica, Strychnos Nuxvomica, Holigarna Arnottiana, Ficus hispida, and clumps of Ochlandra ("Hooda") bamboo. Podostemaceæ are absent from many of these streams. Above ghats near Yellapur in the river bank flora, Hopea Wightiana is

nearly always very common, sometimes mixed with Nauclea missionis, and fine clumps of Bambusa arundinacea. Pandanus (Screw pine) brakes usually occupy the muddy and marshy places and in the sandy dry beds of the streams Argemone mexicana, prostrate Compositæ, Cyperaceæ, Gramineæ, Polygoneæ and Euphorbiaceæ are found during the dry season. Many of the rivers and streams dry up during the hot season. Near Londa in the Belgaum district there is one about 60 yards wide, flowing over schistose and granitic rocks with quartz sand and pebbles in the stream bed. The trees along the banks show evidence of strong floods during the monsoon rains as the trunks are covered high up with patches of grass and vegetable débris. The roots are often exposed by the strong currents washing away the alluvial soil of the banks. The principal trees along these banks are Vitex Leucoxylon, Hopea wightiana (sometimes bearing abnormal leaves 14 inches by 6). Cinnamomum zeylanicum, a variety with small leaves, Eugenia Heyneana, E. zeylanica, Mangifera indica, Pongamia glabra, Calophyllum Wightianum, Aporosa Lindleyana, Ficus glomerata and fine clumps of the thorny Bambusa arundinacea. Maba nigrescens, Ixora coccinea, Strobilanthes ixiocephalus, Dalbergia tamarindifolia and a Crinum in the marshy places, are all common species in this locality. Tamarix ericoides, rare in the beds of the North Kanara rivers, becomes quite common further north particularly in the Konkon and Deccan districts. It is also found near streams in the Surat Dangs. Tamarix gallica, and T. dioica, are associated with Populus euphratica, along the banks of the great Indus river in Sind and furnish the principal fuel used in that district.

DUNE AND HILL FORESTS.

These usually small or medium sized tree forests consist of evergreen mixed with deciduous species, the latter of Deccan type. They cover the sandy or rocky foreshores as well as the hills near the sea from Bombay southwards. The rock formations are trap towards the north and lateritic, granitic, gneissic or schistose along the North Kanara and Portuguese coasts. The heavy rainfall, generally poor rocky or sandy porous soil and proximity to the

sea are the principal factors affecting the vegetation. The flora of this humid region is very varied and mostly of Malabar type. There are, however, few of the trees characteristic of the tropical evergreens and the presence of some species of the deciduous Deccan flora such as Acacia Catechu, Sterculia urens, S. colorata, etc., are interesting features of this vegetation. In North Kanara on the low level laterite close to the sea, the rocks are covered with a growth of deciduous and evergreen, mostly thorny shrubs. Canthium parviflorum, Memecylon edule, Flacourtia sepiaria, Ixora coccinea, Vitex Negundo, Acacia Catechu, Carissa Carandas, Randia dumentorum and R. malabarica form clumps of vegetation respected by man and beast. The red flowers of Ixora and the beautiful blue Memecylon inflorescence give a touch of colour to these patches of green vegetation. The demand for leaf manure along the Kanara coast is very great and the tree vegetation suffers and is modified in consequence. Sapium insigne and Strychnos Nuxvomica protected by their poisonous qualities, are often the only trees left. Quite close to the sea on the sandy or laterite soil but above high water mark in favourable situations we find thickets of Clerodendron inerme, Premna integrifolia, Calophyllum inophyllum, Vitex Negundo, V. trifolia, Calamus Thwaitesii, Salvadora persica, and the naturalised Anacardium occidentale, this latter usually affording symbiotic residence to hosts of red ants. This as well as the planted mango suffer from the attacks of Loranthus elasticus, in the North Kanara district. Pongamia glabra and other pods and seeds carried down by rivers are thrown up on the sand and freely germinate but seldom long survive in the poor sandy soil. Spinifex and Ipomoea biloba are as elsewhere along the Indian coast common and abundant. The latter plant is often the host plant of the twining parasite Cassytha filiformis, which is found but rarely on the Spinifex. Near Bombay from the Thana to the Surat district a small bushy Indigofera covers considerable areas of the sandy foreshore. The screw palm, Pandanus furcatus, with yellow orange fruit and odorous bracts, sometimes associated with Vitex Negundo, and other plants is found along the coast near the sea in various situations

Cocoanut and Borassus palms, the latter sub-spontaneous in the districts near and north of Bombay, are conspicuous in the landscape. Considerable plantations of Casuarina equisitifolia have been made all along the Bombay coast, which seem to thrive better in the North Kanara district than elsewhere. Amongst the trees cultivated for their economic uses, Mango, Calophyllum inophyllum, Artocarpus integrifolia, Spondias mangifera and Tamarindus indica are a few of the principal. The sacred Ficus religiosa is commonly planted near villages and temples. In North Kanara and Goa clumps of the nearly solid bamboo Oxytenanthera Stocksii are found on the borders of cultivated lands and near habitations.

Lawsonia alba, Jatropha Curcas and J. gossypifolia are common in hedges or sub-spontaneous in most places near the sea. In the Surat district the African Baobab, Adansonia digitata, is frequently met with near the coast, a remarkble survival of ancient Arabian introduction. In the North Kanara district and northwards to Bombay, on the hills and spurs of the ghats close to or near the sea we find forests of small evergreen trees mixed sometimes with deciduous species. These forests when protected from the villagers and the cultivator's axe form usually a dense growth of small stems without the great high timber trees characteristic of the tropical evergreens. Amongst the more interesting features of this coast hill flora is the presence of a number of dry zone deciduous plants, Zizyphus Jujuba, Bombax malabaricum, (B. insigne is also common), Acacia Catechu, Sterculia urens, S. colorata, Odina Wodier and Moringa pterygosperma. The mass of the flora is, however, nearly evergreen owing to the moist climate and these forests are therefore generally protected from the action of annual fires. The soil is well covered and the vegetation is, taken as a whole, rich and varied.

In the northern coast hill forests of Kanara, Eugenia caryophyllæa, and Memecylon edule are perhaps the most common trees. Diospyros Candolleana, D. oocarpa, Pittosporum dasycaulon and Acronychia laurifolia, Erythrina stricta, Premna integrifolia, Holigarna ferruginea, H. Arnottiana, Macaranga Roxburghii,

Ficus callosa, F. tomentosa (also growing on laterite rocks washed by the sea spray), Gymnosporia Rothiana, Aglaia littoralis, Ixora brachiata, two species of Argyreia and Ochna squarrosa are found on the southern ghats. Hibiscus furcatus, Carissa macrophylla, Allophylus Cobbe, Vitis gigantea, V. indica, V. sp. near V. elongata, Leea aspera and L. crispa are common shrubs and climbers. Along roadsides, banks of streams and in abandoned fields in the Coompta and Honawar talukas, Mimosa pudica is widely spread. There are also a multitude of other species. In the southern part of Kanara the grand "Tale" palm (Corypha umbraculifera) is locally gregarious and abundant, it is also found in the undergrowth at the base of the Arbail ghat as far as Sunksal (no large trees). In the Honawar sub-division the Forest Department roughly calculates the annual yield of the "Tale" forests at 2,000 stems. The pith of this palm yields a coarse flour in great demand amongst the coast villagers. The leaves and seeds are valuable bye-products. In the Kumta sub-division Diospyros cordifolia, Ixora brachiata, Garcinia indica and other evergreens are mixed with Zizyphus Jujuba, Odina Wodier, Garuga pinnata and Acacia Catechu. Uvaria Narum, Derris scandens and Connarus monocarpus are a few of the more common scandent shrubs in and along the borders of the forests. The remarkable association of deciduous Deccan species and Malabar evergreens is found in every kind of combination according to the more or less fertile condition of the soil. The demand for timber, firewood and leaf manure from the densely populated coast villages adjacent to these forests has had its effect on the constitution of the flora of this region. In the Thana district north of Bombay, the Deccan and intermediate floras are mixed, there are also a number of Malabar (Malayan) types. Teak, Nana, Terminalias, Xylia, etc., are the principal prevailing species. The trees arrive to fair dimensions owing to humidity and favourable soil.

From Anmode and Juglepet in North Kanara northwards through Goa and Belgaum (British) territory are large tracts of mountainous ghat country covered with high level laterite usually

overlying basalt or trap. This ferruginous red or brown coloured clay formed from the denudation of the underlying formation is quite soft when freshly exposed to the atmosphere. After a short exposure it becomes vesicular and one of the hardest and intractable rocks, decomposing with difficulty. The evergreen element is predominant in the edaphic flora covering this area. Small tree forests of variable density, enclosing in the more favoured localities, irregular patches of tropical evergreens with the usual characteristic Myristicas, laurels, palms and lianes, alternate with large open areas covered with colonies of various Strobilanthes. Spear grass (Heteropogon contortus) and other Andropogoneæ (Rottbœllia divergens, etc.), mixed with Blumeas (B. oxyodonta and others), Vernonias, Senecio belgaumensis, S. Grahami, Smithia setulosa, Leea aspera, Alysicarpus racemosus, and prickly, prostrate Acanthaceæ are common. Vigna vexillata Rubia cordifolia, Vitis. sp. (near V. elongata), Lettsomia elliptica, Ipomæa barleriodes, Rourea santaloides and Grona Dalzellii are some of the more abundant climbers. Strobilanthes sesselis, var. Ritchiei is widely spread over this part of the ghats, usually growing in small clumps of 30—40 simple stems, several feet high. This gregarious shrub flowers generally only once every seven years like S. callosus and S. membranaceus. The blue flowers of isolated clumps appear during September and October and are conspicuous along the ghats in open situations. S. callosus, S. membranaceus and S. Neesianus, this latter flowering annually during the hot season, are in a lesser degree striking objects in the open landscape. Ligustrum neilgherrense, Indigofera constricta, Osyris arborea, Lasiosiphon eriocephalus, Glochidion velutinum, G. lanceolarium, Rauwolfia densiflora, Wendlandia Notoniana, Olea dioica, Phœnix humilis, Royle, var. pedunculata, both the stemless and the tree form are prevailing small trees or shrubs and Scutia indica, *Jasminum arborescens, var. latifolia, Uvaria Hookeri, Fagræa obovata, Rourea santaloides, Hippocratea indica, and H. obtusifolia are amongst the most common and

* This species is stated by Dr. T. Cook to be identical with Jasminum malabaricum, Wgt. "Flora of Bombay," p. 112, Vol. II.

widely spread of the woody scandent and climbing shrubs in these small forests confined to and characteristic of the hard high level, porous laterite which covers such considerable areas of this part of Western India.

In the Supa Taluka of North Kanara near Kalpa at an elevation of over 3,000 feet the higher levels are open, grassy plains or rounded, bracken covered hill tops. The ravines and valleys contain small tree forests similar in appearance to those of the Nilgiris. The climate is exceedingly moist and the tree stems are even in the dry season clothed with Trichomanes dipunctatum, Peperomia Wightiana, Adiantum lunulatum, Lycopods, Mosses, Fruticose lichens and Utricularieæ. The great rounded snowy tops of the flowering Nana (Lagerstrœmia microcarpa) trees are conspicuous during the hot season. In this locality Eugenia memecylifolia grows gregariously in shady places at the highest elevation (3,400 feet). Euphorbia linearifolia, a rare species, was found abundant in the grassy uplands. The handsome Amaryllideæ (Pancratium parvum) is conspicuous in places. The usual trees and shrubs found on laterite, also Casearia graveolens, Symplocos Beddomei, Randia uliginosa, R. dumentorum, Tabernamontana Heyneana, Wagatea spicata, Celtis tetrandra, Ficus Tjakela, and F. gibbosa, form the mass of the woody vegetation.

Further north the high Mahableshwar plateau is covered with a dense growth of small, stunted evergreen forest. The trunks of the trees are very short and thick, with long irregularly spreading branches, and the average height of the canopy does not exceed 30 feet. On the laterite soil the flora is poor in species. The principal trees are Lasiosiphon eriocephalus, Randia dumentorum, Actinodaphne Hookeri, Eugenia Jambolana, Mappia oblonga, Glochidion zeylanicum and Terminalia Chebula. Ligustrum neilgheerense, Solanum giganteum, Salix tetrasperma, Pygeum Wightianum, Litseæ Stocksii and the Choua bamboo are less abundant in the growing stock. Strobilanthes callosus, S. ixiocephalus, Osyris arborea, and Crotalaria Leschenaultii, called by Graham the glory of Mahableshwar, are very common shrubs. The principal climbers on the plateau are Lettsomia elliptica,

Argyreia Hookeri, Allophylus Cobbe, and Acacia intsia. During the rainy season Hitchenia caulina, Senecio Dalzellii, Phaseolus grandis, Impatiens Dalzellii (the yellow flowered balsam), Asystasia violacea, Adenoon indicum, Centotheka lappacea, and many other grasses and herbs are widly spread throughout this elevated region. The bracken is as usual common in open situations.

(*To be continued.*)

SAL COPPICE WITH STANDARDS.

BY F. A LEETE, F.C H.

The enclosed photographs were taken in the Charda Sal Forest, Bahraich Division, Oudh Circle. No. I was taken in April 1899, just after the completion of the fellings, and No. II within a few yards of the same place in the following November.

In seven months the average height of the coppice growth was fully 6 feet, and many individual shoots were as much as 10 feet high. The marks on the staff in the foreground of No. I were at 5, 10 and 15 feet respectively from the ground.

Very few of the trees in the forest were more than 3′ 6″ in girth, and the average of the standards was from 2′ 6″ to 3′ 0″ About 60 were left to the acre.

EFFECT OF LAST WINTER'S EXCEPTIONAL FROST ON THE FOREST GROWTH IN THE LAHORE FOREST DIVISION.

BY ATMA RAM, EXTRA ASSISTANT CONSERVATOR OF FORESTS.

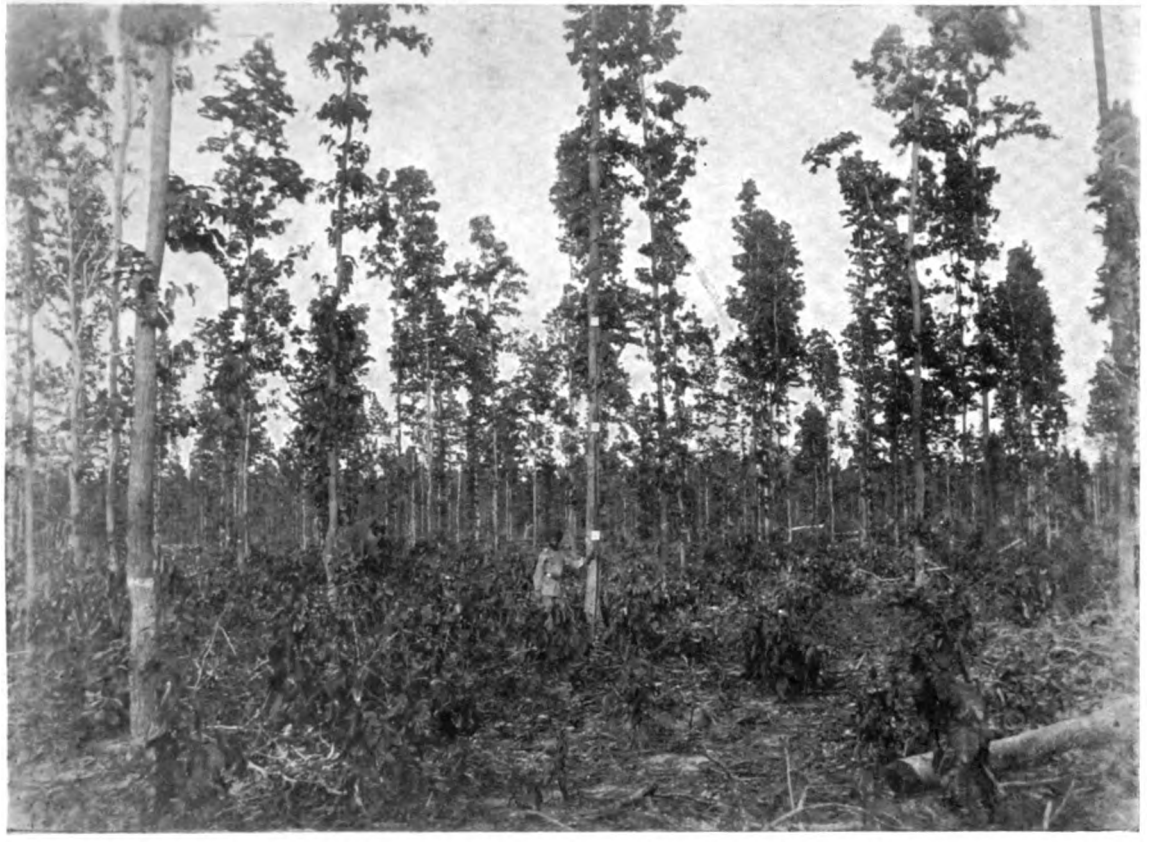
The forests comprised in this division are situated in the plains of the Bist and Bair Doabs and consist of natural forest and plantations.

The principal forest trees are the following :—

Shisham (Dalbergia sissoo).

Tut or Mulberry (Moru alba and M. indica).

Kikar (Acacia arabica and A. modesta).



Charda Sal Coppice with Standards, Bahraich Division, Oudh. View taken in April, 1899, just after completion of fellings.

Farash (Tamarix orientalis).

Jhand (Prosopis spicigera).

Karil (Capparis aphylta).

Pila (Salvadora oboides).

The above are all hardy species, withstanding well the extremes of heat and cold found in this province. Last winter, however, owing to the excessive cold, they all suffered in the order above mentioned.

Early in December last the trees began to shed their leaves and were quite bare by January. In February the Pila, which is almost evergreen, assumed a palish appearance, its thick green foliage shrivelling up and turning yellow. The effect of the frost on imported species of bamboo (Dendrocalamus strictus ?) and on mango trees was disastrous. Many clumps of bamboo were killed outright, and although precautions were taken to preserve the young mangoes by covering them all round with thatch, many were found dead on the removal of the thatch in April. Plants of Eucalyptus citriodora planted out in July 1904 suffered severely, and their stems were dried up, but the roots survived and sent up shoots in the spring. Plants of E. globulus of the same age, however, showed no signs of injury. As a result of the frost all species were very late in putting out new leaves, and in all cases their reproductive power was considerably diminished. The acacias produced no seed and the shisham, whose seed is generally abundant, very little. After the thaw many instances of frost-crack were found on shisham and many trees of this species which from any cause were not in flourishing circumstances were killed outright.

CORRESPONDENCE.

TO THE HONORARY EDITOR OF THE INDIAN FORESTER.

A TREATMENT FOR HYDROPHOBIA.

I.

SIR,—I think Mr. R. D. Hudson will find that *Acacia farnesiana* fits the Babul tree he writes about, a decoction of the leaves of which is instrumental in the treatment of hydrophobia.

W. G. BETHAM,
Divisional Forest Officer.

Ahmednagar.

II.

SIR,—With reference to the enquiry by Mr. R. D. Hudson in your issue for October 1905, page 583, as to the scientific name of the particular species of *Acacia* employed in the Deccan in the treatment of hydrophobia, I wish to reply through the medium of your journal as follows :—

Though it is difficult to determine the scientific name of any plant without a careful examination of botanical specimens, and very risky to be guided entirely by vernacular names in attempting such identification, I believe the species about which Mr. Hudson enquired to be *farnesiana*. It is only the leaf of this species of Acacia that is known to possess some hydrophobia-curing properties, as described, if I remember rightly, in a note from Hyderabad (?) received in 1901 in the Ledger Branch of the office of the Reporter on Economic Products to the Government of India.

K. BANERJEE,
Ledgering Clerk, Office of the Director of Land Records and Agriculture, Punjab.

LAHORE:
20th November 1905.

Charda Sal Coppice with Standards, Bahraich Division, Oudh. View taken in November, 1899, seven months after fellings.

III.

SIR,—In reply to R. D. Hudson the *Divana babul* is pretty sure to be Acacia farnesiana, *dev babul*, which has a fine scent, and a short dark-brown pod.

Talbot calls A. latronum *dev babul*, but I think this less probable.

F. GLEADOW.

IV.

SIR,—In reply to the enquiry made on page 583 of the *Indian Forester* for October 1905, you may care to inform Mr. Hudson that the "Divana babul" is *Acacia farnesiana*, Willd.

Indian Museum, 1 *Sudder Street*, I. HENRY BURKILL.
CALCUTTA:
5th December 1905.

ON CERTAIN IMPORTANT FOREST QUESTIONS.

SIR,—In the September issue of the *Indian Forester*, 'Inefficient' has called attention to the lack of encouragement extended to Forest Officers in the study of science. While not in accord with the writer on several points of the article, I think it cannot be questioned that it would be to the great advantage, not only of the members of the Forest Department, but also of Government to extend such encouragement.

The spur of a money reward for the time and thought expended in study would be welcome, but there seems to me great danger of injustice were the proposed scheme of examinations adopted.

There is, however, another way by which such studies could be encouraged, and that is by extending to the Forest Department the privileges with regard to special study granted for the Indian Medical Service. The higher study of science cannot well be

pursued * in India and a course of lectures at one of the European universities or scientific colleges would be highly desirable, and facilities to this end would be much appreciated by many Forest Officers.

A further concession that would be of great assistance would be the deputation of officers who have proved themselves fitted for one or two months' study at one of the Indian museums, or, in the case of botanists, to the Royal Botanic Garden near Calcutta or to the Ceylon gardens at Peradeniya.

While on the subject of important forest questions, I should like to express a hope that now that the re-organisation of the Department is contemplated, the necessity of a scientific and commercial bureau will not be lost sight of.

It is contemplated to create the appointment of a Conservator-General for each large Province. Is it too much to hope that each Conservator-General will be given a Deputy Conservator as personal assistant? This personal assistant could be entrusted with the preliminary work of organisation and the staff could be added to as progress made it necessary.

COIMBATORE:
6th November 1905.

C. E. C. FISCHER,
Deputy Conservator.

CREEPERS AND CATERPILLARS.

SIR,—Have any of your readers ever noticed any connection between creepers and caterpillars? Caterpillars were noticed defoliating sàl trees in North-East Bengal in May last, and since then they have continued their ravages until now. In many parts the sâl forest presents the appearance of a wintry wooded landscape in England.

It is, however, noticeable that certain parts of the forest are unaffected, and where the damage is not excessive certain trees only were defoliated. It was then seen that trees whose trunks

* Once the advantages, such as the formation of a Research Bureau, exist, the Forest Officer will be in a position to study with as great, and we think with more, advantage in India than at home.—HON. ED.

were bare of creepers were also bare of leaves, and where a mass of creepers wound up and encircled a stem the crown supported by it was full of leaves or only partially defoliated.

The forests in this part have been fairly well cleared of creepers, though there are still blocks which have escaped this operation. Here, where the creepers are massive and encircling almost every sâl tree, there are no signs of the ravages of the caterpillar. On the other hand, along road sides and in cutting areas where creeper cutting has been thorough, the landscape has the appearance a forest at home would bear at the present time. What is the explanation?

F. TRAFFORD,
Deputy Conservator of Forests,
Jalpaiguri Division.

JALPAIGURI:
30*th November* 1905.

REVIEWS AND TRANSLATIONS

REPORT OF THE FORESTRY BRANCH OF NEW SOUTH WALES, 1904-05.

This report is one of peculiar interest owing to the fact that it consists of several sections. The first is devoted to Forestry and has been drawn up by the Chief Forester, Mr. Dalrymple Hay; a second is written by Mr. J. H. Maiden, the well-known botanist, and deals with his work in connection with the Forestry Branch in naming trees and also enumerates the papers published during the year on Forestry and the commercial timbers of the Colony. A third section deals with the suitability of New South Wales timbers for railway construction, with descriptions of the various timbers so used. Mr. James Fraser, Engineer-in-Chief for existing Lines, also adds a valuable paper on these timbers. The report continues with a summary of results and conclusions on the strength and elasticity of New South Wales' timbers, followed by a short Note on Government inspection of timber for export. Sleepers and other timbers for export are at present inspected by Inspectors of the Public Works Department, and when passed

are branded with the Departmental mark for the particular class of timber at one end and at the other with any special mark required by the purchaser. The specifications for the various classes of timbers and sleepers are much the same as in India. The brands for the different kinds of timbers are rather clever. They are circular about half an inch across with the broad arrow with a numeral which denotes the officer who marked the timber at the top ; beneath are the letters N. S. W. and at the bottom the initials of the particular timber, *e.g.*, GG for grey gum, WM for white mahogany, and so on. A scale of charges is in force for this Departmental inspection. A short Note on the Forest Working Laws concludes the report.

We may add that the value of the report is intensified by some excellent full-page illustrations depicting some of the fine forest trees *in situ* in the forest and some export operations.

On the 30th June 1905 the forest area reserved for Forestry purposes was 7,553,717 acres, being an increase of 282,617 acres in comparison with the area reserved on 31st December 1903. To administer this charge there is a staff consisting of 1 Chief Forester, 8 District Foresters, 9 Assistant Foresters, 1 Junior Assistant Forester, 31 Forest Guards and 8 Acting Foresters.

Under prosecutions for Forest Officers we note that 352 cases were instituted, convictions being obtained in 314 with penalties amounting to £372 4*s*. 5*d*. Three hundred and seventy-two seizures of timber obtained illegally were made, claims for 38 of which were preferred, 17 only being upheld. £761 5*s*. 4*d*. was obtained from the sale of confiscated material.

In the Forestry Museum 84 sets, comprising 1,651 specimens of timber, were prepared and issued. A complete exhibit of commercial timbers in bulk was prepared and forwarded to the Acting Agent-General in London and fresh exhibits were prepared for the Museum. We would ask whether a complete set of the most valuable of our Indian timbers in bulk has ever been sent Home and *pushed* at Home ?

Some 70,200 young trees were sent out from the Gosford State Forest Nursery during the season (1904) and planted in

plantations, parks, streets and roads, agricultural farms, cemetries and hospitals, &c.; the total cost of maintaining this nursery for 18 months was £911.

The number of saw-mills at work during the year 1904 was 19 in the Metropolitan district and 305 in the country districts. The number of persons employed averaged 3,655. The total value of the plant, &c., in the State's saw-mills was estimated at £285,925, the value of the timber treated (native and imported) being estimated at £1,170,932, whilst the output of native timber from logs amounted to 117,029,000 sup. feet. During the year Mr. J. Adam, F.C.H., A.M., C.I.E., of the Indian Public Works Department, was deputed to visit the State on behalf of the Government of India on an enquiry respecting the suitability of New South Wales' timbers for railway construction. In order to furnish the Government of India with the fullest and latest information on this subject, the Premier authorised the publication of a special brochure entitled "Suitability of New South Wales' Timbers for Railway Construction." This Note is reproduced in the report under consideration We trust to be able to deal with it in these pages at a later date.

FORESTRY OPERATIONS IN NEW ZEALAND, 1904-05.

Broadly speaking, the Forestry operations to which the Forest Department in New Zealand chiefly restrict themselves are the growth of young trees in nurseries and their subsequent planting out in plantations and enforested lands. There are some nineteen nurseries, plantations, &c., now under management containing some eight and a quarter million trees, the number raised in the last decade being twenty-five million odd. The value of these trees and other improvements effected is estimated at £111,800. These figures speak for themselves and show that New Zealand is making a great effort to improve and enlarge the forests of the country.

As is pointed out in the report, with the gradual increase in the output of trees at the various plantations, the cost of maintenance has increased proportionately. The plantation work,

owing to climatic conditions, varies in amount from year to year. The young plants have to be kept clear of fern, grass and other growth until they have occupied the land from two to four years. It is stated, however, that quick-growing trees such as acacia, several varieties of Eucalypti, *Pinus radiata*, birch, &c., need no attention after the second year. An experiment was made of offering to supply settlers with trees at half rates as the matter had been frequently urged upon Government. It was found, however, as it has been found in other countries, that there was absolutely no demand for such, the information supplied to Government upon this matter proving unreliable. A magnificent tree and one which has been largely cut out is the Agathis australis (*Dammara australis*), the kauri. In some beautiful illustrations, which add great interest and considerable value to the report, one of these trees is shown having a circumference of 27 feet, whilst another depicts a young tree. The following remarks upon this tree are of considerable value and interest :—

"During my recent journeyings in Auckland in connection with the Scenery Commission, I have had the opportunity of making minute inspections of several 'cut-out' kauri bushes, as well as two or three areas of kauri forest which had been burnt some twenty-five or thirty years ago. The districts in which my inspections were made are the Waitkeri Ranges, Whangarie and Puhipuhi.

On all the 'cut-out' areas I found that wherever cattle had been kept out young kauris were growing in abundance—from seedling plants up to trees 6 inches or 8 inches in diameter. Such portions are usually on steep creek-sides or ravines where trespass by stock is impossible.

On the Waitkeri Ranges, near Cascade Creek, a tributary of the Waitkeri, I found young kauris covering the ground as thickly as corn in a field. It was evident that the large trees had been killed by fire many years since—between twenty-five and and thirty I was informed—as was apparent from numerous dead stumps. This particular locality being quite inaccessible to cattle, owing to its steepness, accounts for the young trees

remaining uninjured. The largest trees measured quite a foot in diameter at the base, so that these trees must have grown to this size since the largest mother trees were destroyed.

The presence of so many seedlings and saplings of varying stages of growth is due to the larger saplings shedding seed, and half-grown cones were abundant on most of the trees where they were not too much shaded by the surrounding undergrowth.

It is therefore apparent that the regeneration of the kauri—in certain districts, at all events—has been proved possible without the aid of man. If fire stock and, more particularly, the gum-digger could be kept out of cut-out areas, I have no hesitation in saying that the kauri forests could be renewed at a less expenditure than is possible to plant artificial forests of exotic trees.

It is true that kauri is of slow growth, and that a very long time must necessarily elapse before it can be fit for the axe. But the kauri trees now being cut for timber purposes have struggled with their neighbours for supremacy during, perhaps, hundreds of years, and during this struggle they have probably been partially suppressed time after time before finally conquering their rivals in the struggle for existence. This long-continued competition must necessarily have delayed growth far beyond the actual time required to reach maturity, as would be the case where judicious thinning and up-to-date forestry methods are practised. We have no knowledge of the actual time required for the kauri to reach marketable size under advanced sylvicultural methods, but we are equally ignorant regarding many other trees now being planted for timber purposes throughout the civilised world. Specimens of the red wood of California, for instance (which tree we are planting largely), have been estimated to be over six thousand years of age. American foresters, however, anticipate that in from one hundred to two hundred years redwoods will reach a sufficient size for profitable milling if planted on suitable soil and properly cared for. I do not venture to predict at what age kauri may mature under favourable conditions, but I submit that the matter is well worthy of immediate trial, otherwise the opportunity will be lost for ever.

A very few years will suffice to settle the question as to whether young kauris will spring up from seed scattered by parent trees which have been left standing on account of some fault or blemish, and if this is accomplished, tending, transplanting, and final planting will be saved. This will amount to at least £10 or £12 per acre.

There will of necessity be some expenditure in clearing out worthless trees and keeping down undergrowth from checking the kauris for some years, but a similar expenditure is necessary when dealing with any plantation of trees grown for commercial or other purposes.

I suggest, therefore, that immediate steps be taken to select recently cut-out kauri-bush areas, for the purpose of ascertaining whether it is practicable to re-establish forests naturally. Fencing, partial clearing, and protection from fire will necessarily follow, but estimates of probable expenditure must be left until the areas are thoroughly examined."

For some years past the practice of bleeding kauri trees for the extraction of gum has been in operation in North Auckland, both on private and crown lands. It has been stated that this operation had no effect on the health of the trees or the value of the timber, both statements which we are strongly inclined to agree with the Chief Forester are scarcely in accordance with the experience gained from experiments carried out with other coniferous trees.

We have alluded to the illustrations which illustrate this report. Their excellence is only surpassed by their high interest, and we are of opinion that the example is one which could be with advantage imitated.

CURRENT LITERATURE.

In the BOTANICAL GAZETTE for October 1905, Mr. Forrest B. H. Brown discusses under 'A Botanical Survey of the Huron River Valley' the plant societies of the Bayou at Ypsilanti, Michigan. The 'bayou' is a small area of 60 acres. It includes steep slopes (the bluff), a large bayou with a stretch of flood plain and stream

embracing a wide variety of conditions. In this small territory the plant societies have reached an unmolested development exceptionally favourable for their study. The object of the author was (1) to determine what plant societies were clearly represented, and (2) to determine, from existing evidence, the influence of the factors of the environment which, both past and present, may account for their presence or explain their origin. It was found that the vegetation of the bayou and bluff consisted of a number of plant societies which could be treated under the heads (1) Peat-forming societies consisting of pond-buds, sedges, water-lily, willow, tamarack, etc.; (2) flood plain societies consisting of at first moist sedges, thin elm, ash and maple, and finally walnut and oak; (3) the bluff societies consisting of oak, hickory, juniper and thickets. It was found that the peat-forming societies show sharp tension lines, conforming to depth of water, characteristic of pond vegetation. Such tension lines become obscured in the flood plain societies and still more so in the bluff societies, but in each of them the relation of distribution to soil water, as a controlling factor, is plainly marked. The definite relation of certain societies to soil types, shown to exist here, appears to be due primarily to the capacity of these various soils for water. Of other factors the influence of light was conspicuously manifest.

The CANADIAN FORESTRY JOURNAL for October 1905 has an article upon the Montreal Forest Congress held on 21st—23rd August 1882. This was the first meeting to deal with the subject of Forestry in Canada. The meeting was in fact a joint one of the American Forest Congress and the American Forestry Associations, two separate societies for the advancement of forestry, and it resulted in a junction of their forces. The selection of Montreal for the meeting was the result of an invitation given by several Canadians who attended a previous meeting in Cincinnati. Other articles in the Number are "Tree-planting in the West" by N. M. Ross and Woodland Taxation by J. F Clark.

In the RECORDS of the GEOLOGICAL SURVEY of India for September (Vol. XXXII, Part 3) Prof. C. Diener gives an interesting paper on An Anthracolithic Fauna from the mouth of the Subansiri

Gorge in Assam. The Professor, in describing the fossils sent to him, points out that as the Subansiri valley is an impenetrable jungle occupied by hostile tribes, every fragment of evidence may be considered valuable until their almost unknown area is more thoroughly explored. The determination of fossils from the locality was of further importance in view of the interest connected with the problem of a relation between the coal-bearing Gondwanas of Assam and marine beds of Permo-Carboniferous (Anthracolithic) age. Mr. G. E. Pilgrim has an interesting paper on the occurrence of Elephas antiquus (nomadicus) in the Godavari Alluvium. This paper we shall hope to treat of more fully in a subsequent number.

In the ANNALS of the ROYAL BOTANIC GARDENS, PERADINIYA, Mr. R. H. Lock has a paper on Studies in Plant Breeding in the Tropics, and this is followed by an interesting monograph by the Acting Director, Mr. Herbert Wright, on the 'Foliar Periodicity of Endemic and Indigenous Trees in Ceylon.' A considerable amount of time has been spent by botanists in the tropics in studying the foliar periodicities in plant life with the object of tracing out some of the laws which govern these phenomena. There are several problems to consider, such as the relationship between the time, manner and frequency of defoliation of trees in the tropics and in middle Europe; how far the phenomena of leaf-fall and foliar renewal in the tropics are affected by external and internal forces, and, finally, to distinguish cases in which either or both of these factors are of importance. In the paper under review Mr. Wright considers the amount of variation to be met with in trees commonly deciduous in various parts of Ceylon, the relation of defoliation to transpiration, and the independent effects of heat, light, and moisture. The brochure will prove of considerable interest to Forest Officers.

Nos. 3 and 4 (1905) of the AGRICULTURAL LEDGER series of the Reporter on Economic Products consist of short monographs on the 'Manufacture and Composition of Indian Saltpetre' by David Hooper, and on the collection and composition of the dye stuff Kamala (Mallotus philippinensis) by the Officiating Reporter.

The article deals with the distribution of the tree, preparation of the dye, yield, collecting areas and trade, chemical composition, adulteration, dyeing and other uses of the dye.

In the BULLETIN ECONOMIQUE of the Direction de l' Agriculture et du Commerce de l' Indo-Chine there is an article of considerable interest on the subject of the cultivation and exploitation of Hevea brasiliensis in the Sud-Annam. As the writer ably points out, of all the species of caoutchouc experimented with, it is the Hevea which has remained the favourite. The article describes the plant and the various climates and soils it prefers, methods of planting, extraction of the latex, the amounts obtained and preparation of the resin.

SHIKAR, TRAVEL, AND NATURAL HISTORY NOTES.

THE TREATMENT OF ELEPHANTS' HEADS BY INDIAN MAHOUTS

Could you or any reader explain the reason for daubing mustard oil on an elephant's head as is done by Indian mahouts belonging to the P. W. D. and Military Transport? I see in Vol. III, page 181, Roger's "Manual of Forest Engineering for India" that Mr. Fordyce, Deputy Conservator of Forests, states that mustard oil should be given to the mahout and care taken that it is applied to his charge's head.

I have never seen a timber trader's animal's head thus annointed, nor have I seen a Forest elephant in Burma smeared with oil, and up to date I have always thought it was some useless custom peculiar to Indian mahouts, which, among other advantages, attracted the sun on to the poor beast's skull; but when I see a Forest Officer recommending this treatment, I begin to think, perchance, there is something in it. The book gives no reason, hence my letter, as personally I would have advocated whitewash if any dressing on the head was required.

RUBY MINES DIVISION, *Burma.*

C. BRUCE, *Deputy Conservator.*

EXTRACTS FROM OFFICIAL PAPERS.

TASMANIAN TIMBERS.

In his preliminary report on Australian woods Mr. James Adam, Executive Engineer, P. W. D., India, in referring to the timber resources of Tasmania, wrote that the official information published by the Colony was "much lacking in the essential detailed particulars," and further that "there were also somewhat serious discrepancies, and certificates from the railway officials, actually using the timbers as sleepers were absolutely wanting." Mr. Adam went on to say that, on this being pointed out to the Premier of the Colony, "he was good enough to issue instructions for the preparation of a special report on the subject." It is probably as one result of these representations of Mr. Adam that we have just received from the Honourable Mr. Alexander Hean, the Colonial Minister of Lands and Works, a copy of an official publication entitled 'Tasmanian Forestry, Timber Products and Saw Milling Industry," and we have much pleasure in commending the volume to the attention of the large and growing circle of Engineers in India who have recognised the advantages that accrue from the use of some of the Australian woods. The expansion of this trade is very clearly shown by the increasing imports of Australian sleepers at the chief Indian ports, and particularly at Calcutta. "Tasmanian Forestry" has been compiled by Mr. J. Compton Penny, Chief Forest Officer, under the superintendence of Mr. E. G. Counsel, Surveyor-General and Secretary for Lands, and sets out a description of the timber trees indigenous to Tasmania, their commercial value and the process of manufacture, with particulars of the methods adopted by the Colonial Government to foster the industry. In the increasing trade in Australian woods to India and South Africa, thus far, Tasmania has not taken a very large share, but recent engineering operations have directed attention to some of the special requirements which Tasmans' land timber is particularly able to meet. In

the execution of the new great national harbour works at Dover large quantities of Tasmanian timber have been used by the contractors, Sir Weetman Pearson and Son, Ltd., with very satisfactory results. Some idea of the extent of these operations is suggested by the quantity of timber required for the temporary work, &c., which is stated by Mr. Harold J. Shepstone, in the *Scientific American*, to have amounted as a minimum to the following : hardwoods, principally greenheart and rock elm, 25,000 cubic feet ; soft woods, pitch pine, redwood, &c., 75,000 cubic feet for permanent works. For temporary work, 550,000 cubic feet of Blue Gum and other hardwood ; pitch pine, &c., for superstructure, 850,000 cubic feet or some 1,500,000 cubic feet in all required in the construction of a total length of 9,520 feet of piers and breakwaters, so that the works at Dover provide an exhaustive test of the suitability of timbers. For the temporary staging Tasmanian Blue Gum piles are being principally employed, as this wood resists the attacks of the *Teredo navalis* or seaworm. Mr. Shepstone writes :—

" Some idea of the density of this wood may be the better understood when it is stated that it has a specific gravity of 75 lbs. to the square foot, whereas water is but 65 lbs. A pile of Blue Gum, therefore, 100 feet long and 20 inches square, would turn the scale at nearly 10 tons, while an Oregon log of similar dimensions, having only a specific gravity of 48 lbs. per square foot, would only weigh 6 tons, and consequently float.

" To obtain a pile 100 feet in length and 20 inches square, parallel from top to bottom, demands a tree 15 to 18 feet in girth, 5 feet from the ground, and about 150 feet to the first branch. The Tasmanian Blue Gum, easily attains this height. Indeed, so far as height and general beauty are concerned, the Blue Gum is no mean rival to the famous redwoods of California. A large quantity of the timber to be seen at Dover came from the yards of Messrs. Gray Brothers, of Adventure Bay. Mr. Gray, the head of the firm, states that they often come upon trees from which they could cut piles 160 feet long (that is, 60 feet longer than required by the contractors at Dover) before the first branch is reached, and others 230 feet high measure 7 feet through at the butt. Nor are these figures by

any means the largest recorded for Tasmanian Blue Gum. Mr. Perrin, formerly Inspector of Forests in Tasmania, and afterwards in Victoria, mentions having measured a fallen Blue Gum at Geeveston (on the Huon River) which had a length of 330 feet; and Mr. R. M. Johnston, the eminent Government Statistician, speaks of the 'Tolosa Blue Gum,' also 330 feet high; and Baron von Mueller, the well-known Australian naturalist, says of a Blue Gum growing at Southport in Tasmania that it contained 'as much timber as would suffice to build a 90-ton schooner.' And when speaking of these giants, it should be borne in mind that they are not isolated cases, mere curiosities, but that trees of from 200 to 250 feet are fairly common in the forests, extending over thousands of acres in the Huon and Peninsula districts of Tasmania, rising high and clear of boughs, like the masts of great ships."

The official manual now before us states that a Blue Gum tree of full growth will average 7 feet diameter at the butt, 100 feet in length to the lowest branches, and from 200 to 250 feet in extreme height, taking probably three to four hundred years to attain its full dimensions. For wharf and bridge construction, for piles and the heavier timbers of superstructure, it is superior to anything produced in the Australian States. For bridge or wharf decking it would be hard to find its equal for durability if laid when thoroughly seasoned. For the Dover works several shipments of Blue Gum piles, hewn square to 18 × 18 and 20 × 20 from 70 to 100 feet in lengths, with a large quantity of sawn timber in junk sizes, were supplied from Southern Tasmania. The high specific gravity of the timber, its capability to withstand hard driving and its partial immunity from the ravages of the teredo render Blue Gum specially adapted for piling purposes. It is used also largely for railway sleepers, railway wagon work and wheelwright purposes.

Writing of Tasmanian woods for sleepers, Mr. Adam said that while the hardwoods are much less numerous than is the case on the mainland, there are 14 species of Eucalyptus attaining size enough to yield timber, but only three are suitable for sleepers, and of these two only are obtainable in sufficient quantities

for export. The two being "Tasmanian Blue Gum" (*Eucalyptus globulus*) and Tasmanian stringy-bark (*Eucalyptus obliqua*). Of this latter "Tasmanian Forestry" says, "Stringy-bark, so called as its name implies, from the fibrous nature of its bark, is probably the most valuable tree that Tasmania possesses, inasmuch as it produces a timber of excellent quality, suitable for all constructive work and by reason of its general distribution throughout the island, gives the supply of timber requisite for extensive saw-milling operations. The average tree at maturity is of even greater dimensions than the Blue Gum, often attaining a height of 250 feet, with a diameter of from 12 to 14 feet at the butt. The wood is, generally speaking, more open and free in grain and of lower specific gravity than Blue Gum, but equally durable and adapted for many similar purposes for which that timber is used, such as in piles, wharf and bridge timbers, &c. For mining purposes, (underground and surface work), it is largely in demand. Railway sleepers have a life equal to, if not greater than, Blue Gum. Wood paving is also one of the uses for which Stringy-bark is well adapted, possessing as it does the requisite qualities for that purpose, *viz.*, durability under wet and dry conditions, evenness of wear, with a minimum polish under traffic." The official handbook goes on to say that "prejudice to Stringy-bark timber is sometimes set up by the appearance of seasoning cracks, which mostly appear in the ends of the freshly cut timber—when cut green and exposed to stringent conditions of sun and wind. These although not desirable so far as appearance is concerned, do not really affect strength and durability. The cracks at first noticeable gradually close as the process of seasoning proceeds, until the whole piece again becomes thoroughly consolidated." Other 'hardwoods' described are Ash or Swamp Gum (which cannot be classed with Blue Gum or Stringy-bark for durability); Gum Top Stringy-bark, largely used in house construction; Pepperment and Ironbark, both the latter being consumed in local requirements. The foregoing timbers are dealt with in Section I. Section II describes the Tasmanian "ornamental and other timbers" Section III is devoted to "Secondary Forest trees," producing either timber not in general use, or of a nature

termed "Fancy Wood." Section IV gives Botanical descriptions of the Tasmanian *Eucalypti* by Mr. L. Rodway. Section V traces the history and growth of the Saw-milling Industry of the Colony. Tasmania has long been well to the fore in this direction, for in 1851, one piece of Blue Gum measuring 146 feet in length, 18 inches × 6 inches, sawn clear of heart and sap, was cut at Long Bay, D'Entrecasteaux Channel, and forwarded to the first Exhibition in London. The Tasmanian record for the longest piece in one length is 160 feet. This section closes with the specification for railway sleepers and other timbers for export where the Government certificate is required and the form of certificate. Section VI consists of a number of reports on the utility of Tasmanian woods, including one from Mr. C. C. Nairn, Chief Engineer for Existing Lines, Tasmanian Government Railways. Section VII gives the results of a number of tests carried out on Tasmanian timbers in comparison with English Ash, Beech, and Oak. Section VIII sets out the Regulations under "the Crown Lands Act" of 1903, with the scale of License Fees for timber cutting. The work is copiously illustrated throughout and includes a large map of Tasmania.

Some years ago in these columns a leading Indian Engineer took the Indian Forest Department somewhat to task for its comparative neglect of the commercial possibilities of the timbers of the great forest reserves of India, and his remarks called down on him strong protests from Forest officers. Perusing this excellent Manual of Colonial timbers produced at the suggestion of an Indian Engineer, it occurs to us that the Forest Department of India might do worse than follow the lead.—*In the Indian and Eastern Engineer.*

In our review of Mr. Maiden's notes on the Commercial Timbers of New South Wales (*vide* page 98 of volume XXXI), we have already drawn attention to the necessity which exists for the preparation of such a hand-book.—HON. ED.

MISCELLANEA.

IRELAND AND ITS PROSPECTS.

For how many years will Ireland be in a position to contribute an appreciable quantity of timber to the markets of Great Britain? This is a question which has been for some time troubling

the minds of native timber merchants in that country, and it is highly probable that some drastic changes will take place in the near future to regulate and economise Irish timber resources. It is a pitiful sight for anyone interested in this question as they travel up and down Ireland to observe the vast tracks of land absolutely denuded of timber, and which are yielding but a bare hand-to-mouth existence for a few gaunt-eyed, destitute peasants, when it is remembered that this country is, without doubt, from an expert point of view, the finest in Europe for the production of good timber under a scientific system of afforestation.

But that spirit of gloomy fatalism which has brooded over the Irish nation has communicated itself to the soil. It is only here and there that any attempt, even the crudest, at forestry is to be found. If trees have sprung up, either from seed or suckers, as they do in a most prolific manner, and do not happen to be in the way they are left to grow at haphazard without attention, and as a direct result of this policy of *laissez-faire*, the timber exported is crooked, overgrown, and knotty, and this has undoubtedly given the impression that widely exists amongst English consumers that Irish timber is of such an inferior quality that no good timber is produced. On the contrary, where timber has been grown under favourable conditions, whether provided by Nature or by direct cultivation, and whether it be hardwood or coniferous, it is found on conversion to be unsurpassed in the British Isles.

There have been other contributory causes to the want of systematic forestry, and these are :—

Firstly, a prevalent ignorance of the value of timber. The writer in his experience in Ireland has come across cases where some of the best of timber has been felled and cut up into short lengths for firewood, owing to a deplorable lack of the necessary knowledge of value, even when it would have been possible to have obtained a comparatively good price from saw-mills a little distance down the country.

Secondly, the absence of large land-owners from the country. Their estates have been left in the hands of agents, payable by a

commission, who have, naturally, been more energetic collecting rents than improving property. This means, in most of these cases, a minimum expenditure, and that any proposal to lay out money in plantations would be vetoed immediately.

Thirdly, the distance and excessive freight from the nearest extensive market, which is either England or Scotland, and meaning therefore that the first cost must be extremely low to permit of competition. The diminishing population and the dearth of industries in Ireland seriously curtail the home market, and what limited consumption may occur in this direction is easily supplied from existing resources without necessitating any effort to increase them. The low prices which have been paid for timber for export have held out no inducement to land-owners to plant for future requirements, particularly when fairly good rents are obtainable from tenant farmers, for even very poor land, for grazing.

It should always be remembered when speaking of forestry in Ireland that, in direct contrast to England, no large manufacturing industries have yet arisen to oust agricultural pursuits from the pre-eminent position, but that the farmer is still the most important member of the community, and that any other interest must take a secondary place. Hence the inclination to afforest land is neither so urgent nor so well developed as across the Channel.

This superficial analysis of the conditions under which timber has been produced in Ireland may give those whose acquaintance with this subject is limited, a useful key to the solution of the question, which is propounded at the commencement of this article, and which we will now proceed to investigate a little closer.

Most of our readers will remember the devastating gale which swept across Ireland at the end of February 1903. An unparallelled amount of damage was wrought to standing timber, all the finest trees in many districts being either blown down or irreparably injured. The direct consequence of the storm was a plethora of Irish timber on the English market for at least two years afterwards. Many English merchants went over to Ireland,

and large quantities of timber were exported, being purchased from the owners at merely nominal prices. This has very seriously affected what was, even previously, a very limited supply, and has at the same time, introduced an extended circle of buyers, who are busy making as much as they can out of what remains.

The new Land Act, which has recently come into operation, is also a serious menace to Irish timber supplies. The old landlords may have conserved various woods on certain parts of their estates, but whenever a tenant own comes into possession he at once flies to the timber to raise a certain proportion of the purchase money, and at the same time he concludes that he is removing an obstruction from the ground, which he firmly believes is retarding the productive possibilities of his land, and he has of course, no idea of replanting.

Should this kind of thing go on unchecked, it means a speedy exhaustion of Irish-grown timber—an undesirable result, which would be attained within a very few years.

From an economical standpoint, the exportation of Irish timber in the round is radically wrong for many reasons, as far as Ireland herself is concerned. A much greater interest in forestry and the timber trade would make itself felt if more of the timber were converted and manufactured in the country. It would mean the retention of more money, the employment of more labour, and a more economical consumption of timber, for which comparatively more profitable prices would be obtained in the export market, on account of the freight being unhampered by the dead weight of waste.

But even by increasing the manufacture of timber on or near the growing site, we remain still face to face with the inevitable consequence of a diminishing supply without any effort towards replenishment. It means merely postponing the death of the native timber industry for a year or two.

With the disappearance of the old landowning class, to many of whom flourishing woods were things of beauty, or formed at least cover for their game, and who were naturally the people to look to for the development of afforestation schemes, and the

acquirement of the land by the present tenantry, to whom some department of farming constitutes the sole object of living, what prospects can exist for the creation and improvement of woodlands, so as to firmly establish and encourage a permanently profitable industry in Ireland? The only ray of hope which feebly struggles to enlighten the situation remains in the hands of the Government under the new Land Act. A hair of the dog that bites is the only cure. The Crown should either make it conditional, when advancing the purchase-money, that existing woodlands should be put in proper order under expert guidance, and should be reserved for the production of timber, or it should acquire, by the power it enjoys under that Act, some of the present large waste tracts, suitable for the purpose, and establish State forests. This would vastly increase, after a certain number of years, the internal wealth of the country, and would constitute a timber reserve for the markets of Great Britain, which will be badly wanted.

The Irish lowlands are admirably adapted for willow culture, and the uplands are capable of yielding fine heavy oak, and beech timber of unequalled toughness and hardness. The timber that will be very scarce in England after a few years is good ash of prime quality. Where this is grown in Ireland under favourable conditions, there is no ash in the world which can beat it. Ash will grow anywhere in that country, even on stone walls or on the roofs of houses, and if it were properly cultivated on a drained soil, it would be remarkably tough and clean. As for coniferous timbers, these would pay very well when delivered to the West Coast ports of Great Britain.

THE SCARCITY OF ASH.

The following letter, signed "J. S.," appeared recently in the London *Field*:—

At a meeting of the Institute of Carriage Builders it was declared that the trade was at no distant date likely to be crippled, owing to the scarcity of home-grown ash timber, on which the trade mainly depended. There are signs that the statement is true,

and I would advise owners who have ash of any dimensions, from rails to mature trees, to keep it, unless they can get the top price for it. Like other kinds of home-grown timber, ash appears to be too often thrown at purchasers at prices much lower than should be got for it, and the nominal prices recorded at sales, whether private or by auction, are, I believe, often fictitious. The value is given away in the measure through ignorance or otherwise. The timber merchant never leaves a stick of ash in the wood that will make a tool handle or a rake tooth ; but he gets it all, as a rule, for the price of the trunk, and gives no great price for that, unless the vendor is careful. Timber merchants are now storing ash. Some wood yards are heaped with it, and much of it has lain in the yard for one or two years, if not longer. What occurs to one is, how can timber merchants allow capital of this kind to lie idle so long, unless they get the timber at a very low price. The other day I saw, what I see often, a yard heaped high with the best English oak and ash, so high that a lofty crane was needed to lift the trees on to the top of the heaps when they arrived from the wood. How long some of the oak may have lain one could only guess from its appearance, but I should say two or three years at least. Of course, oak will keep a good while without injury, but ash will not keep so long exposed in the open air, and the buyer who can afford to risk large quantities in that way must get bargains somewhere. In the yard referred to, in a quiet country town, close to the railway wharf, there were, I calculated roughly, a thousand ash trees of all sizes, from poles of 10 cubic feet to trees of 80 feet, and worth from 1*s.* 4*d.* to 2*s.* per foot in the wood. Many of the trees were black at their ends, on some the bark was rotten, and at the base of some of the heaps nettles and other weeds were growing up between and over the trees, showing that they had not been disturbed for may be a year, and probably much longer. In another case, a timber merchant at a sale was heard to say that he did not care whether he got a certain lot of timber or not, as he had about 100,000 feet standing or lying in different parts of three adjoining counties.

PROTECTION OF WOOD AGAINST WHITE ANTS (TERMITES).

All timbers, with the exception of a few of the more expensive kinds, are subject to the depredations of white ants, whilst so far no treatment for the protection of wood against these pests has been commercially successful.

Creosote and other mineral oils have been tried, but they are not lasting, only partially impregnate the wood, and cannot be used for indoor work. Various chemicals have also been employed, but, in general, these are inefficient and too costly. The method introduced, however, by the Powell Wood Process Syndicate appears to effectually overcome these objections. This process consists in first boiling the wood in a saccharine solution, which expels the latent air. In the subsequent cooling the solution is absorbed by the tissues, with the result that the wood is strengthened and improved in quality. It is afterwards artificially dried, and the ordinary process is then complete, the wood being thoroughly seasoned.

In order to render wood proof against the attacks of white ants, it is only necessary to combine with the saccharine solution certain substances obnoxious to these insects, which substances are absorbed by the wood along with the saccharine solution. The extra expense is thus confined to the bare cost of the materials added, which is very small.

Samples treated in this manner were sent out to India by the above syndicate, whose offices are in Temple Bar House, E. C., and satisfactory reports regarding the same have recently been received. The importance of this to everyone concerned in the preservation of wood against these pests must be obvious.

The application of this treatment will now permit of the more extended use of wood in tropical countries for all purposes, and may lead, in many cases, to the substitution of ordinary timber for the more expensive hard woods.

INDIAN FOREST PROBATIONERS AT OXFORD.—The following is a list of the probationers for the Indian Forest Service and the Soudan nominated in 1905 with the Colleges to which they are attached :—C. W. Armstrong, scholar of Jesus College, Oxford ; G. C. Clarence, Magdalen College, Oxford ; C. G. E. Dawkins, Balliol

College, Oxford ; C. C. Gaunt, Exhibitioner of St. Johns, College, Oxford ; H. S. Gibson, Trinity College, Oxford ; H. M. Glover, Mathematical demy of Magdalen College, Oxford ; J. Gunn, Edinburgh University, now at St. John's College, Oxford ; J. K. Hepburn, Queen's College, Oxford ; N. W. Jolly, Adelaide University, now at Balliol College, Oxford (Rhodes scholar) ; W. A. H. Miller, St. John's College, Oxford ; A. J. W. Milroy, Christ Church, Oxford ; A. A. F. Minchin, Exeter College, Oxford ; R. L. Robinson, Adelaide University, now at Magdalen College, Oxford (Rhodes scholar); E. A. Smythies, Christ's College, Cambridge, and Balliol College, Oxford ; and G. C. Wilson, Queen's College, Oxford.

PROHIBITED IMPORT OF ANIMALS INTO VICTORIA, AUSTRALIA.—An Order-in-Council has been issued in the State of Victoria under the Health Act, 1890, prohibiting the introduction into the State, on and after the 1st January 1906, of any of the animals mentioned below from any place outside the Commonwealth of Australia, New Zealand, or the United Kingdom of Great Britain and Ireland, except such as may be introduced for the Zoological Gardens :—

Bull	Calf	Mare	Stallion	Ram	Lamb	Deer
Cow	Bison	Gelding	Ass	Ewe	Pig	Antelope
Ox	Buffalo	Foal	Mule	Wether	Camel	Goat

Any person offending against this order is liable to a penalty not exceeding fifty pounds.

THE MANUFACTURE OF PAPER FROM WOOD-PULP IN BURMA.—Mr. R. W. Sindall, an expert from Home, has been, since his arrival from Calcutta, engaged in conducting an experimental investigation under Government auspices at the Government timber yard at Ahlone towards the utilisation of native timbers in Burma for the manufacture of paper. Mr. Sindall, in the course of an interview, said that the experiments he is conducting aimed solely at the production of a suitable pulp, as once that was procured its conversion further into paper need not be a subject of experiment, but would proceed upon well known industrial lines. About twelve separate timbers have so far been treated with thoroughness. The report on the experiments is expected to be

ready about the end of February. In the meantime Mr. Sindall declared himself unable to say anything as to the commercial prospects of the experiments.

THE ELMS OF KENSINGTON GARDENS.—Woodmen have been busy recently felling the elm trees in Kensington Gardens, which were stated to be a source of danger to the public. These elms have stood for generations, some dating from improvements carried out in the gardens by Queen Anne and Queen Caroline. They have also a quaint association with fairy lore, for, according to the old legend, King Oberon held his Court in the gardens, and his daughter Kenna gave her name to the town and gardens.

UTILISATION OF TREE STUMPS IN MINNESOTA.—According to a report from the German Consul at St. Paul, Minnesota, a new industry is now being developed in the north of that State. The stumps of fir trees, which have hitherto been unused and commercially valueless, are now distilled, and turpentine and tar and tar oil obtained therefrom. The charcoal left behind is not so heavy as that obtained from hard wood, but it is of good quality and finds a ready market. Although the new industry is still in its infancy, about 30 barrels of turpentine, 50 barrrels of tar, 30 barrels of tar oil, and several cart-loads of charcoal are shipped each month. At present four retorts are in operation, each of which takes about 20 cubic yards of wood stumps. The process in the retort occupies about five days, and the procedure is such that the turpentine obtained differs considerably in odour from that of the ordinary turpentine of trade. At first this circumstance prevented its sale, but experiments with the new product have shown that it is of good quality and is as useable as the qualities at present sold. In view of the immense quantities of wood stumps which exist, it is expected that the new industry will become of considerable importance to the State.

TREE DENUDATION IN PERSIA.—Persia is, next to Arabia, the most treeless country in Asia, and fuel is one of the costliest items. A recent report states that the frontier forests are being absolutely cleared on the Persian side, whereas on the Russian side efforts are being made to extend them.

Chaubattia bungalow with the Snows beyond, N.-W. Himalayas.

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THE UNITED STATES FOREST SERVICE.

We publish elsewhere the Secretary of Agriculture's report on forest progress in the United States. The report is of such high interest and the praise of the value of the work of the Forest Service so unstinted that we feel no apology is needed for printing the note in full.

The United States Forest Service actually came into existence as an administrative organisation on the 1st February 1905, the care of the whole of the National Reserves being then transferred to its charge. Every thing affecting the reserves is now determined or executed by men of expert knowledge, familiar with local conditions. Especial attention is drawn by the Secretary to the fact that the entire force has become a part of the classified Civil Service. In this fact alone we see the full realisation by the Americans of the real part played by the forest in the economy of the State in that the very existence and well-being of the community depends entirely upon the maintenance of a certain area under forest and upon the proper management by

experts of the lands, whether State or privately-owned, so maintained.

Commenting upon the urgent need of forestry in his country the Secretary points out that a time had arrived which presented at once an opportunity and a crisis. Forest destruction had reached a point at which a not distant end was perceivable. There were few who believed that the conflicting interests could be reconciled during the lives of the present generation. "That the whole situation is profoundly altered is directly and chiefly due to the work of the Forest Service." High praise indeed, from the Secretary responsible for the Department. Dealing with the financial aspects the Secretary states that a far more complete control (over the forests) is exercised than formerly, yet the net cost to Government of all the work of the Service will be less for the present year than that of the Bureau of Forestry alone before the transfer. A property worth in cash not less than $250,000,000 is administered at a cost of less than one-third of 1 per cent of its value, while increase in that value of not less than 10 per cent per annum is taking place. As the use of the reserves increases the cost of administration must, of course, become greater also, but receipts will certainly rise much more rapidly. The forest reserves are certain not only to become self-supporting but a source of large public revenue.

The Sister Service in India offers a hearty welcome to its young cousin in the New World and its sincerest congratulations on the unstinted praise accorded to its work in the Secretary's first report.

FOREST MUSEUMS

II.—THE GASS FOREST MUSEUM.

In our last issue the question of the creation of Provincial Forest Museums was discussed and the great usefulness of such, both to Local Governments and their departmental officers, pointed out. We drew attention to an excellent institution of this nature, the Gass Forest Museum at Coimbatore, Madras, whose inception and creation was due to the initiative of Mr. Gass, Conservator of Forests, Southern Circle.

We propose here to shortly describe* the arrangement of this Museum in the hope that the notes will prove of use to others wishing to follow in the path so well marked out.

The Museum was commenced in 1901, when Mr. Gass began the collection of specimens of timber and other forest produce and set apart one of the large rooms of the Conservator's office for the purposes of a Museum. At this period he intended to limit the collections to the Southern Circle. Specimens began to arrive in February 1902, and their numbers increased rapidly. During a portion of this year Mr. R. D. Richmond, Assistant Conservator of Forests, was placed in charge of the arrangement of the specimens under the direct supervision of Mr. Gass. In April H. E. the Governor Lord Ampthill visited the Museum and recorded his warm appreciation of the departure. Since His Excellency's visit the collections have been open to the public daily. It was soon seen that it would be an advantage to throw open the Museum to the whole Presidency and the articles now exhibited come from the three Circles. Owing to the great increase in the number of specimens received it was found necessary to add a room from the District Forest Office adjoining the Conservator's Office, thus doubling the available space. This arrangement has not, however, proved satisfactory, and Government, recognising the importance of the institution, have now sanctioned a new building expressly for Museum purposes; this building is now in process of erection, and when finished the 3,000 specimens collected will be transferred to it.

Turning to the arrangement of the collections, Series I consists of 314 specimens of timber, bamboos, &c., the chief timbers being shown in sections, panels and blocks. As examples of the longevity of the lives of some species of trees, a specimen of teak presented by the Cochin State is considered to be 455 years of age, a similar section of rosewood from the same State being 410 years. Sections of the teak from the Nilambar plantations are also exhibited. Amongst the items classed under this series (wrongly so we think)

* An able note upon this Museum appeared in the *Madras Mail* of October 5th, 1905.

are the fruits and seeds of forests trees, fibres (81 varieties), gums (40) and resins, and vegetable dies and oils (28). Series II consists of bamboos, canes, reeds, creepers, &c.,—115 specimens in all. The numerous uses to which the bamboo is put by the jungle tribes are shown here. Series III deals with injury to growth, specimens of timber affected by forest fires, insects, and parasitic growths. Series IV Geological specimens (no mention is made as to whether the various kinds of soils of the Presidency are shown) and Series V Entomological specimens follow, the latter naturally very incomplete at present. Birds and birds' eggs would appear to be also included here, and the series would perhaps be better entitled (together with the next Series VI which exhibits 139 specimens of skins and skulls) Zoological specimens. Series VII is devoted to a collection of weapons and implements used by jungle tribes, whilst the next series (VIII) contains 24 kinds of snares and traps used by the hill tribes for taking game. Series IX exhibits ornaments worn by the hill tribes and X a small collection of their musical instruments. Series XI is probably one of the most interesting to the visitor. It consists of 70 models illustrative of forests operations, boats in use on the rivers, forest bungalows, &c. For example, a model shows the wire rope way at Mount Stuart, others an elephant pit, kraal with a captured elephant and an elephant tamed and at work dragging timber. Other models show coppicing operations. Series XII is a collection of portraits and pictures of forest scenes. Lastly, Series XIII consists of minor items which cannot be included under other heads, such as honey, wax, rubber. These, we think, would have been more in place had they been classified with the gums and resins and oils as "minor produce."

It has not been our purpose here to in any way criticise this excellent institution but rather to hold it up as an ideal to be followed in other Provinces. As experience is gained a more elaborate and minute system of classification of the objects exhibited will doubtless be evolved. Meanwhile we are of opinion that the existence of the Gass Forest Museum places the officers of the department in Madras in a position to be envied by their confréres in other Provinces of India.

SCIENTIFIC PAPERS.

CHICKRASSIA TABULARIS.

BY M. RAMA RAO.

In Hooker's "Flora of British India," and in Brandis' "Forest Flora of North-West and Central India," the capsule of this tree is described as 3-celled. When I was stationed in the Salem District I examined the capsules of this species on more than one occasion and in different localities, and found them to be generally 4-celled, with only a few 3 or 5-celled capsules. In other respects, the description of the species given in Hooker's Flora agreed with the specimens examined by me. I should be extremely interested to hear whether the information in the above-quoted works is based on an examination of a large series of capsules of this species collected in different localities. Otherwise it would appear that the floras require alteration on this head.

As regards the size of this tree none of the Floras consulted by me, nor Gamble's Manual, give any idea of the dimensions attained by this species, beyond saying that it is a large tree. I happened to see a few splendid specimens on the Yelagiris preserved in temple porambokes. The largest of them girthed 18 feet at breast height with a straight and clean bole of about 45 feet to the first branch. It was quite healthy, sound and vigorous. The Yelagiri *Malayalies* call it *Sellangatchi*, while on the Melagiris of the same district, it is called *Gantumali*.

It occurs on all hill ranges of the Salem District above 2,500 feet. Reckless fellings in the past have left but few specimens of large size, which are chiefly confined to temple groves, religiously protected by the hill tribes.

ORIGINAL ARTICLES.

THE DISTRIBUTION OF THE FOREST FLORA OF THE BOMBAY PRESIDENCY AND SIND.

BY W. A. TALBOT, ESQ., CONSERVATOR OF FORESTS, BOMBAY.

II.

EVERGREEN TROPICAL FORESTS.

The evergreen primeval forests of the Indian Western Peninsula extend over many square miles of North Kanara, and in the southern talukas of this district, Kumta, Sirsi, Siddapur and Honawar are continuous towards the west. In favourable situations further north, on the Supa and the Yellapur ghats and in the western part of Belgaum, they occur in isolated blocks or areas (locally called Kans or Rais) which are surrounded by dry deciduous and deciducus and evergreen mixed forests of various kinds of cultivation. Outside the limits of these districts some of the ghat region in the Satara Collectorate is clothed with tropical evergreens. The flora, however, of this class becomes less varied and the number of different species diminishes, as we go further north. South of Bombay, outside the Presidency limits (Travancore, etc.), these forests become more perfect with a greater admixture of Malayan elements. The most distinctive character of this evergreen hygrophilous compared with the xerophilous Deccan and the intermediate mixed forests is the presence of Anonaceæ, Guttiferæ, Dipterocarpeæ, Myristiceæ, Palms, Malayan types of Sterculiaceæ, Laurineæ, Euphorbiaceæ, Urticaceæ and other orders not found in the latter.

In a tropical evergreen forest, growing under favourable conditions we find four storeys of vegetation. Immediately covering the soil are seedlings mixed with shrubs and herbaceous species and in the next zone or storey small or medium sized evergreen trees 50—75 feet high. The top canopy of great evergreens, often 150 feet above the ground is crowned by giant, sometimes deciduous trees, of which Tetrameles nudiflora is one of the most common

and remarkable. The tree stems are in many instances covered with epiphytic Utricularias, Orchids, Aroids and Ferns (Drynaria quercifolia, etc.).

In North Kanara where the evergreen tropical Kans are contiguous to or surrounded by mixed deciduous forest the divergence between the classes of vegetation is very striking. There is considerable physical relief in passing abruptly from the strong glaring sunlight of the open deciduous jungle in the hot season to the cooler atmosphere and deep, somewhat gloomy shade, of the lofty evergreens. The bewildering diversity, height and size of the trees, the universal green and general absence of colour, the great climbers with fantastic shaped stems, the epithytic orchids, aroids and ferns, the general stillness and apparent absence of animal life, appeal to the naturalist, who is satisfied that here at least the action of man has not affected and changed the original flora of these truly primeval forests. The principal forces of nature are in constant action, and there is no annual period of rest, corresponding to the winter in temperate and arctic regions or the hot seasons in the dry tropics. On the shady, moist, well covered soil, the growth is continuous and the struggle for existence amongst the many species in the zones of vegetation is very great. The principal causes preventing the predominence of any one genus or species over more than a limited area are to be found in the very favourable conditions in which this strongly differentiated and extremely rich flora is placed. Many of the species are rare and confined to special localities. For example, Pinanga Dicksonii is locally abundant only on the Gersoppa and Nilkund ghats of North Kanara. Alsodeia zeylanica, Erythropalum populifolium, Apodytes Beddomei, Solenocarpus indicus, and several other plants have each been collected but once and may not be again met with for a long time in these evergreens. It is very difficult to correctly identify on the spot many of the high trees growing in the Kans. The rapid and continuous growth produces generally a thin, smooth, greyish bark with scarcely any rhytidome. The great height of many of the stems prevents examination of their foliage, the flowers are also often inconspicuous and

appear at different seasons of the year. These together with the diversity of the species, makes a satisfactory interpretation of the flora almost impossible. In the smaller less varied and more open deciduous forests such examination is not attended with similar difficulties. It is of common occurrence to see a tall tree in full bloom in the evergreens and to be unable to procure specimens of the flowers, except by felling or sending up a native climber, both usually very tedious operations. Much of the evergreen region of North Kanara is somewhat difficult of access, as the dense undergrowth often bars the way of the observer. The forest pathways are also usually bounded by monotonous walls of verdure, without the relieving colour of conspicuous flowers. However the five or six zig-zag ghat roads from the Kanara uplands down to the coast afford excellent opportunities for observing this interesting and varied flora. The tropical evergreen forests covered a much greater area formerly in the Sirsi and Siddapur talukas of North Kanara than they do in the present day. The supari palm (Areca catechu) cultivation has destroyed thousands of acres of fine forest and has laid waste a considerable extent of valuable territory, and this denudation is continually going on as the areca nut palm plantations require for leaf manure an area of forest six to nine times as great as the extent of the actual plantations themselves. There is also the cutting of what is termed "wet or ground betta" required for this cultivation which involves the destruction of the undergrowth mostly outside the allotments for dry "betta" (tree loppings) made to the garden owners. Evergreens in all stages of decay may be observed, and when these disappear, the gardens in their immediate vicinity naturally follow. The wasteful management of the North Kanara betta assignments and destruction of the Kans has been strongly opposed by the Forest Department for many years. The supari garden cultivation principally affects the tropical evergreens which disappear sooner or later under the destructive treatment, and the Haigas often hasten the complete destruction of the tree vegetation by burning the more or less denuded area of their "bettas" for cattle grazing purposes. As long as there is jungle in the vicinity of their

gardens these people pay little attention to the requirements of future generations. There is another forest destroying agency at work in the Bombay Presidency, namely, Kumri cultivation. Patches of forest, evergreen or deciduous, usually on the slopes or tops of hills are felled and the timber burnt; fortunately the evergreen tropical forests were formerly avoided by the Kumri wallahs, as the labour of felling the high timber was too great. The burnt surface is rudely tilled and sown with Eleusine corocana (ragi) and if allowed the same area is re-kumried the following year, when the place is abandoned and a new wooded area selected. These patches of re-kumried forests require many years, probably centuries, before they are reconstituted. Thousands of acres of bare hill tops are conspicuous evidence of the effect of this destructive cultivation in the Honawar, Kumta and Ankola talukas of North Kanara. Many of these ancient kumries are now covered with colonies of Stobilanthes (S. callosus, etc.). Usually where the soil is of fair quality and evergreens and deciduous forests are contiguous the once destroyed evergreen flora is replaced in the course of time by a growth of deciduous species. I do not think, however, that the foregoing destructive agencies have as great or far-reaching effect on the constitution of the evergreen forest flora as the annual forest fires and continual goat browsing have on the deciduous forests of the dry districts.

The abandoned bettas and kumri lands in the course of time, if left to themselves, are gradually recovered with forests. The surrounding usually varied flora and a heavy rainfall are conditions favourable to the reconstitution of the denuded area, and although the process may take a very long time it is certain in the end. On the other hand, the Deccan forests, under the unfavourable conditions of a scanty rainfall and with the destructive annual fires which traverse such large areas, have little chance of recovery. The flora of this region becomes poorer and poorer in the number and size of the constituent ligneus species, until ultimately little or no tree vegetation remains.

The Bombay tropical evergreens cover a comparatively small area when compared with those of the Malay Peninsula and

Burma and do not contain nearly so rich a flora. For example, taking four characteristic Malayan natural orders the number of species in each flora is as follows :—

1. Guttiferæ	...	M. ...	... 66
		B. ...	... 20
		N. Kan. ...	... 11
2. Myristiceæ	...	M. ...	... 47
		B. ...	... 9
		N. Kan. ...	... 4
3. Palmeæ	...	M. ...	... 142
		B. ...	... 53
		N. Kan. ...	... 8
4. Anacardiaceæ	...	M. ...	... 67
		B. ...	... 35
		N. Kan. ...	... 8

A very large proportion of the genera of Malayan origin in North Kanara contain only one species each, and if there are several as, for example, in Myristica and Amoora, these are well differentiated and distinct, which points to an ancient origin. There are nearly 600 species of trees, shrubs and climbers in the North Kanara evergreens, and three hundred and twenty species of woody plants are found in the deciduous mixed intermediate forests and those of the dry Deccan plains. Some of these deciduous species, however, extend into the evergreen zone of vegetation, but the evergreens themselves are not found away from the influence of the heavy rainfall along the ghats. The ten predominant ligneus orders in the North Kanara "Tropical Evergreens" are Euphorbiaceæ, Urticaceæ, Leguminosæ, Laurineæ, Rubiaceæ, Guttiferæ, Dipterocarpeæ, Acanthaceæ, Meliaceæ and Anonaceæ. It is very difficult to place these families in order of predominance, as the species of this evergreen flora are combined in endless variety. For example in the Telgiri Kan near Yellapur (area about 200 acres in extent) in Kanara, predominant amongst the undergrowth are herbaceous Vernonias, (V. divergens, and V. indica), Gomphandra axillaris, Rauwolfia serpentina, Justicia wynaadensis, Rubia quadrifolia, Memecylon

Talbotianum, Costus speciosus, Mappia fœtida, Leea sambucina, and seedlings of Cinnamomum and Caryota urens. In the small tree zone Flacourtia montana, Spondias acuminata, Diospyros sylvatica, Litsæa Stocksii, Callicarpa lanata, and strangely enough Pajanelia Rheedii (usually found along river banks and nearly always a rare tree) are common. The ubiquitous and characteristic Caryota urens, Artocarpus Lacoocha, Myristica corticosa and M. malabarica are also abundant in this zone of growth. More than half the large trees forming the top canopy belong to Diospyros microphylla and Polyalthia coffeoides, Dysoxylum glandulosum, Ficus nervosa, F. callosa and Mimusops Elengi are also numerous. In this Kan there are no giant buttressed deciduous species overtopping the evergreens, except a few large and tall stems of Alstonia scholaris. The more common climbers are Gnetum scandens (stems two feet in diameter), Entada scandens and Cansjera Rheedii. Piper trichostachyon, P. Hookeri, the epiphytic narrow leafed Hoya retusa, several species of orchids principally species of Dendrobium, Aroids, Remusatia vivipara, Raphidophora pertusa, and the ferns, Niphobolus adnascens, Vittaria elongata, Pleopeltis membranacea, Adiantum caudatum, etc., are abundant on the tree stems. About a mile away towards the west there is another Kan with a quite different arrangement of species. One of the predominant shrubs in the undergrowth there is Psychotria Dalzellii, which grows gregariously almost like a species of Strobilanthes. The small trees are mostly Actinodaphne Hookeri, Cinnamomum zeylanicum, Murraya exotica, Litseæ zeylanica, Caryota urens, and Melia dubia. Chickrassia tabularis (Lal devdari) trees are common and of large dimensions in the highest canopy. I had 250 of these latter marked for felling in this "evergreen" in 1886. Nearer Yellapur we find another arrangement in one of the Mundgod road Kans. Here the undergrowth contains Ixora nigricans, Lasianthus sessilis, Chasalia curviflora, Glycosmis pentaphylla, ferns and seedlings of the trees growing in upper zones of vegetation. In the lower small tree zone Aporosa Lindleyana is very abundant and supplies the rafters (Suli nulli) used by the villagers. Atalantia racemosa, Memecylon edule, and Ficus asperrima are also prevailing

species. The large trees consist of Mangifera indica, Vitex altissima (common), Ficus callosa, Eugenia hemispherica, Antiaris toxicaria and others. Two of the principal climbers in this Kan are Embelia robusta and Ventilago Madraspatana. A few miles from Yellapur, due west towards the Arbail ghat under a heavier rainfall (150 inches annually), the phytographical constitution of the evergreen forests changes, the soil is often stony with sometimes tracts of high level laterite. Strobilanthes callosus, S. Heyneanus, S. lupulinus, S. barbatus and Cæsalpinia mimosoides are common and gregarious over considerable areas of the undergrowth. This type changes into hill forests along the Arbail ghat.

There are considerable stretches of forest with few large stems, often a dense growth of small trees with one or more predominant species. Aporosa Lindleyana, Atalantia racemosa, Olea dioica, Nothopegia Colebrookiana, Mallotus albus, Linociera malabarica, Celtis tetrandra, Cleidion javanicum, Harpullia cupanoides, Glochidion Hohenackeri, Mappia oblonga mixed with Cedrela Toona, Sterculia guttata and Holigarna Grahamii, Grewia umbellifera, Beaumontia Jerdoniana and Anodendron paniculatum are prevailing climbers. Crotalaria fulva and Breynia rhamnoides are common bushy shrubs in open situations, and Melastoma malabathricum and Mussaenda frondosa, are usually to be found near streams and in moist places. On the southern ghats in North Kanara from Devimane on the Kumpta-Sircy road to the falls of Gersoppa, the Malayan element of the tropical evergreen forests becomes stronger and more varied and there is a preponderance of Myristicas, Dipterocarpeæ and great trees of Malayan origin. Many species not at all found or rare in the northern part of the district become quite common. On the Gersoppa ghat large Calophyllum tomentosum, (Poon spar), cylindrical stems with their peculiar characteristic yellowish bark are conspicuous and sometimes associated with groups of a slender dwarf palm, the graceful endemic Pinanga Dicksonii. Myristica magnifica, with its wonderful aerial roots, the immense buttresses of Tetrameles nudiflora, the great trunks of the purple fruited Antiaris toxicaria, the handsome flowers and tubercled stony fruit of Elæocarpus tuberculatus, the hanging orange coloured inflated

fruit of Harpullia cupanoides, the thorny scaly climbing scandent Calamus Thwaitesii and the short thick stemmed palm, Arenga Wightii, all combine to give a distint aspect to the rich flora of this locality. The peculiar grasses, Panicum pilipes, Centotheka lappacea, and Ischœmum semisagittatum are abundant in the herbaceous undergrowth. On the Dodmani ghat further south the most abundant and striking tree is Diospyros crumenata, (hitherto only noted in the Ceylon forests), the great cylindrical trunks of which dwarf the more moderate sized stems of Ailantus malabarica, Mesua ferrea, Artocarpus Lakoocha, Myristicas, Garcinia Cambogia, Diospyros pruriens, D. sylvatica, D. assimilis, Clausena Willdenovii, Sageræa laurina, Chrysophyllum Roxburghii, etc. For several miles near the top of this ghat there appears to be areas covered with Eugenia macrosepala, formerly described as a small shrub but in this locality a small gregarious tree, sometimes mixed with the almost equally common Travancore Lansium anamallayanum and Memecylon Wightii. I found also here and only here the rare climber Erythropalum populifolium, and the still rarer Apodytes Beddomei, a small tree discovered long ago by Colonel Beddome in Travancore.

Near the Gersoppa waterfall, on both sides of the river above the great gorge, the forests contain many wood oil trees (Dipterocarpus turbinatus) with smooth bark and huge cylindrical stems. The pathways and roads are covered in places with their winged fruits during May and June. Elæocarpus serratus, Pygeum Wightianum, Holigarna Grahamii, Nephelium Longana, large trees of Symplocos Beddomei, Pterospermum Heyneanum, and P. acerifolium are a few of the more abundant and common large or moderate sized species. Amongst the smaller trees and shrubs Glochidion Hohenackeri, Cleistanthus malabaricus, Alstonia venenatus, Bragantia Wallichii, Hemicyclia venusta, Dimorphocalyx Lawianus, Blachia denudata, Mallotus albus, Debregeasia velutina, Cleidion javanicum, Boehmeria malabarica, Unona pannosa, Chailletia gelonioides with its peculiar red arillate fruit, Euonymus indicus, Croton Gibsonianus, Psychotria flavida and P. canarensis are some of the principal. The beautiful and ornamental flowered

Thunbergia mysorensis, Anodendron paniculatum, Chonemorpha macrophylla, Ellertonia Rheedii, Dalbergia rubiginosa, D. tamarindifolia, Derris platyptera, Parsonsia spiralis, Mezoneuron cucullatum, Calamus pseudo-tenuis, C. Thwaitesii, Salacia oblonga, Gouania microcarpa and Aeschynanthus Perrottetii are conspicuous climbers and epiphytes. In the deep shade of the undergrowth are five species of Begonia, (B. integrifolia, B. crenata, B. concanensis, B. trichocarpa, B. malabarica), Piper subpeltatum, Ixora polyantha and a host of other herbaceous species, Carex brunnea, Scleria elata, Gleichenia linearis, Campteria biaruta, Blechnum orientale, Thamnopteris Nidus, Vernonia divergens, Blumeas, and Crotalaria triquetra are found covering directly the deep, moist vegetable mould. These tropical evergreens situated along the crests of the ghats harbour a sparse population, chiefly Haigas and their dependents. The local demand for timber is consequently limited and is met by generously administered forest permit rules. The best known timbers are yielded by Vitex altissima, Calophyllum tomentosum (Poon spar), Artocarpus hirsuta, Shorea Talura, Dysoxylum glandulosum, Chickrassia tabularis, Cedrela Toona, Eugenia utilis, and Diospyros assimilis (ebony), the latter mostly of small size. Principally owing to difficulties of transport and want of accommodation for travellers this region has been rarely visited by botanists.

(*To be continued.*)

BRUSHWOOD BURNING IN THE CHANGA MANGA PLANTATION.

BY ATMA RAM, EXTRA ASSISTANT CONSERVATOR.

This operation is done annually in the coupe of the year. After the fellings are over at the end of March the brushwood, comprising small branches and twigs of the trees felled, is cleared off 40 feet from the firewood stacks and 5 feet round the standards and thrown inside the coupe compartments and set fire to, under the supervision of the Divisional and Range Officers. This clearing of the brushwood from the sites of the stacks and round the standards generally takes about three weeks. The firing is done and finished in the last week of April. As soon as this operation is completed

in any one compartment water (the plantation is an irrigated one) is let in to soak the ground for retrenching and refreshing the stools and standards. The retrenching in the burnt compartments is commenced and finished in May, the proper irrigation following the retrenching. Blanks caused by excess burning or already existing are sown direct with sissu seed. The irrigation and sowings are generally finished by the end of June. Then tending follows. In August-September the improvement of the coppice is carried out, noxious grasses, weeds and shrubs being cut down, and the mulberry, the formidable enemy of sissu, is cut back where suppressing the sissu coppice. This is the briefest account of the brushwood burning in the coupes. But the question naturally arises whether the process is based on sylvicultural reasons or others more weighty. I would invite opinions upon the following contrast :—

Reasons for burning brushwood :—

(1) There is no sale of the faggot wood; people will not remove it even gratis.

(2) (*a*) The brushwood hinders retrenching and consequently irrigation.

(*b*) The trenching out facilitates the growth of root-suckers.

(3) Checks, suppresses, or interferes with the growth of coppice shoots coming under or in contact with it.

(4) Interferes with the sowing operations in blanks.

(5) Renders difficult the improvement work of the coppice.

(6) Tends to restock the area by artificial means by reason of clearing the ground.

Reasons against burning brushwood :—

(1) (*a*) Deprives the soil of its natural manure; artificial manuring is never done and cannot be done in such extensive areas; the soil becomes too poor in the second rotation to produce strong shoots.

(*b*) The soil gets burnt to a considerable depth along with its useful elements of organic and inorganic matters.

(2) (*a*) Retrenching is not very necessary, irrigation being done by flushing the ground. It can best be done by making narrow "bands" along the width of the compartments at convenient lengths according to the level of the ground.

(7) Harbours certain species of insects injurious to forest growth.

These bands can always serve as irrigation levels in the compartments.

(6) Root-suckers always appear when the vigour of the parent stools dies through fire, though they are much helped by digging the soil in trenches; but it is not advisable to make the forest too dense to produce thick wood which is here required.

(3) Though the brushwood may interfere with coppice shoots for some time, if the irrigation is successful it must soon decay and they would get over any damage done.

The large amount of money which is spent in burning and retrenching can best be utilised, in part, in disengaging the coppice shoots where interfered with by brushwood.

(4) The already existing blanks must show themselves when coppice shoots appear, and they can be restocked in convenient rpaces by planting out.

(5) The cutting back of mulberry, noxious weeds and shrubs suppressing the sissu will be rather a difficult task, but it is only a matter of money which can be saved under burning and trenching, and utilised here, in part, in addition to the original item. The rate per acre of improvement work may be doubled.

(6) The aim has been to fully stock the area without taking steps to thin out afterwards; the result has been the production of thin wood and consequently loss in money return. It may be advantageous if trees grow at convenient distances to produce thick wood and to dispense with the necessity of thinnings which are surely required in thick coppice forest.

As the demand for sissu and mulberry timber is growing, there is no reason why good thick stems should not be produced; the forest should never be allowed to become too dense so as to avoid the severe natural struggle for existence. It has an advantage of cleaning the boles but never of producing thick strong stems.

(7) If faggot wood lying on the ground results in attacks of insect pests, the fire causes death or severe injury to valuable trees and stools and ultimately gives growth to various species of fungi.

Chaubattia Forest Rest House, N. W. Himalayas.

This is how it happens. The huge fire burnt in the compartments penetrates the soil more or less according to the amount of brushwood lying on it and sends up flames high or low accordingly. The penetration causes death or severe injury to many a stool and the flames affect the standards according to the degree of their nearness to the fire. Many a stool comes into direct contact with the fire and gets cooked or baked. With the irrigation the fungi begin to grow on the dying or dead roots of the injured stools and trees, the spores having been brought by water or wind. The most common of them are the hard flowered fungus and the white-blight mycelium.* The former appearing at the base and the latter at the stem and thus developing spread spores all round. No amount of grubbing out of the affected roots or stems can extirpate them. Besides the above reasons there are several more against the burning, such as—(8) Cost of burning ; (9) cost of retrenching ; (10) injury to some of the valuable standards unavoidable ; (11) injury to some valuable young stools ; (12) growth of fungi on the injured or dying stock ; (13) loss of beneficial moisture ; (14) luxuriant growth of weeds ; (15) loss of some game birds.

TYPES OF FOREST REST-HOUSES IN INDIA.

BY THE HONORARY EDITOR.

We have been greatly struck during tours through India on the great disparity which exists both in the type and in the varying degree of comfort of the buildings erected by the Department as rest-houses for the controlling staff for use during the extensive touring forest work entails. Whilst fully recognising the fact that the nature of the building erected must depend to a great extent on the climate it has to contend with and on the materials available, it is at the same time an almost universal rule that the worse the climate the staff has to withstand the poorer the accommodation provided for it. The Local Administration of the United Provinces, although their Forest Officers enjoy a comparatively equable and cool climate, have

* Specimens of these fungi have been sent to Dr. Butler, who will, we trust shortly give us an account of them.—Hon. Ed.

taken the lead in this matter; they have thoroughly recognised the cardinal principle that on the state of a man's health will depend the quality of his work and that shattered health in their senior officers saps the very life from a Service. With a view to obtaining an amelioration in the type of bungalows or rest-houses existing in other Provinces, we would ask our readers to forward photographs depicting the present types of rest-house in use in their circles with notes on their advantages or disadvantages.

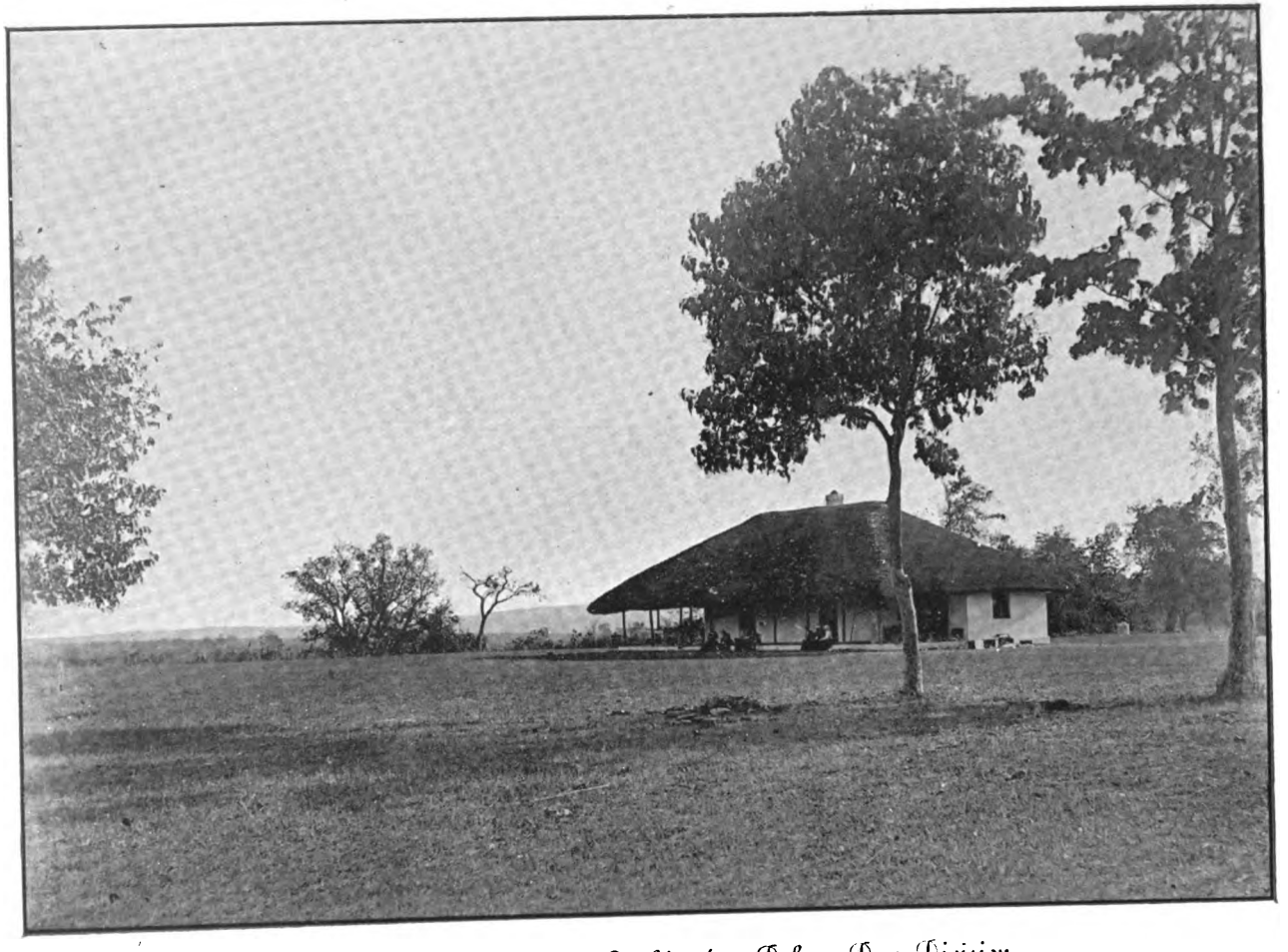
We reproduce in this number examples of types of forest rest-houses representative of those commonly found in the divisions of the United Provinces. Our acknowledgments are due to Mr. R. C. Milward, I.F.S., for the excellence of the photographs depicted.

We are indebted to Mr. Hobart-Hampden, Director, Imperial Forest School, for the following information on the bungalows we have chosen for illustration.

The rest-house shown in Plates V and VI is Chaubattia standing at something like 7,000 feet up in the N. W. Himalayas, looking over the Ranikhet Chir (*Pinus longifolia*) forest away to the snows, with the Tresul right in front—a grand view. Around it is the famous Chaubattia fruit garden planted by Government with the object of inducing the people of Kumaun to grow orchards of European fruit which is very well adapted to these hills. The house is of stone and mud mortar, lime pointed and has an iron-sheeting roof. There are three rooms besides bath-room, godown, &c.

Plate VII depicts the Lachiwala rest-house situated in the Dun eleven miles from Dehra and in the vicinity of several different working circles and a plantation of Bambusa burmanica. This plantation, just as it had become valuable and was beginning to demonstrate how superior this bamboo is to the indigenous Dendrocalamus strictus, was clean cut back like so much of the forest by the phenomenal frost of 1905. It is, however, already recovering.

The bungalow has a good plinth, *kutcha-pacca* walls, thatch roof and fire-places in the rooms. There are three of the latter



Forest Rest House at Lachiwala, Dehra Dun Division.

with dressing-rooms, bath-rooms, and godown. This bungalow is a good sample of many of the Dun rest-houses.

In Plate IX is shown the Dudwa forest rest-house situated in the centre of the Kheri Division in Oudh. It is in the middle of fine sal forest and from it no less than seven lines or roads (two of which branch almost immediately) radiate through the heart of the forest. The house is of brick with tiled roof and tile or brick floors and sal beams. This type of bungalow was invented by Captain Wood when Conservator in Oudh and was called class I. In this pattern there are two high upstairs rooms with a verandah running all round, whilst downstairs there are two ordinary rooms, two long dressing-rooms, two bath-rooms and one godown. The staircase is of brick and there are small verandahs in front and behind. Dudwa has, we understand, been rendered more useful by adding another room and bath-room upstairs, with some further additions below. These houses are extremely *pacca*, but the downstairs rooms are a trifle too low.

A CURE FOR WHITE LEPROSY.

BY K. BANERJEE.

Psoralea corylifolia, Linn. (*Babehi, babachi, bukchi, &c.*), is an herbaceous weed, the seed of which is said to be used for scenting hair oil and for other minor purposes.

But the most important use of it—a cure for leucoderma (white leprosy)—has been made mention of by several authors, but without the exact process of preparation being given.

The late Dr. Kanai Lall in his "Indigenous Drugs of India" strongly recommended the oleoresinous extract of the seed for leucoderma, but the authors of the Pharmacographia Indica state that only negative results were obtained in later experiments with it.

I believe Dr. Kanai Lall to have been correct in his recommendation so far as the seed of *Psoralea corylifolia* was concerned, but only the adjuncts and processes of preparation were wanting.

I was told of a well-tried and infallible cure for this disease known to the members of a noble family in Bengal. It is said that the recipe of the remedy was originally obtained from a hermit or *sanyashi* by some one of that family.

I cannot understand what prevented them from making it known to the public for the good of the unfortunate victims to this dreadful disease.

I am glad to say that after all I have been successful in getting the exact process of its preparation, the want of which, I believe, has up to date stood in the way of successful experiments. Now I wish it to be made known to the public for verification and appreciation of its merit.

The seed of *Psoralea corylifolia* is the principal ingredient of the remedy, and the process of preparation is as given below in full :—

The seed is first powdered finely and thereafter the powder is pasted in cow-urine, sometimes in combination with a few fresh leaves of *Eclipta alba*—(Vern. names *mochkand*, *bhangra*, *babri* (Hind.), *kesuti*, *keysuria*, &c., (Beng.)—a herbaceous weed of the Natural Order Compositæ. Admixture of water is to be strictly avoided. In order to avoid any mixture of impurity and dust the cow-urine should be caught, when being passed, in a stone or glass pot (never in a metallic one)

The paste thus prepared should be applied thinly over the white patch twice or thrice a day. The paste sticks very firmly to the patch, and should be applied one layer over another until the accumulated layers of paste come off of themselves taking with them a thin layer of skin from the diseased part.

The application of the paste is to be continued as before, and the occasional peeling off of the accumulated layer of paste together with a thin layer of skin should be allowed. Gradually some very small and scattered spots, other than pure white in colour, will be visible, and the application of the medicine having been continued regularly, the said small and scattered spots will almost imperceptibly develop and ultimately turn the whole white patch into the natural colour of the skin.

It is said that leucoderma of the purest white type takes a longer period to cure than the reddish one. The patient should take good and nourishing diet.

CORRESPONDENCE.

TO THE HONORARY EDITOR OF THE INDIAN FORESTER.

"SPIKE" DISEASE AMONG SANDAL TREES.

SIR,—In an article headed "Forest Administration in Mysore" which has been reprinted from the *Madras Mail* in the *Indian Agriculturist* of October 2nd, 1905, I find the following paragraph:—"There are some interesting facts in the report about the sandal 'spike' disease. No less than 23,360 trees in the Mysore District and 673 trees in Hassan had to be uprooted; whilst in a few small patches where the major part of trees were 'spiked' and in dense lantana thickets no uprooting was carried out. Dr. Butler and Mr. Barber made some interesting experiments to test the contagion of the disease; 151 healthy trees were budded with diseased buds, 20 trees were budded with buds from practically 'spiked' trees, 20 more had diseased wood bound on to branches of which the wood was specially exposed in order to receive the virus, and 10 more had roots from diseased trees placed in contact with their roots. But in not a single case did the disease spread by this means to the sound trees. The Conservator says that the disease is really met with in localities where the vegetation associated with sandal is healthy and vigorous; and this seems to support the theory that 'spike' depends on the amount of nutrition that sandal derives, not from the soil, but from its hosts in the neighbourhood; and that if the hosts are shorter-lived than sandal, the sandal suffers."

The facts expressed in the above paragraph seem to support the views put forward by me in the note on "Spike Disease among Sandal Trees" published in the *Indian Forester* of February 1904.

I now write to enquire of Forest Officers in Mysore through your columns whether the suggestion made in paras. 9 and 10 of my note have been considered ; and, if so, with what result. As Inga dulcis is a very fast grower and a favourite host of the sandal, and one too that would grow very well in almost every part of the Mysore Province, I would suggest its being extensively introduced in some of the sandal tracts where the "spike" prevails.

CAMP GIDDALORE: M. RAMA RAO.
30th November 1905.

MEMORIAL TO THE LATE HERBERT SLADE.

SIR,—I enclose copy of a letter I am sending to friends of the late H. Slade. As there will be some friends in India who are not known to me I shall be obliged if you can insert the letter in your next issue so as to give publicity to it.

RANGOON: Yours truly,
18th December 1905. W. P. OKEDEN.

DEAR SIR,—I have been asked by many of the friends of the late H. Slade what Memorial is to be erected to him in Burma. After careful consideration and consultation with the relatives in England, I have decided that the Memorial shall be a Fern and Orchid House to be erected in the new garden of the Agri-Horticultural Society about to be established at Maymyo. Miss Slade has written to me asking me to convey to all friends the family's deep appreciation of the kind wish to perpetuate their brother's memory and she informs me that she will send out the brother's collection of books (15 volumes) on Orchids, etc., to be kept for the use of the Maymyo Garden.

Subscriptions to the above Memorial limited to Rs. 10 or under per subscriber should be sent to the undersigned.

The Committee of the Maymyo Garden will be asked to arrange for the erection and care of the House and the books and any surplus subscriptions will be applied in such manner as that Committee may think suitable.

Miss Slade informs me that she will arrange for a tombstone to be erected over the grave at Akyab.

Yours faithfully,

W. P. OKEDEN,

Administrator of the Estate of H. Slade.

RANGOON:
18*th November* 1905.

CREEPERS AND CATERPILLARS.

SIR,—Under this title Mr. Trafford asks in the January number (p. 28) for an explanation as to why sal trees thickly encircled with creepers have only incurred partial defoliation from a plague of caterpillars or have escaped it altogether whilst creeperless trees were completely defoliated. I have not seen specimens of the caterpillars referred to, but they will doubtless be one or more of the species of *Lymantria* or *Leucoma* mentioned, as defoliating Sal trees in Assam and the Bengal Duars, in Departmental Notes on Insects, No. 1, pp. 63—77, 80-81. These larvæ feed more or less gregariously on the trees, and as soon as they have entirely stripped one they descend to the ground and ascend a neighbouring one. Now in a forest where some of the trees are encircled by large creepers the caterpillars will naturally seek for trees without such impediments to their upward march and therefore creeperless trees will suffer the heaviest defoliation. A caterpillar coming to a heavily-creepered tree would commence its ascent, but finding that the foliage around it was not that in which it was in search of would weary of the ascent or instinct would tell him that there were more easily ascended trees close by. Only in cases of very heavy caterpillar plagues would heavily-creepered trees suffer complete defoliation, and in such cases it will be found that as food becomes scarcer and scarcer the caterpillars will be driven to feed even upon the leaves of the creepers themselves.

E. P. STEBBING.

REVIEWS AND TRANSLATIONS.

SUITABILITY OF NEW SOUTH WALES' TIMBERS FOR RAILWAY CONSTRUCTION.

In reviewing, in our last number, the Report of the Forestry Branch of New South Wales for 1904-05, we alluded to the fact that that Government had recently had drawn up a note on the suitability of the New South Wales' Timbers for railway construction. This note was specially prepared for the information of the Government of India who had deputed an officer of the Public Works Department, Mr. Adam, to make enquiries into the subject.

The note commences by dealing with the Timber resources of the country. Some of the finest belts of forest on the Continent, occur between the Main Dividing Range and the Pacific. Among hardwoods the commercial timbers include three varieties of Iron-bark, Tallowwood, Black-butt from stringy barks, Grey Box, Sydney Blue Gum, Woolly-butt, Turpentine and Brush Box, Grey Gum, Spotted Gum, Forest Red Gum, and Red and White Mahogany. Among conifers, the Moreton Bay and Brown Pines ; while among the brush timbers and woods of fine grain are Red Cedar, Rosewood, Red-bean, Black-bean, Birch, Silky Oak, Beefwood, Onionwood, Blackwood, Native Teak, Coachwood, Sassafras, Tulipwood and many others. West of the Range where the table-land sinks down to undulating country and vast plains, through which the tributaries of the Murray make their way, the vegetation changes to scrub and open forests, consisting of eucalypts such as Murray Red Gum along the water-courses with several varieties of Box, and Iron-bark and Cypress Pine. The area containing timbers of commercial value is roughly estimated at 20,000,000 acres or about 10 per cent of the area of the State. The proportion of this wooded area within the coastal districts (where the rainfall is greatest), *i.e.*, about three-fifths, includes the greatest variety and the most valuable of the State's resources. Up to the year 1904 7,503,200 acres of the total

forest area had been examined and reserved from sale for the conservation and perpetuation of the timber supply.

As regards export of timber the amount is comparatively insignificant at present, the principal trade so far being with New Zealand in railway sleepers and Iron-bark for bridge construction, and in Iron-bark, Tallowwood and Turpentine for harbour works. In addition to this, consignments of Black-butt, Tallowwood and Red Mahogany for paving blocks, and Iron-bark for sleepers, Black-butt and Tallowwood for railway carriage building have been sent to the United Kingdom; hardwood timber for paving, and Rosewood for furniture manufacture to Germany; Iron-bark Blue and Grey Gum and Turpentine sleepers to South Africa; and small quantities of hardwoods for paving and other purposes have been sent to the United States of America, Fiji and elsewhere. There is also a considerable export to adjoining States. In 1903 the total value of export in rough timber comprised 19,000,000 odd superficial feet, but the trade is a growing one, and promises in time to assume important proportions. The following figures show the value and growth of export of domestic timber during the past ten years:—1895, £45,029; 1896, £46,830; 1897, £59,786; 1898, £76,941; 1899, £102,218; 1900, £99,349; 1901, £143,549; 1902, £124,235; 1903, £163,258; 1904, £158,846.

The note goes on to say that apart from ordinary building construction in which local timber is largely used, timber for public works may be classed under three main heads:—Bridge and jetty material, railway material, including sleepers and timber for rolling stock, and telegraph poles. Australian woods, it is said, have within recent years come into use for finer classes of work such as railway carriages, coach-building, wainscotting and parquetry.

The State itself possesses large tracts of Iron-bark which it uses largely itself for piles, trams, girders and transoms of bridges, on account of its strength and durability, and Tallowwood, Grey and Red Gum, Black-butt, Sydney Blue Gum and stringy bark for decking and light scantling, Turpentine and Iron-bark being used for jetty and pier work. The average life of these timbers naturally varies a great deal, being dependent on situation and climate, but

40 years is recorded for Iron-bark bridge timber, and there are instances on record where Turpentine piles were found perfectly sound after standing in salt water for 30—40 years. Experiments have also shown that this wood can resist the attacks of marine borers (Teredo).*

With reference to sleepers it is stated that sleepers cut from the most durable of the Australian hardwoods last much longer in the track than the timbers commonly used for this purpose in Europe and North America, even when the latter have been injected with antiseptic substances such as creosote, sulphate of copper, chloride of zinc or mercury and milk of lime. Even Oak thus treated is only said to last from 19·5 to 25 years in the track whereas Iron-bark is said to last 25 years in the track in New South Wales. Naturally such comparisons are not of very high value where India is concerned since the climatic conditions are so different and vary so tremendously in different parts of the country.

For rolling stock the States use Iron-bark and Tallowwood for under-framing. Of other timbers Black-butt comes next. Other timbers such as Sydney Blue Gum and Spotted Gum, &c., are found to twist and warp unless well seasoned.

The note continues with a short description of all the timbers mentioned in the opening paragraph, their uses and amount available being shortly commented upon. Some short reports on experiments made on strength and elasticity of the various timbers follow with a short note upon Government export timber property marks and Forest Working Laws. Three handsome plates illustrate the report which is terse, compact and well written for the purpose in view. We reviewed in this Journal last year† a small handbook on the Commercial Timbers of New South Wales and pointed out how useful such a work would prove to India and the great necessity that existed of such a one being drawn up. The necessity exists as strong as ever, but in addition to such a handbook we require

* *Vide* note on the "Ravages of Shipworms on Australian Hardwoods" and plate in Vol. XXXI, pp. 106, 107 of this Journal.

† *Ibid*, p. 97.

shorter, more concise ones for use in India by special Departments, *e.g.*—

One on Indian timbers	suitable for	Railway Construction.
Do.	do.	Roads and Buildings Construction.
Do.	do.	Canal and Irrigation Works.
Do.	do.	Telegraph Department.

Here in India we are not concerned to any considerable extent with the increase of the exports of the timber out of the country. The Continent is so immense and the demand for timber increasing so largely that what is required of the Department is endeavours to supply it to the utmost stretch of its capabilities. To do this we must be able to lay our wares, *i.e.*, place our timbers, with no uncertain voice before the departments who will employ them. Before this can be done we must list our commercial timbers and divide them into the various groups required, which can only be done after testing their strength, durability, &c., in a properly equipped testing laboratory; such requires to be set up, for the Department does not possess it and has depended too long on getting the work done here, there and nowhere with absolutely negative, in fact dangerously injurious, results.

With the issue of our commercial handbooks we feel sure that in many cases it will be no longer necessary for sister departments to go elsewhere for a large amount of the wood they require.

FOREST SURVEYS IN INDIA, 1903-04.

On the 1st April 1904, the Forest Surveys ceased to exist as an independent unit being amalgamated and formed into a Branch of the Survey of India. The Forest Survey Branch is now, therefore, under the direct superintendence of the Superintendent of Forest Surveys, acting under the direction of the Surveyor-General in India.

The cost of all Forest Surveys with the exception of special works, such as boundary surveys and the surveys of plantations on

a particularly large scale, is now uniformly distributed in the proportion of 30 per cent to topographical surveys and 70 per cent to the Forest Department. The cost of all first editions of forest maps drawn in connection with current field surveys is distributed in the same proportion, while that of second and subsequent editions and of special maps is borne by the Forest Department. The annual programmes from the Bengal Presidency are submitted for approval to the Inspector-General of Forests; those of Bombay and Madras to their Governments. The combined programme for the whole of India is then submitted to the Surveyor-General who, in consultation with the Inspector-General of Forests, includes it in the general programme of the Survey of India for the year which is submitted annually to the Government of India. Minor Forest Surveys are, as heretofore, conducted by the Local Forest Officers.

The period covered by the report under review is the Survey year ending 30th September 1904.

The following statement shows the progress of Forest Surveys and will, we think, be found of considerable interest.

Detail survey on 4-inch scale and larger scales of Forest Reserves on 30th September 1904 (approximate areas in square miles).

Province.	Circle.	Previously surveyed	Surveyed during the year.	Total surveyed up to 1903-04.	Balance surveyed.	Total area of reserved and protected forests as per form 46.	Remarks.
		sq. m.	sq. m.	sq. m.	sq. m.	sq. m.	
Bengal ...	Bengal ...	1,681	310	1,991	7,590	9,581	
United Provinces of Agra and Oudh.	Central Circle ...	1,908	36	1,944	4	1,948	
	School Circle ..	799	...	799	70	869	
	Oudh Circle ..	1,234	...	1,234	58	1,292	
	Total ...	3,941	36	3,977	132	4,109	
Punjab ..	Punjab	3,030	209	3,239	4,127	7,366	
	Jubbal-Tarhoch ...	170	...	170		...	
North West Frontier.	North-West Frontier	185	...	185	49	234	
Central Provinces.	Northern Circle ...	9,246	2	9,248	...	9,248	
	Southern Circle ...	9,204	...	9,204	573	9,485	
	Berar Circle ...	145	...	145	3,796	3,941	
	Total ...	18,595	2	18,597	4,369	22,674	

Province.	Circle.	Previously surveyed.	Surveyed during the year.	Total surveyed up to 1903-04.	Balance surveyed.	Total area of reserved and protected forests as per form 46.	Remarks.
		sq. m.	sq. m.	sq. m.	sq. m.	sq. m.	
Burma	Northern Circle ...	944	577	1,521	3,263	4,784	
	Southern Circle ...	2,746	414	3,160	2,162	5,322	
	Tenasserim Circle ...	2,749	...	2,749	2,512	5,261	
	Pegu Circle ...	3,292	117	3,415	1,256	4,671	
	Total ...	9,737	1,108	10,845	9,193	20,038	
Assam ...	Assam ...	658	160	818	2,960	3,778	
Ajmer-Merwara.	Ajmer-Merwara ...	144	...	144	4	148	
Madras ...	Northern Circle ...	2,841	526	3,367	3,452	6,819	
	Southern Circle ...	3,692	277	3,909	1,506	5,475	
	Central Circle ...	5,295	...	5,295	1,970	7,265	
	Total ...	11,828	803	12,631	6,928	(a) 19 559	(a) Includes reserved lands.
Bombay ...	Northern Circle ...	1,996	76	2,072	247	2,310	
	Southern Circle ...	4,789		4,789	274	5,063	
	Central Circle ...	2,852	658	3,510	2,848	6,358	
	Sindh Circle ...	...	...	...	1,066	1,066	
	Total ...	9,637	734	10,371	4,435	14,806	
	Grand Total ...	59,606	3,362	62,968	39,787	1,02,293	

The report states, however, that it is not contemplated to survey all the forest area shown as unsurveyed on the 4-inch scale, as the value of many of the forests does not justify the expenditure, and existing 1-inch maps will probably in many cases suffice for all present purposes. With the present establishment, forest surveys throughout India will probably be completed in about six years. This estimate may, however, have to be modified according to future requirements of the Forest Department.

We are not in a position to read fully between the lines of the above paragraph, but we trust it does not mean that the work of the Forest Surveys will cease before every acre of reserve forest has been properly laid down by them on the map. We have had experience of divisions where, valuable or not, the boundaries enclosing the reserves were so ill-defined that constant encroachments and litigation were the result which meant that a considerable proportion of the staff in the working season were kept hanging about the Courts, to the detriment of all work and loss of revenue; also the loss of cases owing to the impossibility of producing maps

which any native Magistrate would accept, our experience being that no boundary laid down by a forest officer will be accepted by a native Magistrate.

What the Divisional Forest Officer requires is that the reserves under his charge, whether valuable from a pecuniary point of view or not, shall all be correctly laid down on the map. The knowledge that in any dispute he can go into Court with perfect reliance upon his maps would, in many divisions with which we are acquainted, remove a great load from his mind and enable other important works to be carried out with greater success.

CURRENT LITERATURE.

The first number of the new quarterly publication of the Pusa Research Institute entitled the AGRICULTURAL JOURNAL OF INDIA has recently made its appearance and we would heartily congratulate the Government of India and the Agricultural Officers more especially concerned with its preparation on the initiation of a long-felt want. Agriculture and its improvement is of such great importance to India that it is difficult to realise that the country has had to wait until the 20th century for the subject to be approached in the only way that experience has shown is certain to give a full return for the time and money expended. There are few commercial undertakings now-a-days which can succeed without the aid of the expert and amongst those which certainly cannot do so ranks, pre-eminently, agriculture. The inauguration of a Research Institute, an Agricultural College for the training of future Government employés and, of as great importance, the sons and relations of great landowners, and of research and experiment stations scattered over the Provinces, were notable departures. The corner stone has been put to the work with the appearance of a journal of the nature of the one under consideration. The improvement of agriculture and therefore of the condition of the people and per se of the Government land revenue should henceforth make great steps forward. This number opens with a brief review by Mr. F. G. Sly, Officiating Inspector-General of Agriculture, of the steps taken to improve the methods

of agriculture by the Government of India in the past and then goes on to detail the proposals for the work to be done in the future. Other articles follow by the members of the expert staff of the Department. The columns are open to contributors other than Members of the Research Staff and we note two articles of this nature. The first on Cotton in the United Provinces by Mr. W. H. Moreland, I.C.S., and the second by Mr. C. A. Barber, Government Botanist, Madras, on the Samalkota Sugarcane Farm. The number is illustrated by some excellent plates.

"Forestry in South Africa" is the title of a paper by Mr. D. E. Hutchins, Conservator of Forests, Cape Town, in SCIENCE IN SOUTH AFRICA for August 1905. The article commences with some account of the indigenous and introduced timber trees. In connection with these latter we read that some of the finest timber trees of the Northern Hemisphere (Cluster Pine, Stone Pine, Oak, &c.) have now been under cultivation in South Africa for 200 years and may reasonably be considered to be completely naturalised. A short account is then given of Forestry in Cape Colony. On the subject of recruitment of the staff it is mentioned that owing to the prohibitive cost of the training at Cooper's Hill the last Forest Officer sent from the Cape went to the American Yale Forest School and he has since been joined by another one from Orangia. Owing to the absence of a good Forestry School in England the proposal to start a South African one is under consideration! The brochure then continues with brief notes on Forestry in Natal, Forestry in Orangia (Orange River Colony), Forestry in the Transvaal and Forestry in Rhodesia. The total forest area at present in South Africa is given as 640,902 acres. With the exception of Cape Colony where systematic forestry has been practised for nearly a quarter of a century, forestry in the various South African States dates only from the reconstruction following the war; and it is only in the Transvaal that there is, as yet, any notable forest expenditure.

In the FOREST QUARTERLY (No. 4 of 1905) Mr. A. L. Daniels has an article on the Measurement of Saw Logs and Round Timber, the Editor a note on Increment of Spruce in West Virginia and

Fire Losses. In this latter Mr. B. E. Fernow details the increment put on to small spruce, which had been growing under the shade of old trees which were suddenly killed off by what was probably a bark beetle attack, when exposed to more light. These small trees were of a considerable age—for 6-inch trees were over 80 and 100 years, 8-inch over 150 years old. There was no response to the changed conditions for 8—10 years after the old timber had begun to die. It was found that when the growth did commence the diameter accretion varied from ¾ to 1¼ inch in five-year periods, so that in 25 years a 2-inch tree would have grown into the 5—6 inch class and the latter into 11—12 inch trees, and so on. Mr. H. S. Graves gives an instructive note on the rates of growth of Red Cedar, Red Oak and Chestnut. There is also a note entitled the "Catalpa Craze" in which it is pointed out that the tree does not possess the properties claimed for it, *i.e.*, rapid growth and adaptability to all kinds of soil. It is stated that it is doubtful whether it will ever be really useful for sleepers. Apparently over 100 years ago when the fear of a wood famine was agitating Germans a solution offered was the immediate planting of Catalpa.

Volume XXXII, Part 4 of the RECORDS of the GEOLOGICAL SURVEY of INDIA, contains two appreciative notices of the late H. B. Medlicott and W. T. Blanford, both former Directors of the Survey. We have already noticed the irreparable loss which India has suffered by the death of the latter. C. S. Middlemiss gives a paper entitled a Preliminary Account of the Kangra Earthquake of 4th April 1905. He points out that unlike the 1897 earthquake which commenced in Assam and North Bengal, the starting point of the present one was the Kangra District in the N.-W. Himalaya. Great damage to life and property occurred in the neighbourhood of the Kangra Valley and Dharmsala as also in the hilly tracts of the Mandi State and Kulu; serious damage to Dehra Dun, Mussoorie, Chakrata and other places in the vicinity and slight damage to the large towns of Lahore, Amritsar, Jullundur, Saharanpur, &c. "Outside these points, again, in ever-widening closed curves, the earthquake was felt with continually diminishing

intensity until the limits of its appreciation by the unaided senses coincided roughly with part of an ellipse passing through the following localities:—Quetta, Surat, Ellichpur, False Point and Lakhimpur." After a general account the article deals with the scientific and geological aspects of the shock.

BULLETIN No 38 of the IMPERIAL DEPARTMENT of AGRICULTURE deals with the cultivation and curing of tobacco. It is stated that one of the most promising of the new industries of Jamaica is the cultivation of tobacco. Jamaica cigars and cigarettes are becoming widely known and the culture of tobacco on a large scale is advocated It is said that Jamaica tobacco has never yet been used as a pipe tobacco owing to its thick nature, but it is considered that it would probably do excellently as an ingredient for a mixture

SHIKAR, TRAVEL, AND NATURAL HISTORY NOTES.

ON THE OCCURRENCE OF ELEPHAS ANTIQUUS (NAMADICUS) IN THE GODAVARI ALLUVIUM.

The following are extracts from an important paper by Mr. G. E. Pilgrim, B. Sc., of the Geological Survey, upon the discovery of a skull of *Elephas antiquus* (*Namadicus*) in the Godavari alluvium which appeared in the Records.

In February of last year, Mr. H. F. G. Beale, of the Public Works Department, informed the Geological Survey of the discovery of fossil bones at Nandur Madmeshwar (Lat. 20° 1′; Long. 74° 11′) which I was at once deputed to excavate. The locality is on the Godavari river and is about eight miles south of Niphad station on the G. I. P. Railway in the Nasik district of the Bombay Presidency.

Great interest must attach to any discovery of fossil bones in the Godavari alluvium, as so few records of such exist. As compared with the alluvial deposits of the Narbada, which flows in a contrary direction, and enters the sea on the west coast of India, our knowledge of those of the Godavari is very limited, both as regards the fossil contents, and even as to the nature, thickness and

superficial extent of the alluvium itself. It may not therefore be out of place to touch upon these points in the course of this paper as tending to throw some light upon the origin both of the Godavari and of the Narbada deposits.

That the fossil fauna of the Godavari beds is no less rich than that of other Indian river deposits is proved by the reports we have in the past of exceptionally large "finds" of bones in them. In but few cases, however, has any trouble been taken to preserve the bones or turn the discovery to scientific account. At some time during the fifties, an elephant skull was found in the Godavari valley. No account of the discovery seems to have been published, and, so far as I know, the only authentic record of it is contained in a manuscript note by the late General Twemlow, the original discoverer. To this Dr. W. T. Blanford had access when he wrote his note on the Godavari gravels.* He considers that it is the same as that referred to by Dr. Falconer in a paper read before the Geological Society of London,† when he mentioned the occurrence of *Elephas namadicus* "in richly fossiliferous fluviatile deposits of Southern India." Major-General Twemlow also seems to have been under the impression that the skull in question was examined and named by Dr. Falconer. We may therefore conclude that this Godavari elephant was identified by Falconer as *Elephas namadicus*, Falc. and Cautl. It was obtained near Paitan, a town on the Upper Godavari, south of Aurangabad (19°45′; 75°30′), on the left bank of the river, and had been washed out of a calcareous conglomerate, of which the bank consisted. The skull was sent to Sir Philip Egerton in England, but I have no knowledge of what eventually became of it. It appears to have been of immense size, as the tusk is said to have been 29 inches in circumference. The tusk of the animal which forms the subject of the present paper measures 25 inches in circumference at the base.

Since 1867 no collections were made from these interesting deposits until February 1904. I shall therefore proceed to the details relating to this latest fossil find.

* Mem. Geol. Sur. Ind., VI., p. 232.

† Q. J. G. S., XXI, p. 381; Falconer Pal. Mem., II, p. 463.

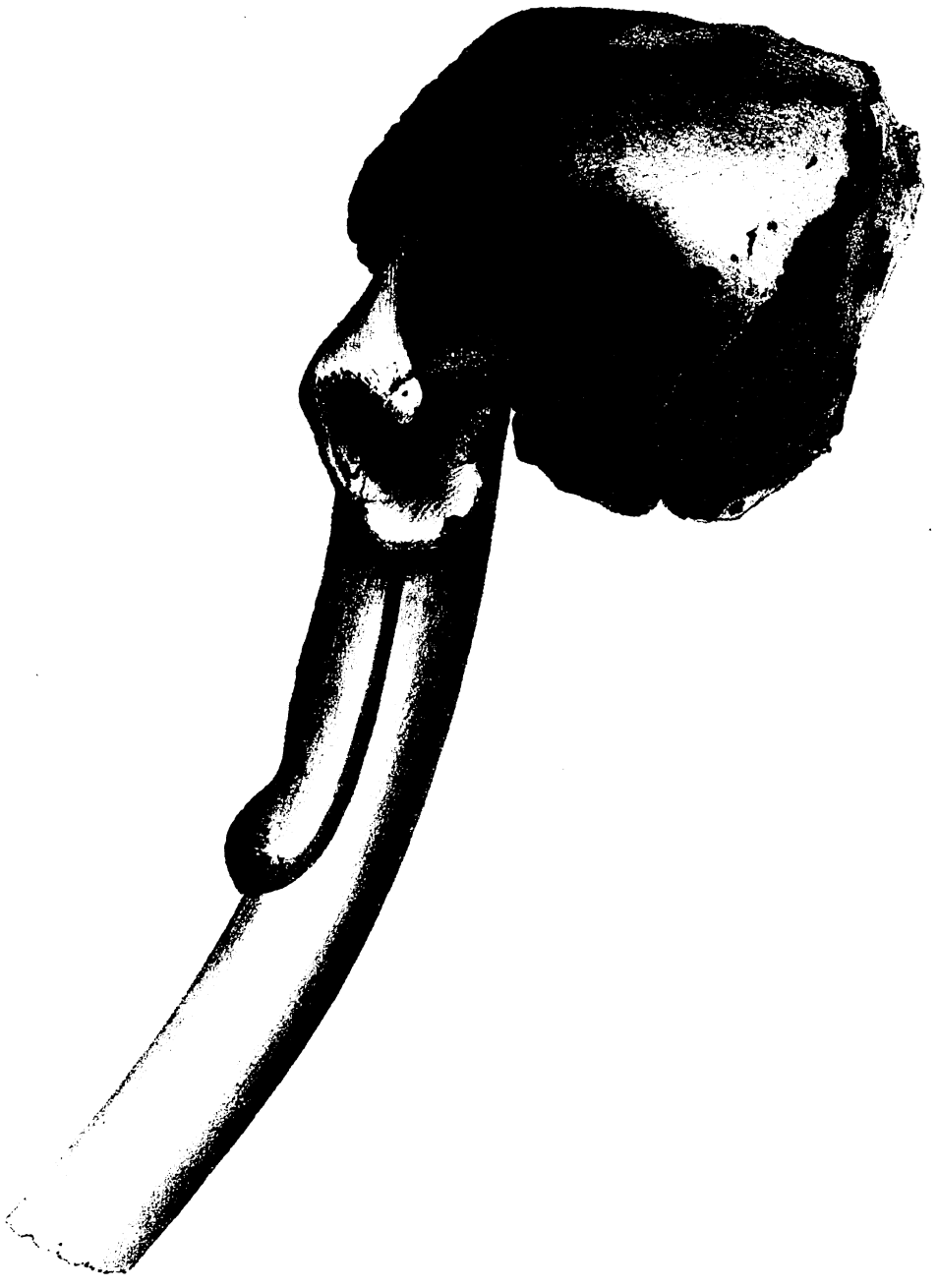
In the area which I was able to examine, most of the alluvial deposit lies on the left bank of the Godavari. The alluvial cliffs rise to a height of about 60 feet above the general level of the river-bed and are highest at a point about one mile further up the river than Nandur Madmeshwar. It was here that I found, embedded in the gravels, in the very channel of the river, a magnificent skull of the ordinary Narbada elephant. These cliffs consist of conglomerates, gravels, and clays quite devoid of any stratification and showing evidences of a continuous period of deposition, marked only by such changes in the character of the deposit as might be expected in the history of most rivers. Calcareous concretions (kankar) were not observed in any portion of the deposit. The river-bed here was perhaps a quarter of a mile wide, but at the time of my visit most of it was entirely dry and the flow was kept up only in two or three channels. The broadest of these occupies the extreme right-hand margin of the river-bed. The falls are not more than 15 feet high, and are entirely of the Deccan Trap. In fact all the rock within sight here is of the same nature, as is also the greater portion of the dry bed of the river. To the right of the river just here there seems to be hardly any trace of alluvium, although lower down, opposite Nandur Madmeshwar, the right bank is alluvial. On the left of the river, however, the alluvial deposit stretches away some distance, but has been deeply carved out into innumerable small gullies showing to what an extent the forces of denudation have been acting. It would seem as if this alluvial deposit were confined to the immediate neighbourhood of the Godavari or of its main tributaries, one of which, the Kadva, I followed from the railway. At various places near its banks the same network of deep channels had been cut out of the soft alluvial gravels, the existence of which I have noted on the Godavari. The smaller tributaries, however, had cut down into the Deccan Trap, and in many cases their sides consisted only of trap and soil arising from disintegration of trap. One is therefore led to the conclusion that the alluvium, though distributed over a wide area and accumulated locally to a considerable thickness, does not persist equally, and, except in the

immediate neighbourhood of the depositing streams, is either superficial or altogether absent. It seems highly probable, however, that the alluvium of the Godavari valley as a whole, even if it be only superficial, is sufficient to merit a recognition on the geological map as distinct as that which has been accorded to the more northern rivers.

Immediately at the foot of the alluvial cliff above mentioned, the river flowed in three small adjacent channels, in one of which were the fossil remains. These channels were separated from one another by a hard, calcareous, gravelly conglomerate, which, next to the bones, had become cemented into a refractory concrete material inseparable from the bone. The skull was almost entirely covered by water about three feet deep. On account of the alteration in the general level of the water being but slight for a considerable distance, it proved difficult to lower it at the required place, while the porous nature of the rock prevented the dams from being very effective. I supplemented the dams, however, by keeping a large gang of coolies continually baling, and in this way I was able to dry the spot sufficiently to extract all the fossil bones embedded there.

Throughout the operations I was much indebted to Mr. A. Hill, C.I.E., Executive Engineer at Nasik, for the assistance and implements which he kindly placed at my disposal.

The position of the animal, as found, was facing upstream The cranium was resting on the vertical portion of its occiput, while the inferior part must have been subjected to the erosive action of the river for several years. Under these circumstances its imperfections are not surprising. A portion of a tusk lay detached a few feet in front of the cranium. Closely cemented to the cranium was the distal end of the femur, the head of the bone having evidently been jammed by some projecting part of the skull. About 4 feet behind the cranium, the pelvic bones were found. Through the kindness of Mr. H. M. Phipson, the Honorary Secretary of the Bombay Natural History Society, the proximal end of the femur and another portion of a tusk have been placed in our possession. Both of these had previously been obtained



Lith^d and Printed at the Geol. Surv. Office, Calcutta

ELEPHAS ANTIQUUS (NAMADICUS)

from the same spot by Mr. Beale and sent by him to Bombay. The whole of the remains are now deposited in the Geological Museum at Calcutta where the skull has been reconstructed and set up. That all of these belonged to a single individual no reasonable doubt can be entertained.

In the gravels near the same spot was found a portion of the lower jaw of a Hippopotamus containing the incisor and canine teeth. This specimen is unfortunately missing,* but there is little doubt that it belonged to the subgenus *Tetraprotodon* and may be assigned to the species *H. palaeindicus*, Falc et Cautl. A single tooth has been identified as that of *Equus namadicus*, Falc. et Cautl. Crocodile teeth were also found, and several shells of Mollusca which are identical with those that exist in the area at the present day.

The cranium and bones, which I am describing, and which represent the species *Elephas antiquus* (*namadicus*) Falc. et Cautl. belonged to an individual of remarkable size. It cannot have stood much less than 16 feet at the shoulder. The cranium, as found, is larger than any hitherto recorded. Individual bones have, however, been found both in India and in Europe, the original owners of which must have attained an equal or even a greater stature. The validity of the name *Elephas antiquus*, as applied to the Narbada elephant, will be referred to later. It will be more convenient to describe first the portions of the animal which the present find has put into our possession.

The cranium.—The cranium either on one or both sides possesses all the essential features of the portion above the maxillaries and the foramen magnum. The occiput on the right side is complete, with the exception of a small region lying between the posterior depression and the vertical boss. On the left side this region is retained, but, on the other hand, the whole occiput external to the left vertical boss is broken away, together with portions of the parietal and frontal

* It was stolen during the night from my collection of specimens at Nandur Madmeshwar, presumably by a villager, and subsequent enquiries failed to elicit any information with regard to it.

and the upper part of the temporal. The foramen magnum and the occipital condyles are missing. The frontal region and nasals are perfect. The incisives are only partially preserved. It will, however, be observed that sufficient of them has been left bordering the nasal fossa, as well as in the distal region, to determine their shape and dimensions. The portions of the temporal fossa below the level of the external auditory meatus are broken away; on the left side the auditory opening cannot be observed, but on the right its position is distinctly indicated. The base of the zygomatic process of the temporal is preserved on the right side, and on both sides the orbit with the supra-orbital and post-orbital processes are well shown. The cranium, like all the bones, was surrounded by a very hard, unyielding calcareous conglomerate in removing which the bones have lost some substance.

The accompanying plate, Plate VIII, exhibits some of the more important characters of the present cranium, and the most casual inspection of it can leave no doubt as to its identity with the crania from the Narbada beds figured by Falconer in the *Antiqua Fauna Sivalensis*, Plates 12A, 12B, Figs. 1—3 and Plate 24A, Figs. 4, 4A, as *Elephas namadicus*. These are the two most complete crania which have been known up to now, and are preserved in the British Museum. One of them has small tusks and probably belonged to an adult female. The tusk sheaths are broken off almost immediately in front of the nasal foramen. The other, that of a young male, has large tusks, and shows also the characteristic divergence of the incisive alveoli. Five other crania exist in the Geological Museum at Calcutta. These are all exceedingly imperfect. Two of them, however, show the supra-orbital ridge, which, until Pohlig's extensive discoveries of *E. melitensis*, Falc. in the Grotto di Pontale von Carini in Sicily* had been considered peculiar to the Indian species, if indeed there were not still some Palæontologists left who favoured Professor Leith Adam's surmise that this peculiar frontal projection was a deformity or a distortion produced by compression after death. The present skull is that of a fully grown male. Plate VIII shows

* Abh. d.k. Bayer. Akad., XVIII, p. 75.

a side view of the skull which is here reproduced through the courtesy and with the permission of Mr. T. H. Holland, F. R. S., Director of the Geological Survey. It appeared as Plate XII in the Records from which these extracts are made.

EXTRACTS FROM OFFICIAL PAPERS.

OBITUARY.

We sincerely regret to have to announce the death on the 14th January last of Mr. C. C. Hatt, Deputy Conservator of Forests. The sad occurrence took place at Rajahatkhowa in Assam, but shortly after his return from leave. Hatt went through his forest education at Cooper's Hill (1889—1891) and joined in Bengal as Assistant Conservator on December 28th, 1891. At Cooper's Hill he was a prominent athlete well known on the football field and was a general favourite amongst his contemporaries. In Bengal he had made a name for himself as a sound officer and had been employed for a considerable number of years on working plans. In 1894-95 he was deputed to the Morbanj State to inspect the forests of the State and draw up a scheme for working them.

His many friends in India will sincerely deplore his loss

REPORT OF THE SECRETARY OF AGRICULTURE ON THE UNITED STATES FOREST SERVICE, 1905.*

During the past year the Government work in forestry entered upon a new phase. Practical work in the actual introduction of forestry began in 1898, but it was not until February 1st, 1905, when the care of the national forest reserves was transferred to

* Reprinted from the Report of the Secretary of Agriculture, Mr. J. Wilson, for 1905 to the President, United States.

the Department of Agriculture, that the Forest Service became an administrative organisation.

This transfer was a logical outcome of the recent work of the Service. During the last six or seven years it has passed through a remarkable development, which has followed, but not kept pace with, the demonstration of capacity for public usefulness. On July 1st, 1898, the Division of Forestry employed eleven persons, of whom six filled clerical or other subordinate positions and five belonged to the scientific staff. Of the latter two were professional foresters. The Division possessed no field equipment; practically all of its work was office work.

At the opening of the present fiscal year the employés of the Forest Service numbered 821, of whom 153 were professional trained foresters. Field work was going on in 27 States and Territories from the Atlantic to the Pacific and from Canada to Mexico. Over 900,000 acres of private forest were under management recommended by the Service and applications on file for advice from owners contemplating management covered 2,000,000 acres more. During the year nearly 62,000 letters were sent out from the offices at Washington, the majority of them in reply to requests for information and advice from the public, of a kind which could not be met by printed information.

This contrast imperfectly indicates the full extent of the change which has taken place and the progress which has been made. Seven years ago there were in the whole United States less than ten professional foresters. Neither a science nor a literature of American forestry was in existence, nor could an education in the subject be obtained in this country. Systematic forestry was in operation on he estate of a single owner, honourably desirous of furnishing an object lesson in an unknown field. Lumbermen and forest owners were sceptical of the success of forest management, and largely hostile to its introduction. Among the public at large a feeling in favour of forest preservation, largely on sentimental grounds, was fairly widespread but almost wholly misinformed. It confounded use with destruction, shade tree planting with forestry.

Photo-Mechl. Dept., Thomason College, Roorkee. Photo. by R. C. Milward.

Forest Rest House at Dudwa, Oudh.

The real need of forestry was urgent. A time had come which presented at once a great opportunity and a dangerous crisis. Forest destruction had reached a point where sagacious men—most of all, sagacious lumbermen—could plainly discern the not distant end. The lumber industry vital to the nation at large was rushing to its own extinction, yet with no avenue of escape apparent until forest management for future crops should be forced by famine prices. Meanwhile, however, the ruin would have been wrought already.

Timber-land owners were selling their holdings or their stumpage with little evidence of an understanding of their future value, and lumbermen were compelled by business to keep down the cost of operations to the lowest terms or market their products at a loss.

Forestry was both an evident economic need and an apparent economic impossibility. Few well-informed persons believed that the obstacles to its introduction could be overcome sufficiently to bring it into common practice among private owners during the lives of the present generation.

That the whole situation is profoundly altered is directly and chiefly due to the work of the Forest Service.

With its offer of practical assistance to forest owners made in the fall of 1898, its field of action shifted from the desk to the woods. The lumberman was met on his own ground. Uncertain speculations were converted into business propositions and untried theories into practical rules. Actual management for purely commercial ends has been taken up and applied on their own holdings by some of the best known lumbermen in the country. What lumbermen as a body now think of forestry is illustrated by the recent effective movement in their National Association to endow a chair of lumbering at one of the forest schools.

Public opinion generally has experienced an equal change, and a sound national sentiment has been created. The great and varied interests dependent upon the forest have been awakened to the urgent need of making provision for the future. States have been led to enact wise laws and enter upon a well-considered forest policy.

Forestry is a matter of immediate interest to every household in the land. Forest destruction is no imaginary danger of a distant future. If it is not speedily checked its effects will sooner or later be felt in every industry and every home. To make these facts known is a national duty. The work o education must continue until public opinion will not tolerate heedless waste or injudicious laws.

Present standing of forestry.

The period which has passed since 1898 has been, in forest work, a period of large definite accomplishments and of effective preparation for the future. Of the exact knowledge concerning our American forests, upon which the practice of scientific forestry depends, vastly more has been gathered during the last seven years than previously from the time Columbus landed. In 1898 the Division of Forestry had hardly approached the specific problems of forest management in the United States, and had developed no efficient methods of attacking them. The records now on file are based on the measurements of millions of individual trees. Commercial tree studies looking toward management have been prosecuted for 32 important species. Working plans have been prepared in 28 States, and field work has been conducted in every State and Territory in the United States, and in Porto Rico, Alaska, and the Philippines.

The scientific knowledge gathered in the field has taken form in a rapidly growing literature of the subject, and has furnished the basis for a system of professional education To-day there is scarcely more occasion for the American to go abroad to study forestry than to study medicine or law.

Besides creating a science of American forestry, the Forest Service has worked out the methods of operation by which forestry may be put in practice. It found in existence a fully developed system of lumbering, which had brought efficiency and economy of labour to the highest point, but was often wasteful of material and regarded forests as simply so much standing timber to be cut. Men taught to regard cheap logs at the mill as

the supreme test and sole end of good lumbering, justly proud of their proficiency in a highly specialised industry, and impatient of restraint, could not be expected to welcome with cordiality changes for a purpose whose utility they were necessarily slow to recognise. To work a reform it was necessary to begin with existing conditions and improve them instead of criticising them. Had not the Forest Service taken the lead in finding out just how practical rules for conservative lumbering might be laid down and carried out forestry could not have reached the point at which it now stands in the United States.

In the field of economic tree-planting the same story is repeated and shows definite, important, and permanent results. It is true that in 1898 farmers throughout the Middle West, where tree-planting finds its largest field of economic usefulness, were already alive to their need of planted timber. But the knowledge of what kinds of trees to plant and how to make them grow was imperfect. These were the fundamental problems: (1) The comparative adaptability of various species to regional and local conditions of climate, soil and moisture; (2) the comparative usefulness of the species which can be made to thrive; (3) the protective benefits of planted timber; and (4) the rate of growth and the future yield which can be expected.

Substantial progress towards the solution of all of these problems has been accomplished. The Forest Service has made in all 300 separate planting plans for private owners, covering an aggregate area of over 50,000 acres in 36 States and Territories. It has completed regional studies of the broad conditions in the New England States, California, Kansas, Nebraska, Iowa, Eastern South Dakota, Western Minnesota, Illinois, Oklahoma, and the Ohio Basin in Ohio, Pennsylvania, and West Virginia. These studies largely supersede the necessity of future individual studies on the ground. It is now in a position to exercise great helpfulness in the whole planting movement throughout the United States. It has established in the minds of Western farmers generally the facts that tree-planting can be made successful and that it adds to the money value of their farms. It has also called attention to the

great hygienic importance of tree-planting on the watersheds; of public water supplies of cities, east and west; has developed practical methods for reforesting denuded mountain slopes and for establishing new forest growth in regions of little rainfall, and has powerfully contributed to the great work of reclaiming desert lands through water conservation and to the whole irrigation movement.

The gain in economy of use.

The Forest Service has in the last seven years added greatly to our visible forest resources. In the saving of waste it has enriched the country by many millions of dollars and in this way alone has added vastly more to the national wealth than its total expenditures for all purposes during its entire history.

Its most important achievements in decreasing the drain upon our forests by providing for their more effective utilisation have been along four lines—determination of the strength of different kinds of timber, studies of methods by which timber may be made more durable, efforts to decrease waste in lumbering, and the discovery and introduction of better methods of gathering forest products other than lumber.

By its timber tests the Forest Service has established the suitability of various little-used but abundant woods especially for structural uses, and has made possible the more economical use of other woods by an exact determination of their strength. By its studies of the effects of seasoning and the value of different methods of preservative treatment, it has opened the way to an enormous reduction in the drain upon our forests for railroad ties. What this demand at present is may be realised when it is considered that if a tree were growing at each end of every railroad tie laid in the track in the whole United States all the timber produced would be needed for renewal alone. In other words, two trees must always be growing in the forests to keep one tie permanently in the track.

By its studies of lumbering methods the Forest Service has shown lumbermen how timber formerly wasted in high stumps

tops, and logs left in the woods could be utilised without added expense. And a not less serious waste of a great resource was cut off when the invention of a new method of turpentining made it possible to eliminate the destruction of our southern forests through boxing the trees, and at the same time to gather a far larger value in turpentine than before.

Forest exploration.

Finally, the Forest Service has rendered a great service by its explorations of forested regions. Useful contributions to the knowledge of our forest resources have been made through specific studies of important regions. Such studies have been completed for New Hampshire, Texas, California, the Southern Appalachians, and are under way for every important timber region of the country. In addition the organised collection of the facts of production for the entire country has lately been begun. In the West, examinations by the Service have been of great value in selecting forest reserves and locating their boundaries. The guiding principle of this policy is, of course, that all land should be put to its best use. This principle the Forest Service has assisted to put into effect by the recommendations as to what lands should not as well as what should be reserved.

Reserve administration by the forest service.

The Forest Service had become fully qualified, by its past work, for the responsibility laid upon it by the transfer of the reserves to its administrative charge. The immediate effect of the change was the opening of the reserves to much wider use than ever before. This is the natural consequence of intrusting the care of these great forests to the only branch of the Government which has the necessary technical knowledge. The inevitable consequence of a lack of such knowledge must be the restriction of right use or the practical certainty of misuse Only under expert control can any property yield its best return to the owner, who in this case is the people of the United States.

Under the system of administration now in force everything effecting the reserves is determined or executed by men of expert knowledge, familiar with local conditions. This entire force has become a part of the classified Civil Service. Timber is cut only under the supervision of trained men in accordance with a plan carefully prepared to safeguard the permanent welfare of the forest; yet the sales of timber have many times increased since the Forest Service took charge. A far more complete control is exercised than formerly, yet the net cost of the Government of all the work of the Service will be less for the present year than that of the Bureau of Forestry alone before the transfer. A property worth in cash not less than $250,000,000 is administered at a cost of less than one-third of 1 per cent of its value, while increase in that value of not less than 10 per cent per annum is taking place. As the use of the reserves increases the cost of administration must, of course, increase also, but receipts will certainly increase much more rapidly. The forest reserves are certain to become not only self-supporting but a source of large public revenue.

Work of the year.

The transfer of the national forest reserves to the care of the Department of Agriculture was effected on February 1st, 1905. The administration of these vast forests fell quietly into its place in the Service, and has since been conducted with steadily advancing efficiency. Every office in the Forest Service is actively concerned in their management, working and planting plans are in preparation and have been prepared for various parts of them, and they are absorbing and will continue to absorb a greater and greater part of the work of the Forest Service.

Forest management.

Public Lands.

On the public lands greater strides were made in the introduction of forest management than ever before. Wherever on the reserves timber is in present demand working plans are being

prepared which will insure the best use of the forests. On the Chippewa Indian Reservation, in Minnesota, the complete success of the plan to secure the perpetuation of the forests is assured. In California, Colorado, Montana, South Dakota, and Wyoming studies of leading commercial trees have provided a basis for the intelligent management of the forests in which these trees hold an important place, including many of the reserve forests.

Private Lands.

The movement to introduce forest management on private lands is spreading rapidly, especially in the Pacific Coast States and the Middle West. Nearly four-fifths of the applicants for co-operative assistance were small owners. The total area for which assistance was asked was nearly 1,500,000 acres. Examinations to determine the practicability of management were made of 22 large timber tracts in 15 States, and detailed working plans were made for 8 large and 81 small tracts, with a total area of almost 2,000,000 acres.

Co-operative working plans for private land have secured for the Forest Service, at very small cost, data of the most important character concerning the leading timber trees and timber regions of the country. The depletion of supply and the dependence of numerous industries upon our hard-wood forests make the need of a knowledge of how to perpetuate the forests urgent. In the Southern Appalachian region and on hard-wood bottom lands of the South Atlantic and Gulf States the studies of previous years have been rounded out, and the Forest Service is now equipped to recommend with confidence practical methods of management for commercial ends.

Forest Extension.

Up to the present year the work in extension found altogether its largest field of usefulness in the preparation of planting plans for farm protection and local timber supply in the scantily timbered regions of the Middle West. It is certain that tree-planting will always hold an important place in farm economy,

but it is more and more becoming possible to supply the needed information for this work from the central office as a result of regional studies. The large projects involved in the establishing or replacing of forests on reserve lands now unforested, and in demonstrating to the consumers of timber that they must provide for their future needs, will probably for the next few years increasingly claim the attention of the Forest Service.

During the year a revision of the terms of co-operative assistance was made to induce wider acceptance by small owners. Up to the present time 380 planting plans have been made, of which 49 were made during the past year.

Reserve planting during the year included the establishment of nurseries in the Santa Barbara and Gila River Reserves, broadcast sowing and field planting on the Black Hills Reserve, and field planting in the San Gabriel and Dismal River Reserves, besides the extension of previously established nurseries. The experiment in broadcast sowing in the Black Hills is especially notable, because the results obtained now appear to be entirely favourable and because success has never before been gained under this method in this country. The significance of this fact lies in the enormous difference in the cost of reforesting by sowing seed on ground not previously prepared and of rearing and transplanting nursery stock for large areas.

Forest-replacement studies were prosecuted during the year in the Wichita, Prescott, Pikes, Santa Barbara, San Gabriel, San Bernardino, San Jacinto, and Sierra Reserves.

By the completion of the co-operative study conducted in the State of California valuable information was secured concerning the relation of chaparral to water conservation and forest renewal and concerning fire-protection.

Forest Products.

Lines of co-operative work now completed have brought definite and important results in introducing preservative treatment as a means of increasing the durability of ties and thereby decreasing the drain upon the forests. The results give good

reason for the belief that tie preservation will shortly become practically universal.

The study of the preservation of telegraph and telephone poles promises further economies of the same kind.

In timber tests, studies of red gum, red fir, western hemlock, and loblolly and long leaf pine have furnished facts which will lead to the wiser use of these species and of structural timber generally. Strength tests of woods for other purposes have been begun, and methods have been prepared for the more extensive prosecution of this very practical work; but the full utilisation of the opportunity presented for public usefulness must wait until the necessary facilities are provided.

Dendrology and Forest Exhibits.

Progress was made during the year in the general study of forest distribution, classification, and composition throughout the United States, especially through regional studies. Previous studies of basket willows and turpentining methods have been continued with further helpful results.

MISCELLANEA.

THE APPOINTMENT OF PROBATIONERS TO THE FOREST SERVICE.

In spite of the complete failure to obtain candidates last year we see from a paper recently issued that the Secretary of State is going to renew the effort to obtain candidates for the Forest Service on the lines described in our issue of July (pp. 361-369) of last year.

We extract the following from the circular in question:

Appointments.—The Secretary of State for India in Council will, in the summer of 1906, make not less than ten appointments of Probationers for the Indian Forest Service, provided that so many candidates are in all respects qualified under the conditions

hereinafter set forth, upon the results of a competitive examination to be held in London on the 28th August 1906, by the Civil Service Commissioners.

Age.—The age-limit is fixed between 18 and 21 years.

Qualifying Examinations.—A candidate must have passed or must undertake to pass before October 1906 (failing which his selection would be cancelled) Responsions at Oxford or the Previous examination at Cambridge or some one of the other examinations held (1) by these Universities, or (2) by the Universities of London or Dublin, or 3) by the Joint Board of Examiners for the Scottish Universities, or the Scotch Education Department, or (4) by the College Entrance Examination Board of the United States of America and recognised by the Universities of Oxford or Cambridge as equivalent to Responsions or Previous, or must have passed an examination at some foreign University which, in the opinion of the Secretary of State in Council, is at least equivalent to any one of the competitive examinations above mentioned.

Subjects of Examination—The subjects of the competitive examination to be held in August are Mechanics and Physics, Chemistry and Botany. There will also be a qualifying examination in German to be passed. Only the elements of the three above-mentioned subjects are required and French is not included in the examination.

We can only reiterate the opinion held by those who have given the subject careful consideration that men obtained on the above lines are not the men required for the Department, nor are they likely to be able to carry on successfully the work which is now reaching so high a state of efficiency in India.

THE DIRECTORSHIP OF THE ROYAL BOTANIC GARDENS, KEW.—Our readers will join us in sincere congratulations to Lieutenent-Colonel D. Prain, F.R.S., I.M.S., late Director, Royal Botanic Gardens, Calcutta, who has recently been appointed Director of the Royal Botanic Gardens, Kew, in succession to Sir W. Thiselton-Dyer. Colonel Prain took up his duties on December 16th last.

THE REVUE DES EAUX ET FÔRETS.—We note with regret that *M.* A. Mélard has resigned the Editorship of the *Revue des Eaux et Fôrets* after having charge of our distinguished contemporary for a period of three years Our readers will join us in our feelings of regret at the step taken by M. Mélard and in offering him our sincere congratulations on the eminently competent manner in which he has carried on the periodical, to which, we are glad to note, he will still remain a contributor. M. Madelin has kindly undertaken to act in the place of M. Mélard.

THE EARTHQUAKE IN UPPER INDIA.—On Wednesday, the 6th December, Mr. T. H. Holland, F.R.S., Director of the Geological Survey of India, delivered an extremely interesting lecture to the Asiatic Society of Bengal on the recent Earthquake in Upper India. The lecture was illustrated by an unique series of lantern slides prepared from photographs taken for the Department, and was in anticipation of an exhaustive paper on the subject which will appear shortly in the Memoirs of the Geological Survey of India. Mr. Holland exhibited a series of charts upon which isoseismic lines had been placed which showed an epicentrum both in the Kangra Valley and about Mussoorie, which places are some one hundred and fifty miles apart. It was shown that at both these points there is a marked embayment of the tertiary rocks of the lower slopes of the Himalayas, into the old Himalayan rocks proper, and the general rise of these latter rocks in the Kangra neighbourhood is more abrupt than elsewhere in the Himalayas. The earthquake is attributed to stresses resulting from these conditions. Photographs were reproduced which tended to show from the evidence of ancient forts and temples that no such severe shock had been felt for a minimum of 1,000 years.

OBITUARY.—We regret to report the death at his native village of Babu Srudhur Chakravarti, a retired Extra Assistant Conservator of Forests of Bengal. He served for over 30 years in Bengal and is said to be the only native officer who has yet secured a pension in Bengal after serving up to the age-limit.

SPARKS FROM ENGINES.—£150,000 COMPENSATION.—A correspondent has forwarded us the following extract from the *Daily Telegraph* :—

On August 15th last year sparks from the locomotive of a goods train set fire to the great forests in the vicinity of Runzlau and Primkenau, belonging to the Duke of Schleswig-Holstein, Count Dohna, and thirty-one other landowners. A great quantity of timber was destroyed, and all the landowners brought actions against the Prussian State Railways Administration.

Judgment has to-day been given for the plaintiffs with damages aggregating £150,000 sterling.

A RUBBER POLO BALL.—In a report of a game of polo at Newport, Rhode Island, on September 2nd, between two teams of well-known players—the winning side including Reginald C. Vanderbilt—the New York *Times* says :

"The feature of the match was the use of a new polo ball, being of hard rubber with a pneumatic covering. The ball was tried as an experiment at the request of William A. Hazard, Secretary of the Polo Association. It seemed to lack speed when hit and had a tendency to bound in the air instead of rolling well over the ground. The well-known sound also was lacking when the mallet came in contact with the ball. After playing with it a few minutes Mr. Agassiz cried, 'Throw out a good ball,' and the customary wooden ball was produced. The new ball was not tried again. It was the opinion of the players that the pneumatic ball seemed dead when struck compared to the wooden one. Harry S. Kip refereed the game."

Secretary Hazard has not given up his interest in having a rubber polo ball tested, and is certain that the players are prepared to consider such a ball on its merits. As to objections heard to it thus far he informs *The India Rubber World* :

"I was told that it seemed too dead ; they could get too little distance from it. They said they liked the sound of the wooden ball ; they could judge from the sound whether it had been hit square, and so on. They complained that it became wild readily, and

for that reason they could not play it longer than a wooden ball."

Mr. Hazard is still negotiating with rubber manufacturers, one firm of whom write to us: "We have made a few pneumatic polo balls, and they have been pronounced excellent in certain features by some players who have urged us to complete the ball in all its details. This we are trying to do, and we hope to bring it out next season."

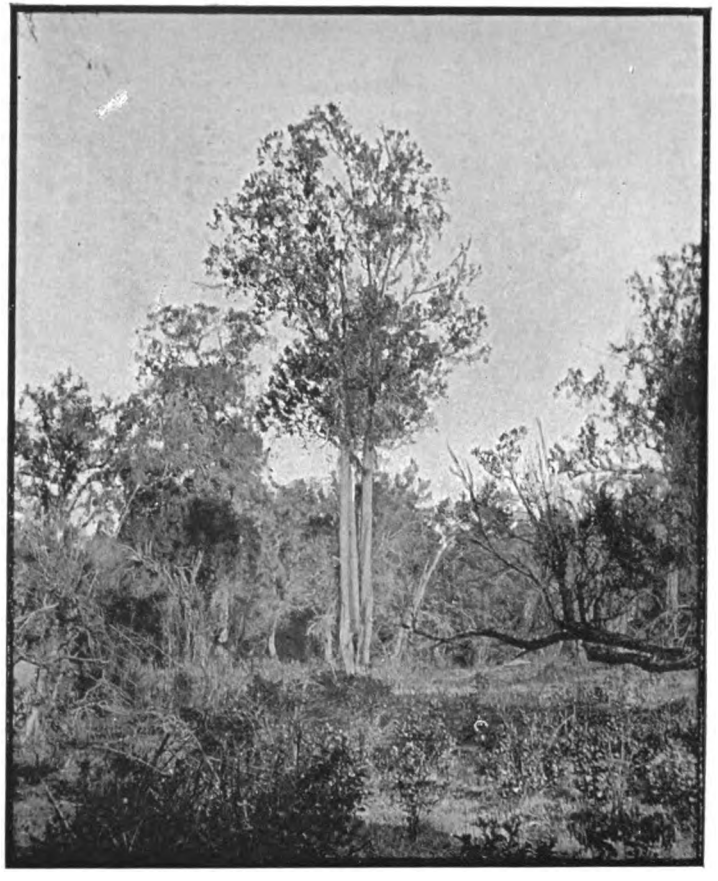
AFFORESTATION IN IRELAND.—Mr. Augustine Henry, speaking on Saturday before the members of the Irish Literary Society on "Forestry in Ireland," said that there was one serious problem n Ireland—that, alone of all the white men's countries in the world, its population was steadily declining. They all knew very well to what the emigration was due. It was due to the lack of employment, and he had taken an interest in the subject of afforestation because he saw in it a means of providing a considerable amount of employment in the present and the future, and a means of checking that emigration which was draining the life of Ireland.

HIGH PRICE FOR RUBBER.—The *Times of Malay* reports that at an auction sale at Singapore on July 26th, $4.10 (silver) per pound was paid for "Para sheets" from Plang estate, owned by Edwin Philips, of Sungei Siput, Perak, Federated Malay States This price was equivalent, at the exchange rate then current, to about 6s. 11¼d. [= $1.68¾] in London. The rubber was reported to be of good colour and free from mold.

HILL ROADS IN THE SOUTH OF INDIA.—The Pallapollieum-Chinnar road, which is intended to connect the planting districts of Travancore with Coimbatore and the West Coast, nearly completed, already carries a considerable timber traffic from the Anamalai forests. Four feeder roads in connection with the main ghaut road on the Anamalais are in hand. They are intended to further open out this new and important planting district. Several

feeder roads on the Shevaroys, to connect the planting areas with the ghaut road to Salem, were in progress. The Tellicherry-Coorg road, which is the main trunk road connecting Coorg with the West Coast and carries an average traffic of 200 carts a day, is now undergoing substantial improvement. The necessity for opening up the planting district of the Lower Palnis has long been recognised, and in 1902 a bridle-path of gradients suitable for cart traffic from the foot of the hill near Athur to Kanalkadu, a distance of 12 miles, was sanctioned. It was afterwards decided to widen this into a cart road with branches to Iyempoliem and Tandigudi, of which about 14 miles were practically completed during the year. An extension of this cart road to Kodaikanal *viâ* Law's ghaut has also been proposed and is now being estimated for.

OLEA CHRYSOPHILLA.



JUNIPER FOREST.

Photo. By E. Battiscombe.

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PROVINCIAL FOREST TRAINING SCHOOLS.

How to educate the lower grades of the Provincial staff in forest business is a question which must often have presented itself both to the Conservator of the Circle and to the officer in charge of the forest division. It is a matter which has yearly been acquiring a greater degree of importance until to-day, in most parts of the country, it faces the department as probably one of the most urgent problems requiring solution. In the early days of forest conservancy the services of the Forest Guard, to go to the lowest rung, were required as much as a guide in, as a guardian of, the forests. The superior officers were occupied in ascertaining what the forests contained, their extent in demarcating new reserves and in removing timber from accessible areas for railway purposes—in all of which operations the educational knowledge required from the lower subordinates was not excessive. The question of educating the upper ranks of the Provincial service—the Ranger quickly forced its way to the front and the Dehra School was founded with this purpose in view. The School

has produced the present Extra-Deputy, Extra-Assistant, the Ranger and Deputy Ranger. We trust in a subsequent article to deal with the training given at the Dehra institution. For a time the assistance given by the Dehra Dun trained Ranger and Deputy Ranger afforded considerable relief to the Divisional Officer. The stage had not yet been reached when forest education of some sort was essential throughout the ranks of the department. Reservation and demarcation progressed hand in hand with the amelioration of the forests up to a point when it became possible to bring them under working plans. Scattered throughout the continent there now exist numberless demarcated tracts worked under well-thought-out plans, requiring a highly technical staff to ensure that every provision and prescription laid down shall be carried out in so far as is humanly possible. The untrained officer in the Provincial service is no longer of any use. From highest to lowest some training is required and the instruction must be given, of course, in proportion to the intellectual attainments of the class it is possible to recruit. The Forest Guard, and the Forester immediately above him, can no longer, if they are to be of any real use, remain the uneducated jungly inhabitants of the forest tracts in which they have been reared. So far as is possible they are still the men required for the posts, but it has become essential that they should be given in some manner a certain amount of training in the work required from them.

The point we wish to consider in this article is how should this training be imparted and to what extent is it required ?

Last year we reproduced in this Journal* proposals under consideration in Madras for a training school in that Presidency. The suggestions made by the Board after consultation with the Conservators were that a training school for Foresters and Guards should be instituted in each Circle, and that a three months' course in the vernacular, confined to practical field work, be given. These proposals were not accepted in their entirety by the Madras Government, and in one cardinal point they radically modified the suggestions. The training of the Forest Guard was

* Volume XXXI, p. 285.

cut out altogether. They sanctioned the formation of a training school for Deputy Rangers and Foresters already in the department, who had not had the benefit of training in the Forest School at Dehra nor were likely to be deputed there; the school to be also open to candidates for the appointments at their own expense. The course was to be a six months' one, two separate courses being thus undertaken in the year, the students in each term not exceeding 30. The instruction was to be given by an Extra-Assistant Conservator assisted by a Ranger, the direct control of the school being under the Conservator. The subjects to be taught were laid down as elementary surveying, demarcation, fire-protection, supervision and execution of works, elementary principles of sylviculture, mensuration, gymnasium. This school was inaugurated on the 1st April last and has been in existence nearly a year.

The formation of this school has shown that the Madras Government are fully alive to the great necessity of training the subordinate staff, and we have little doubt that the case of the Guard will in itself receive attention at a not distant period.

Turning now to India we find that the Guard and Forester are entirely uneducated in forest matters, and for the most part the greater number of the Deputy Rangers are in the same position. In other words, in a great part of the country highly-trained officers are endeavouring to carry on technical and complicated work by means of entirely unskilled labour, the results being detrimental to the forests themselves, to progress and to continuity of policy.

We would ask whether it is not possible to at once start about remedying this state of affairs, and our recommendations, we think, will not involve any large outlay whilst at the same time adding a hundred per cent to the value of the subordinate ranks—the Deputy Rangers, Foresters and Guards who have had no chance of a technical training but who would greatly profit by it in their executive work. We will consider how this can be done.

Some years ago, owing to the wise foresight of the N.-W. P. and Oudh Government of the period, there came into existence what was known as "Oudh leave" under which Forest Officers

in those favoured Provinces, were allowed to proceed to the summer headquarters of the Local Government (Naini Tal) at their own expense for a period of two months during the recess, thereby recruiting their health whilst getting into touch with the higher officials of the Province and with other members of the Department. Probably no wiser or more benevolent policy was ever inaugurated than this concession, and we are glad to note that it is now being freely extended in other Provinces; for, in addition to the United Provinces, officers in Bengal, Assam and Burma have had the privilege extended to them. We see in this valuable concession a means of carrying out our proposals for the education of the subordinate grades. We would suggest that during the recess in the hills a class should be formed to last over a period of about four months. To this class would be deputed the intelligent Deputy Rangers, Foresters and Forest Guards, the course being conducted by an Imperial Officer. The instruction would be confined entirely to the practical side of Forestry and would, as far as practicable, only deal with the species of trees, &c., with which the men would have to deal in future. We would suggest that the course comprise a few lectures upon the life-history of the tree and its requirements, aided wherever possible by sketches and drawings on the black board. The lecturer would then deal with the effects it is intended to obtain by various forest operations and the disasters which result if these are not properly carried out. The protection of the forest should take a prominent position in the course. Elementary demonstrations of the effects of fire, grazing and injuries by men, animals and insects would be given. Protection would be followed by a short course on methods of utilisation, the proper manner to fell, methods of extraction, &c, the course being concluded with some notes on forest engineering, the main principles of kutcha road making, the building of simple bridges, &c., being described. The keynote of the whole instruction, which should be rigorously insisted upon, would be simplicity; the whole course would be a purely practical one, scientific language, nomenclature, formulæ and symbols being rigidly excluded. In recording their notes during the lectures the students should

be made to copy down the figures drawn upon the black board and an endeavour should be made to see that they have some elementary ideas of how to draw out freehand a rough plan of a simple bungalow or bridge.

We have said that the course should be conducted by an Imperial Officer, and we would suggest that in addition a Provincial Officer be attached to act generally as tutor to the students, inspect their note books and see that they are written up, &c. The only qualification which would be required of the student would be sufficient literary attainments to enable him to follow the prescribed instruction, which would, of course, be in the vernacular. Most Divisional Officers (and probably every Conservator) are aware of the fact that there are numbers of excellent, keen, hardworking men amongst the subordinate ranks who would profit generally by adding a little knowledge of the above kind to the practical experience they already possess and the value of the trained article to Government would be incalculable.

As will be seen our proposals, whilst they will usefully occupy the time of the subordinates during the recess and result in immensely increasing the efficiency of the lower Provincial staff, will cost practically nothing. A small allowance or travelling allowance to the Provincial Officer deputed and railway fares and travelling allowances to the students will not prove heavy items, and we feel sure that the Divisional Officers would welcome the formation of such a school with alacrity.

In drawing the attention of Local Administrations to these proposals, we would earnestly ask for their co-operation in the department's aim at efficiency, and nothing but efficiency, throughout all ranks.

SCIENTIFIC PAPERS.

ON THE LIFE HISTORY OF TERMES (COPTOTERMES) GESTROI, WASM. THE HEVEA RUBBER TERMITE.

BY E. P. STEBBING.

For some years past it has been known that the rubber plant (Hevea braziliensis) in the Malay Archipelago has been subject to the attacks of a species of termite known as Termes (Coptotermes) Gestroi. This insect had been reported from Borneo and Singapore and also subsequently from the Straits Settlements. In 1898 the late G. D. Haviland wrote as follows upon this termite * :—"This species is remarkable for its habit of killing live trees. It encloses the trunk with a thick crust of earth; under cover of this crust it eats through weak spots in the tree to the heart of the wood."

In a note in the Agricultural Bulletin of the Straits and Federated Malay States H. N. Ridley, the Editor, mentions that Para rubber trees when growing in grass appear to suffer just the same from the attacks of this pest. In a subsequent issue † R. Pears corroborates this statement and says that the same is the case when the trees are growing in "lalang." Neither the grass nor the "lalang" appear to form any hindrance to them "as they carry on their labours as vigorously as ever, destroying several adjacent trees as they would do if the ground were clear." From the observations detailed below the reason for this behaviour will appear. Since the insects work beneath the ground the presence or absence of vegetations round the trees can have little effect upon their operations.

In May of last year I received a communication from Mr. F. B. Manson, at the time Conservator of Forests in Tenasserim, informing me that he had received a report from the Manager

* Journal Linn. Soc., Lond., Zoology, Vol. XXVI, p. 391 (1898), December 1904.

† February 1905, p. 78.

of the Mergui Rubber Plantation (Mr. J. W. Ryan) stating the trees were being attacked by species of termites. A copy of this report, to which I shall allude later, was sent to me together with three different specimens of the termites committing the damage.

Two of these have now been identified by M. Desneux, the well-known authority on the Termitidæ, as Termes Gestroi and a species of Termes closely allied to T. annamensis, Desn., which had previously been reported from Annam. No identification of the remaining specimens sent has yet been found possible owing to workers only having been received.

We will consider these insects in detail.

TERMES GESTROI.

The *workers* are elongate, pale yellowish white insects with the head small, pale; the first thoracic segment enlarged and broader than the two following. The body is oval, broader than the meso, and metathorax and bluntly pointed posteriorly. Length ¼th inch.

The *soldier* is smaller than the worker. The mandibles black, prominent and crossed over one another. First thoracic segment enlarged and orange in colour; rest of insect yellower than in worker; legs more elongate and powerful. Length 1/5th inch.

According to Mr. Ryan this termite attacks the tree at the crown of the root and eats its way upwards, hollowing out the trunk. Since the white ants commence their work well below the ground, there is no indication of their presenee until the trees begin to show signs of withering. The damage has then gone too far for it to be possible to save the attacked tree. The branches begin to die and drop and the tree itself falls in the first strong breeze.

It would appear that Termes Gestroi attacks the tree for the purpose of obtaining the rubber from it, for, on applying pressure to the bodies of the termites, it was found that the majority of them were full of fresh latex. They apparently collect and store the

rubber, masses of rubber being found as a rule in the nests, which are usually situated at the crown of the root. From one of these nests situated at the base of a three-foot girth tree as much as 2 lbs. of rubber was collected.

An examination of the crown portion of the root of a tree shows that the main direction of the galleries made by the termite is horizontal, *i.e.*, parallel with the long axis. These galleries are of considerable size, ramifying a great deal, have smooth sides, and are connected here and there by holes or short galleries eaten out in a vertical direction. The galleries practically form an intricate mass of chambers which are kept quite free of earth and some of which are evidently stored with a certain amount of rubber. In the specimen of the root I have examined, it is apparent that the work of the termite is entirely confined to the crown of the root, none of the tunnels extending upwards into the stem (in the present case stems, for there were two taking off from the root).

ADDITIONAL INSECTS PRESENT WITH TERMES GESTROI IN THE NEST.

In the tube containing the specimens of Termes Gestroi I found grubs and pupæ of other insect forms present.

1. At least two different kinds of Heterocerous larvæ were present, both probably noctuids.

2. Immature pupæ of a species of coleoptera, perhaps a coccinellid (Coccinellidæ). The pupæ were, however, quite unknown to me.

The presence in the nest of these other forms of insect life is of very considerable importance. One or more of them may be predaceous upon the termites. It may be pointed out here that should such prove to be the case the knowledge would be of the very first importance in considering measures for combating the termite.

TERMES SP. PROX. ANNAMENSIS, DESN.

This Termes was taken from a nest situated in the ground in the plantation a few feet away from the rubber trees. It was

thought by the Manager to be identical with T. Gestroi. It is, however, a different species, and as far as is at present known causes no damage to the rubber trees.

TERMES (?) SP.

Only workers having been as yet procured of this species it is impossible to identify it at present. Mr. Ryan states that the insects build their galleries on the outside of the trunk and feed on the dead bark, thus following the usual procedure of *Termes taprobanes* in Sal forests. The Manager mentions that he has never found the insect to injure the rubber trees in any way, nor has he ever found any latex in their bodies. Since this insect is present in the plantations it will be of interest to have it identified. For this purpose the other members of the community are required. By tracing down the earth galleries on the bark of the tree to the base of the latter and turning up the earth all round it, it will be possible to obtain them and thus to have this point settled.

POINTS IN THE LIFE HISTORY OF T. GESTROI REQUIRING FURTHER OBSERVATION.

We at present know little about the life history of T. Gestroi, and since it appears more than probable that the termite is likely to prove a source of very considerable loss in rubber plantations, unless its action is thoroughly understood, it behoves those in charge of such areas to endeavour to do all in their power to procure all information possible upon its life history and methods of attack. The following are some of the points requiring further observations and elucidation.

1. The period of the year at which the termites are active and commit injury to the trees.

2. Is the rubber in the nest used as food by the termites?
   (*a*) To feed the young larvæ.
   (*b*) To serve as food during the period of inactivity, if there is one.

3. The origin of the nest. How is it first formed?

4. Where do the termites found in the nest in the crown of the root come from in the first instance?

5. Length of time which elapses from period of first attack to time the tree is seen to be dying.

6. Depth below the surface at which the termites work.

7. Proportion of active workers to non-workers in a community.

8. Do the insects always work in the dark?

9. Is it possible to reach the nest without killing the tree?

10. The position occupied by the king and queen termites in the nest.

11. Are there any subsidiary galleries radiating from the central nest to other parts of the plantation, either above or below ground? If so, where do these go?

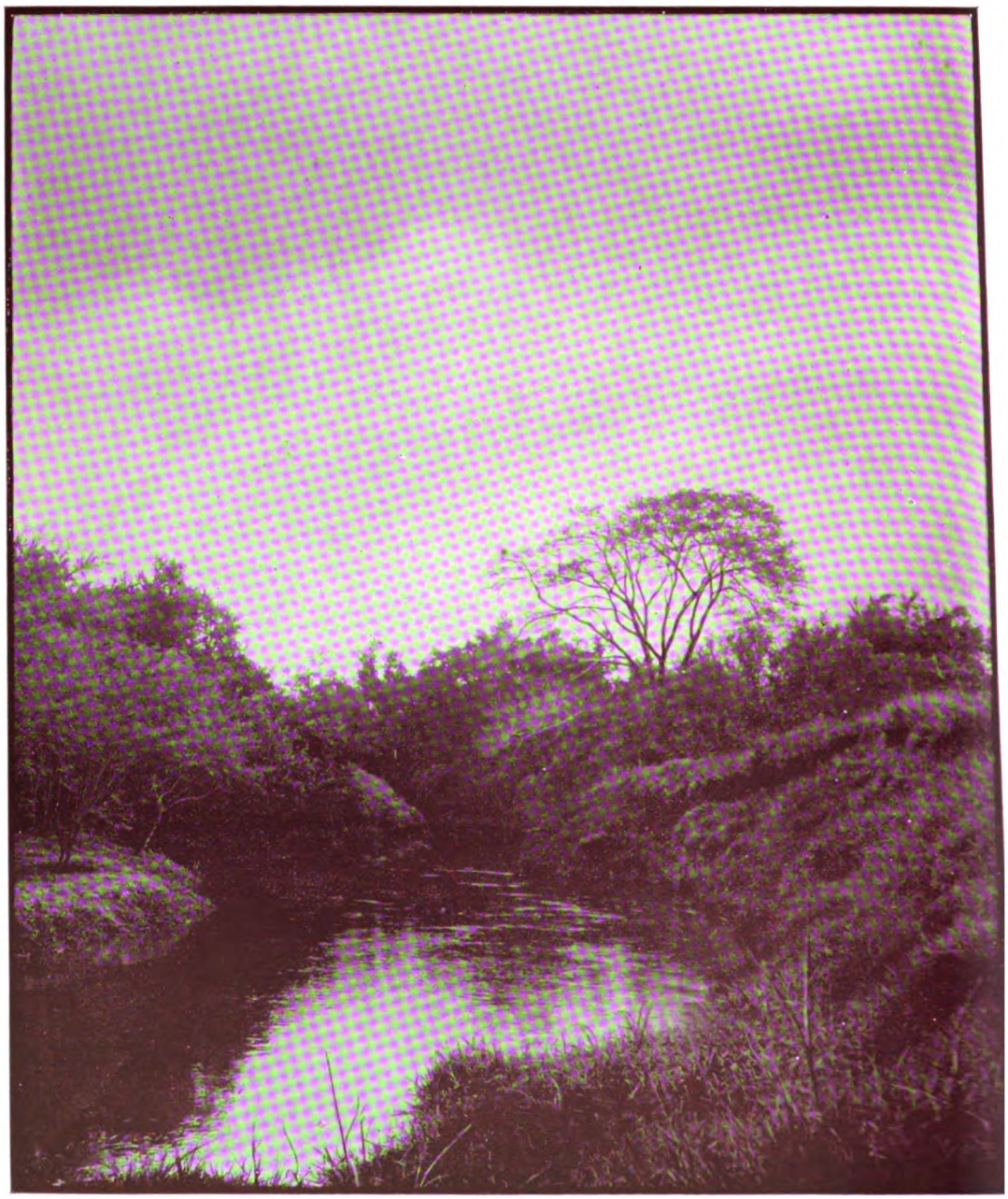
12. Is the nest connected in any way with adjacent ones in neighbouring trees.

13. The parts played by the heterocerous larvæ and the grub and beetle of the coleopterous pupa found in the nest.

These are some of the points which occur to me as requiring solution. Doubtless others will present themselves to Managers on the spot. Until we have answers to these questions from careful observations made on the spot, it is almost impossible to say what would be the best way of combating this extremely serious pest. So much money has been, and is being, put into rubber plantations in what may be termed the Indo-Malayan region, which is evidently the home of Termes Gestroi, that it behoves us to take up this question of the study of its life history fully and without delay.

I shall be exceedingly obliged if readers of this note will kindly send me* all the information they can procure upon the insect at an early date.

* To Dehra Dun, United Provinces, India.



AN AFRICAN STREAM, THE RUERU.

Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by E. Battisc

ORIGINAL ARTICLES.

FORESTRY IN THE EAST AFRICA PROTECTORATE.

BY E. BATTISCOMBE, ASSISTANT CONSERVATOR OF FORESTS.

It is only within the past five years that public attention has been drawn to the East Africa Protectorate, and even now many people have a vague sort of idea that it is only another name for Uganda.

Roughly speaking the Protectorate may be said to be that portion of Africa, bounded by the Indian Ocean, lying to the north of German East Africa, to the east of Lake Victoria Nyanza and extending as far north as Abyssinia and Somaliland.

A very good idea of the conformation of the country may be obtained by following the line of the Uganda Railway from the Coast at Mombassa to Lake Victoria at Port Florence. Leaving Mombassa the line commences to rise at once and continues to ascend steadily till it reaches the summit of the Kikuyu Escarpment overlooking the great Rift Valley, which extends from the Red Sea to the Zambesi River. Maseras, 16 miles from Mombassa, is 530 feet above sea-level, Voi, 103 miles, is 1,830 feet, and Nairobi the metroplis, 320 miles, has an altitude of 5,450 feet and the summit of the Escarpment 358 miles, 7,900 feet. Having climbed thus far the line descends into the Rift Valley which it crosses, Elementeita in the valley being 5,890 feet in altitude, and then commences to ascend the Mau Escarpment, whose summit is over 8,320 feet; the line then commences its descent to the Lake, Port Florence being 3,650 feet above sea-level at Mombassa and distant from that place 584 miles.

In March 1902 Mr. Elliott, late Conservator of Forests in the Punjab, was appointed Conservator of Forests of those forests immediately adjoining the Railway; his appointment being

subsequently altered to that of Conservator of Forests for the whole Protectorate. His task was a large one; for two years he had no trained men to assist him, but during his term of office, which unfortunately terminated last April, he managed to reach all the most important tracts of forest and had them gazetted as forest areas. This was most important as settlers were pouring into the country and taking up land as near to the Railway as possible and naturally without any consideration for forest preservation. Already the area under forest is small, and every acre is needed in order to maintain the water-supply of the country, so that the result might well have been calamitous had the settlers been allowed to work their will on the forests. It is not the settlers, however, who do damage but the natives of the country who destroy the forests by burning, felling and grazing their goats and cattle in all directions. This trait in their character is not perhaps altogether peculiar to the natives of East Africa.

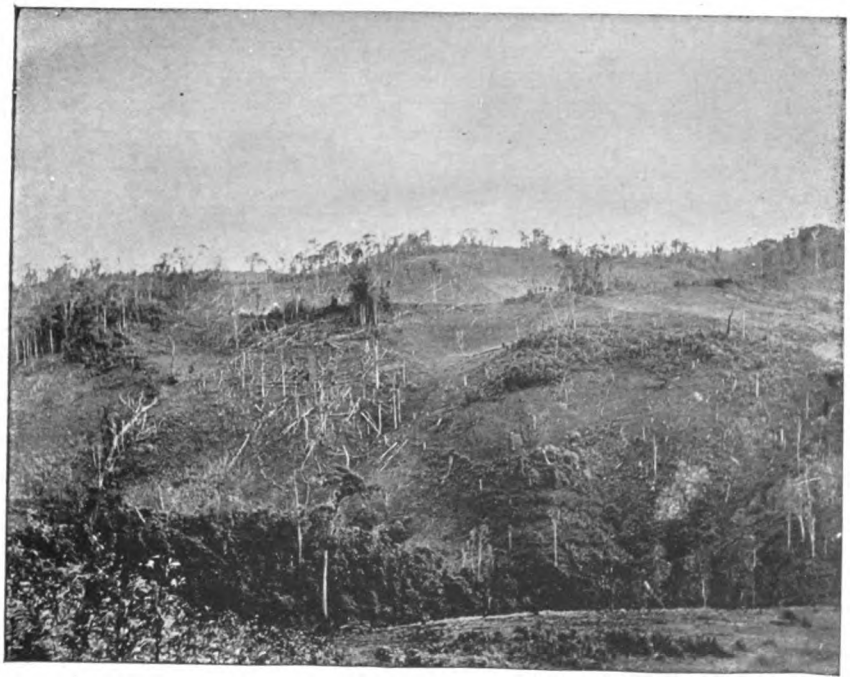
At present it is the chief object of the Forest Department to put a stop to all further encroachments by the natives, to properly define the boundaries of the forests, and to find out what amount of timber there is available for extraction, as there is a rising demand for timber for building and other purposes.

The Forest Department is now under the management of the Director of Agriculture.

It is of the forest on the high lands, *e.g.*, from an altitude of 5,000 feet up to the tree limit, that the writer of this article wishes to give a short description.

Between altitudes of 5,000 feet and 6,000 feet the forests are very irregular appearing in patches of 1,000 to 5,000 acres, and are essentially composed of hard woods of no great size; in the majority of cases the conditions of forestry in these groups are excellent wherever the natives have not made an ingress; the boles of the trees being clean and straight, with but little undergrowth showing that the crowns of the trees form a complete canopy overhead. From 6,000 feet up to 7,500 feet, the forests are enormously varied, many hardwoods, also many quick-growing species—all with very large leaves—which appear to be worthless

JUNIPER FOREST.



FOREST DESTROYED BY NATIVES, ALL RECENT.

Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by E. Battiscombe.

either for fuel or construction purposes: Juniper—J. procera—begins to appear at an altitude of about 5,500 feet and gradually increases in quantity as one advances higher, and at about 7,000 feet Podocarpus—at present the most useful known timber in the country—is found; both these two conifers flourish at an altitude of 8,000 to 8,500 feet, the former being found pure on dry wind swept hillsides, the latter preferring the deep soil of the broad leaved forests, but is never found pure. The tree limit is reached at about 8,500 feet, bamboos appearing at about 8,000 feet and flourishing up to 10,000 feet: these are succeeded by open moorland, covered with species of heath, the flora being typically alpine.

Of the species of trees composing these forests unfortunately at present but little is known; some few have been named. Juniper and Olive are the only two species which form pure forests, all other species growing in mixed forests.

The following orders are largely represented—Oleaceæ, Tiliuceæ, Rubiaceæ, Rutaceæ, Apocynaceæ, Malvaceæ, Compositæ (one large tree, wood hard and light, native name Muhugu), Leguminosæ. The conifers are represented by Juniperus procera, Podocarpus milanjianus and P. elongata. Waddringtonia is not indigenous.

Rubber is to be found nearly all over the Protectorate; it is chiefly derived from species of Landolphia, L. Kirkii being the most sought after for commercial purposes. The chief rubber districts are at the Coast, in the Kilimanjaro district, and near Lake Victoria Nyanza. It is found up to 7,500 feet on the Aberdare Range, also on the Mau.

In order to give some idea of the conditions prevailing in the forests near Nairobi a short description is given of a small block of forest of which the writer has recently made a rough working plan.

SITUATION.

The Karura forest is situated about three miles north west of the town of Nairobi.

AREA.

The area of the forest is 2,590¾ acres. This includes much grass and scrub land. The actual area of forest is 2,102 acres; included in the remaining 488¾ acres is grass land, scrub and areas destroyed by fire but in which a few scattered living trees are still standing.

CONFIGURATION.

The forest stands on the edge of the Nairobi plain at an approximate altitude of 5,600 feet above sea-level at Mombassa. It is intersected by two rivers, the Ruaraka and the Karura; the Katisura stream forms the southern boundary for two miles; the banks of these rivers which flow in an easterly direction are fairly steep but nowhere precipitous. From west to east the forest extends 3¼ miles.

GEOLOGY AND FOREST SOIL.

The forest lies on the iron stone which is overlaid by red earth; wherever the trees have not been destroyed there is a good depth of humus. In many places the sub-soil is very shallow, and here and there the iron stone crops out.

CLIMATE.

The climate is dry and fairly equable, there being no great extremes of heat or cold. There are two wet seasons, from March to the end of May and again from the middle of October to December. The winds which are generally easterly are not dangerous. The average rainfall for the past five years has been 37·04 inches.

DANGERS

Fire is the chief danger to be guarded against. Heavy thunderstorms do a certain amount of danger by causing trees which have been completely enveloped by a species of fig to fall, and in their descent they break many other trees. Damage caused by lightning is to be seen occasionally.

The natives formerly committed a great amount of damage by destroying parts of the forest in order to cultivate; at present the

FOREST AT ALTITUDE OF 8000 FEET.

Species: Podocarpus milangianus; Allophyllum abysinnicum; Pygeum africanum.

MUHUGU TREES, NAIROBI.

Photo. by E. Battiscombe.

chief damage caused by them is the grazing of goats within the forests.

Damage by game is insignificant, Bush buck and Duyker eat young saplings, but not to any great extent. Much information still remains to be acquired concerning insect pests.

CROP.

The crop, consisting mainly of hardwoods, is enormously varied. With the exception of Mukurue (Albizzia ?), Makinduri (Croton Elliotanus), Muhugu (Compositæ) and a few isolated specimens, the trees do not attain to any large dimensions, rarely exceeding 60 feet in height or 3 feet in girth. The species are all fairly equally distributed over the whole area, Mukurue and Mukoyi (Albizzia) growing on the banks of streams only.

In order to obtain an idea of the amount of timber in the forest, three sample areas of ½ acre each were taken and every tree carefully measured with the following result per acre :—Number of trees 350 ; volume 7,565 cubic feet. The following were the chief known species : Albizzia (2), Dolichandrone Hildebrandii, Croton Elliotanus, Calodendron capense, Olea chrysophylla, Olea laurifolia, Teclea unifoliata, Strychnos sp., Ochna sp., Bombeya sp., Randia sp., Acacia sp., Grewia sp.

As regards sport to be obtained in the forests there is very little ; what shooting there is, is distinctly of the big game order as elephants are the chief denizens of the forest. There are a good number of Bush buck (Tragelaphus sylvaticus) in the woods bordering on grass land ; they are very shy, and on account of the dense undergrowth very difficult to come up with. Water buck (Cobus ellipsiprymnus and C. deffassa) frequent the edges of forests. Leopards are very plentiful, especially near the native cultivation where there is always plenty of food in the shape of monkeys. Rhino are sometimes found in the forest ; they are excellent forest guards, as they are treated with great respect by most natives ; they are, however, essentially animals of the plains. So much has already been written about the sport to be obtained in the Protectorate that it would be useless to repeat it here ; it may not,

however, be out of place to add that any one contemplating a short shooting trip of three months or so, and prepared to "rough it" a little, could not do better than make a journey to this country, where for a small outlay he would get excellent sport and at the same time enjoy a delightful climate.

PROPORTION OF STAFF TO REVENUE IN BURMA.

BY F. A. LEETE, F.C.H

The figures given by F. A. L. in the August number are likely to be misleading as they stand, especially for Burma. To make the statement at all correct an extra column for "Unclassed Forests" is required.

The phrase, "there are no protected forests in Burma," is constantly cropping up in annual returns, but there is very little to choose between the status of "protected forests" in India and "unclassed forests" in Burma.

Unclassed forests in India do not come under the Indian Forest Act and the Forest Department has very little to do with them. The area of such forests is now relatively small and their value, direct or indirect, not worth much consideration. Here and there parts may be taken up, but the greater portion will eventually cease to exist as forests.

Protected forests come under the Indian Forest Act and the Forest Department does take part in their management. They include those forests which call for professional management, but to which it is not considered to be worth while to apply the elaborate procedure of reservation.

There are considerable differences in the recorded areas of such forests in the various provinces of India. In the Central Provinces there appear to be none, whilst the United Provinces have 9,393* square miles.

In Burma the term "Unclassed Forests," or "Public Forest Land" as it is called in the Forest Act of 1902, means "land at

* Not shown in F. A. L.'s statements: Managed by District Officers under the general control of the Conservator Revenue practically *nil.*

the disposal of Government and not included in a reserved forest." There is no intermediate stage.

2. F. A. L.'s figures apparently refer to 1902-03. For that year the recorded area of unclassed forests in Burma was 89,220 square miles.

Although it is very unlikely that anything like the whole of this large area will ever be reserved, yet there is very little that can be eliminated altogether, at present, as being of little or no value. A very large portion of the total forest revenue of the province is derived from these forests. Out of 60,475 teak trees girdled departmentally in 1902-03, no less than 25,179 were outside reserves.

As an example of the position with regard to the unclassed forests, the division of which I hold charge may be quoted. In Minbu out of a recorded area of 1,693 square miles of such forests, proposals were worked out in 1905 by Mr. J. Copeland for the reservation of 1,580 square miles, one-third as revenue yielding and two-thirds primarily for climatic reasons. About 300 square miles of forest still remains to be examined, showing that the original estimate was rather small.

In other divisions conditions are much the same. Progress with reservation is slow simply for want of officers. At the present rate it is quite possible that large areas may cease to be worth reservation before anyone has time to take them up.

To sum up, therefore, and to return to our starting point, even if we only take half the 89,220 square miles of unclassed forests as contributing anything appreciable to the forest revenue of 1902-03, instead of the receipts being Rs. 316 per square mile, they were not more than Rs. 107.

3. Coming, as I did early in 1904, direct from the Garhwal Division in the United Provinces to the Minbu Division in Upper Burma, the contrast between the two could not but make itself felt.

The following figures, taken from the returns for 1902-03. speak for themselves :—

Particulars.		Garhwal.	Minbu.	Remarks.
Area of division ...	sq. miles.	484 ×[1]	2,470 ×[2]	×[1] all reserved. ×[2] only 777 reserved.
Average area of range ...	,,	61	353	
,, ,, beat ...	,,	9	49	
Staff—				
Gazetted Officers ...	,,	2	2	
Rangers ...	,,	6	2	
Deputy Rangers ...	,,	5	8	
Foresters and Guards ...	,,	56	54	Excluding peons.
Receipts	Rs.	2,23,748	70,124	
Expenditure—				
A. II For purchasers ..	Rs.	4,189	409	
III Drift	,,	...	236	
VI Elephants and Stores	,,	3,064	1,775	
VII Roads and Buildings	,,	18,089	983	
VIII :—				
Demarcation and Settlements .	,,	26,890	95	
Surveys	,,	22	11,483 ×[1]	×[1] 4″ Forest Survey.
Fire-protection ...	,,	9,601	11,076	
Miscellaneous ...	,,	2,134	1,096	
IX Miscellaneous ...	,,	618	226	
Total A	Rs.	65,507	27,380	
B. Establishments ...	,,	37,254	36,139	
Timber extracted by purchasers :—				
(i) Round ...	C. ft.	111,143	247,790	
(ii) Converted ...	,,	356,297	1,625	
Receipts from above ...	Rs.	1,90,706	49,074	
Average per cubic foot. ...	,,	6 annas	3 annas	

4. The Garhwal Division consists of a continuous block of forest situated almost entirely in the hills. The forests must have been quite inaccessible, formerly, except on foot. From the very start of systematic management it was recognised that it was hopeless to expect any demand for the timber in the forests without liberal expenditure on roads. Road-making was started some 30 years ago, and the division now possesses over 400 miles of cart-roads and 200 miles of bridle-paths all made and kept up departmentally. The result is that, for the last 10 years or more, the demand for timber has been fully equal to the supply. This applies not only to timber of good quality but also to refuse of all descriptions.

In the division there are 22 pucca forest rest-houses costing on an average from Rs. 2,000 to Rs. 2,500. In all the 8 ranges there are one or more two roomed houses for Range Officers and smaller houses in all beats for guards.

There is a daily post from outside, and a daily dâk inside. It rarely, if ever, takes more than a couple of days to communicate with any Range Officer or with the Divisional Office.

The forests are full of game. Perhaps the writer is the only Divisional Officer whose bag of tigers has been less than half-a-dozen a year. A fisherman could not wish for anything better than the Ramganga which flows for 30 miles through the middle of the forests.

5. The Minbu Forest Division comprises two districts, Minbu and Magwe. The forests extend up to the Arakan Yomas on the one side and to the Pegu Yomas on the other. These two ranges are about 100 miles apart. Half way between them is the Divisional Headquarters, Minbu, on the Irrawaddy.

The more valuable forests being inside the hills, a good deal of time is taken up with travelling from one side to the other. Six weeks, at least, of every camping season are spent outside the forests.

There are three posts a week from outside, but instead of taking one or two days to reach him, the Divisional Forest Officer's dâk may take anything up to a week.

The crop of forest offence is large, and unreported cases are probably far more numerous than those reported. The want of sufficient supervision over subordinates naturally results in plenty of malpractices on their part. The bigger the division in proportion to its staff, the longer the list of offences; police work takes up a far larger share of one's time than forest work.

Inside the hills there are no roads, only village-tracks. Needless to say, it is rarely possible to go at more than a walk along these paths, and that a good part of the day is taken up with a 10 or 12 mile march.

There are three good forest houses in the jungles, and outside the hills there are good Public Works Department houses along the principal roads. In the cold weather a tent is constantly in use. From March to May one is glad to make use of any sort of temporary forest hut or of a road-side "Zayat," though it is hardly safe to dispense with a hat in the heat of the day in either of them.

6. Although the point of the foregoing remarks is to bring out the contrast between the two divisions, yet the differences in past conditions must not be lost sight of. In Garhwal we have the results of 50 years of work; in Minbu of only about 15. Only a few days ago I came across old papers in the Divisional Office showing that it was hardly safe to tour without an escort away from headquarters as late as 1891. Considerable progress has been made, but, to a new-comer, it appears that a stage has been reached beyond which no appreciable progress is possible without such an increase of the forest staff as it is hopeless to wish for all at once.

With one forest guard in 49 square miles and one ranger in 350 square miles what can be done in the way of road-making with a view to the opening out of the forests, or in the way of fellings for their improvement? We are simply marking time, for as fast as we pick up threads in one direction we have to drop them in another, and this must go on until the staff is about quadrupled in all grades. Who can say how long this will take?

7. This line of thought naturally leads one to ask whether the existing staff is used as economically as it should be. More Forest Officers being so urgently needed, why take up so much of the time of those that are in the province with work that requires no special professional training? The measuring and passing of teak logs is quite mechanical, the looking after and disposal of drift, the inspection of saw-pits, the checking of accounts at revenue stations, etc., could be done just as well by a man who was not a forester. For this sort of work a few week's training would be sufficient. Why not therefore have a separate branch of the Department recruited in the open market? In this way 20 or 30 men properly graded amongst themselves could be taken on, thus giving in a year or so a relief to the existing staff that would require at least 10 years at the present rate of recruitment of two or three juniors a year at the bottom of the professional list.

8. To any one who has spent all his service in Burma the above remarks may seem rather over-drawn. It may perhaps, to some extent, be a matter of temperament and training, but I find it hard to get up as much enthusiasm over work in Minbu as I did in Naini Tal, Bahraich, Kheri or Garhwal.

It will always be a pleasure to look back on the time spent in the latter Divisions. Every forest presents sylvicultural problems for solution, but simply to be able to theorise, in the intervals between prosecuting forest subordinates, as to what ought to be done, is quite a different matter from being able, not only to study the effect of actual cultural operations in the past, but also to carry them on a step oneself.

As far as climate goes Upper Burma at any rate compares more favourably with India than appears to be generally supposed outside Burma. I certainly had a very imperfect and distorted idea of the conditions prevailing in the province. Minbu appears to share with three or four other districts in the dry zone the unenviable reputation of being the hottest part of Burma. March, April and May are hot. The mid-day temperature indoors oscillates between 95° and 110°. Inside the jungles nearly every tree

is leafless, outside the jungles there is nothing to relieve the endless monotony of dust but occasional mango, pipal and tamarind trees.

During the other nine months of the year conditions are very different. From June to October, although the annual rainfall is under 30 inches, yet cloudy days are the rule rather than the exception. There is generally a good breeze blowing, and the punkah never need be kept going all day long. In December and January camp fires are a necessity. The night time is much preferable to Oudh even in the hottest months. I don't know what happens in wet places like Rangoon, but in Minbu a punkah is never required at night, and for the greater part of the year a blanket is not superfluous. Little as I at first wanted to come to Burma, yet I must admit the truth of what I was told before arrival by men who knew the province, that the country was the reverse of being as uncomfortable and unhealthy as it is painted in imagination by so many people in India.

THE DISTRIBUTION OF THE FOREST FLORA OF THE BOMBAY PRESIDENCY AND SIND.

BY W. A. TALBOT, F.L.S., CONSERVATOR OF FORESTS, BOMBAY.

III

Deciduous forests.

The deciduous forests, spread as they are over more than three-fourths of the total wooded area of the Bombay Presidency, possess a much less varied flora, in which the African and Malayan elements are predominant, than the evergreens. The number of woody plants in all the deciduous classes does not much exceed three hundred species, about half the number crowded in the comparatively small region occupied by the heavier and denser evergreens. It is generally considered by botanists that materials do not exist for determining with accuracy the phytographical boundary line between the two great Deccan and Malabar botanical provinces, which include nearly the whole of the Bombay Presidency forest

region. This difficulty arises from the somewhat artificial and territorial nature of the boundaries of these provinces. South of Bombay the Pulneys, Nilgiris and Bababuden hills extend across the Peninsula, and owing to the moist climate on the slopes of these mountains they carry with them far inland a number of Malabar species. For instance on the Bababuden hills in Mysore, the highest summits of which attain an altitude of over 6,000 feet, there are three distinct well marked altitudinal zones of vegetation. First comes the dry Deccan, with its characteristic flora, from the plains up to 3,000 ft. Between 3,000 and 4,500 ft. there is a moist zone with a comparatively heavy rainfall, containing high mixed forests of intermediate type. This region is adapted for coffee growing and the forests have generally been removed or thinned to suit this cultivation. Coffee planting in Mysore is, however, excellent climatic forestry, as the rainfall is attracted and well distributed in the cultivated area. Above 4,500 ft. in the upper atmosphere with a very heavy rainfall and a low mean annual temperature, the character of the flora changes nearly abruptly. The rounded hills of this elevated region are open moorland covered with tall grasses, Strobilanthes sessilis, bracken and a varied flora of shrubby and herbaceous species, and in the ravines and sheltered situations is a dense forest growth of characteristic Nilgiri Shola plants. This, however, concerns the Malabar province outside the Bombay Presidency limits. From the Kanara district northwards, the boundary between the evergreen and deciduous floras is determined with comparative accuracy, and the dividing line between the tropical evergreens and intermediate deciduous forests is usually very distinct, particularly so on the Northern Kanara and Belgaum ghats, where isolated Kans are enclosed in deciduous forests. These Kans vary in extent from a few acres to several square miles and disappear entirely, when the annual rainfall is below 80 inches. Towards the east the separation between the deciduous forests of the intermediate and Deccan floras is not so apparent or well defined, As we go further in that direction the size of the trees diminishes, and whilst the elements of the dry Deccan flora become more and

more abundant a large number of intermediate species disappear altogether under the altered conditions of the climate. The forests of this dry region are more open and interspersed with cultivated lands, and it is usually only where the lands are barren and unfit for agricultural purposes that the jungles are allowed to exist. On the other hand the soil of the slopes and valleys of the ghat forest region is often deep and very fertile and the height of the trees and density of the growth are increased accordingly. The very unhealthy climate of this mountainous country accounts for the sparse population and the existence of the forests over such a large area.

In the Western Indian Peninsula the dry Deccan flora spreading from the north and east and the evergreen Malabar from the south and west have evolved an intermediate deciduous forest flora which in the humid climate of Mysore and North Kanara about the centre of the Malabar botanical province attains its greatest perfection The evolution of the deciduous forests can in many places in North Kanara and Belgaum be traced to the degradation and destruction of the evergreens by human agency. There are, however, on the southern ghats large areas of mountainous country covered with mixed forests, some of which were probably never altered or affected by that means. The heavy rainfall and consequent humidity of the climate has eliminated a large proportion of the dry Deccan element. On the other hand, the species of Malayan origin Myristicas, Palms, Dipterocarps, Laurels, etc., are conspicuously absent. The origin of many of the well differentiated species peculiar to these intermediate forests is obscure and whether from Malabar, Deccan, or other sources it is difficult to determine. For example, Lagerstrœmia microcarpa, Bedd. is more nearly allied to L parviflora the dry zone species than it is to its cogener L. Flos-Reginæ, of distinctly Malayan origin. Oxytenanthera monostigma, the well known "choua" bamboo another species, is seldom found outside the deciduous moist intermediate forests. Its cogeners with the exception of O. Thwaitesii, from the Nilgiris and O. Stocksii, cultivated on the Kanara coast, all are found either in Burma or the Malay Peninsula.

Bauhinia foveolata, probably an endemic tree, is from its general appearance of Malayan origin. Pittosporum dasycaulon Thespesia Lampas, Kydia calycina, Hemigyrosa canescens, Eriolæna Candollei, Erinocarpus Nimmoanus, Melia dubia, Evodia Roxburghiana, Zanthoxylum Rhetsa, Stereospermum chelonoides, Zizyphus xylopyra, Leea macrophylla, Millettia racemosa, Desmodium gyrans, Indigofera pulchella, Mucuna monosperma, Flemengia strobilifera, F. congesta, F. involucrata, Pseudarthria viscida, Crotalaria dubia, C Heynearia, C. leptostachya, C. fulva, Pterocarpus Marsupium, Grewia abutilifolia, G. tilæfolia, G. Microcos, Wagatea spicata, Acacia concinna, A. Intsia, Albizzia odoratissima, A. Lebbek, A. procera, Pueraria tuberosa, Spatholobus Roxburghii, Bauhinia malabarica, Eugenia utilis, E. memecylifolia Casearia graveolens, Hymenodictiyon obovatum, Embelia robusta Bassia longifolia, Hoya retusa, H. Wightii, Strychnos Nuxvomica Vangueria spinosa, Argyreia sericea, A. pilosa, Ipomœa campanulata, Lettsomia elliptica, L. aggregata, Strobilanthes callosus, S. ixiocephalus, Calacanthus Dalzelliana, Neuracanthus sphærostachyus, N. trinervius, Barleria montana, B. Gibsoni; Dædalacanthus roseus, D. purpurascens, Cleorodendron infortunatum, Symphorema involucratum, Solanum verbascifolium, Colebrookia oppositifolia, Loranthus gibbosus, L. lageniferus, L. obtusatus, L. Wallichianus, L. cuneatus, L. elasticus, L. trigonus, L. Stocksii, L. capitellatus, Phyllanthus indicus, Glochidion velutinum, Mallotus albus, Macaranga Roxburghii, Ficus asperrima, and Phœnix humilis are all found in the intermediate deciduous forests and are absent from the Deccan dry zone, and they may be either of Malayan or Deccan origin. Many of the trees widely spread throughout the Deccan have some of their specific characteristics modified and altered in the moist intermediate forests under the changed conditions of soil and climate which prevail there. There is no doubt that the long continued action of the human residents in these deciduous forests has profoundly influenced and affected their flora. The increasing population of one age extensively cleared large areas of forest clad land to be abandoned in the next and again slowly recovered with tree vegetation. The necessity of large open

spaces for cattle grazing, the burning of the jungles to improve the quality of the grasses, the constant lopping of species suitable for fodder or leaf manure, and the sylvicultural operations which have been in action from time immemorial with the object of supplying building timbers, firewood and secondary forest produce, all re-act on the climate by either diminishing the quantity of the annual rainfall in many places and adversely affecting its distribution everywhere. A close consideration of the variations of the great climatic factor, affecting the forest flora of the Indian Western Peninsula, the monsoon rainfall, opens up a series of botanical and economic problems of peculiar interest. Within a maximum rainfall of 350 inches on the highest ghats of Kanara and Satara and a minimum of a few inches in the Sind and Guzerat desert regions every grade of humidity of climate is found and the intensity of this humidity is re-acted on by the condition and density of the forest growth itself. The destruction of the forests in many regions is well known to be the cause of a diminished and insufficient rainfall. The dry and uncovered barren soil in these denuded countries possesses no longer sufficient power of condensing the moisture laden atmospheric currents. In regions where the configuration of the land does not sensibly affect the direction of these currents or the amount of moisture, the absence of forests effectually prevents the storage and subsequent distribution of the condensed water. The soil is washed away by sudden floods and fertile regions are transformed into tracts of mere desert. Uufortunately the ignorant and wasteful treatment of the Western Indian forests has resulted in the formation of large areas of barren unproductive soil The principal destructive agencies of the Bombay forests have been touched on in other parts of this article

A reference was made to the destruction of evergreen tropical forest in connection with the cultivation of the areca nut palm. In the deciduous Deccan forest area the annual recurring fires, the indiscriminate cutting and lopping and the browsing of goats have caused the disappearance of many species. The forests are open, often constituted of one or few kinds of gregarious fire resisting trees

which never attain large dimensions but generally remain small and stunted. Even in the intermediate deciduous forests which are well protected, some species approach extinction, for example, Cordia Macleodii (Hadang), which yields a favourite timber for the construction of country carts has almost become extinct in the border forests of North Kanara on this account. The present treatment of the high timber intermediate forests of North Kanara and the consequent more or less successful attempts at keeping out fires have had some curious effects. In the fire protected area of the fine high timber forests of Gund and the Peshkardroog teak seedlings are very rare, and it is only on the broad burned fire paths that the seeds cracked by the heat have come up freely. Those which fall in the unburnt forest are destroyed by insects or rot and do not germinate. Attempts are made by planting to solve this sylvicultural problem and preserve this valuable species from diminishing from the growing stock in what is one of the most valuable teak areas in India.

MOIST DECIDUOUS FORESTS.

These exist in the same area and under the same climatic conditions as the evergreens; they extend towards the west along the well-drained slopes of the ghats, down into the Konkan. The great humidity of the climate, equable high temperature and deep well-drained soil from the denudation of the underlying metamorphic schists, are the favourable conditions under which these forests attain their greatest perfection. The usual period of active vegetation whilst not continuous throughout the year is much longer than in the dry Deccan forests. The short time the trees are bare of foliage and the green herbaceous undergrowth often considerably lessen the danger of forest fires occurring. In the Peshkardroog and other great teak and mixed forests of the Supa division of North Kanara, fire tracing can scarcely be undertaken before the 15th March as the jungle refuse will not burn, and as heavy rains often fall in May and sometimes earlier the annual fire danger period is reduced to less than two months. The fires, however, cause infinitely more damage in these forests when they do occur, owing to the accumulated dry material, than in the small open

jungles of the Deccan region with its scanty undergrowth. The chief differences which distinguish the moist deciduous from the dry deciduous class are in the former the larger size of the trees mostly from seedling origin, the much greater density of the forest and the existence in either class of a large number of different characteristic species. A number of trees are common to both classes which yield valuable timbers and are consequently prominently brought to the observer's notice. The principal of these is the teak (Tectona grandis), and in the North Kanara ghat forests this species locally abundant attains to large dimensions and yields timber of excellent quality. In the dry Deccan and lighter rainfall zone forests the size of the teak is greatly diminished, and the numerous stems originally from shoots only yield poles, containing a large proportion of sap wood and not convertible into logs. In the Surat Dangs and the Akrani forests of the Khandesh district teak of somewhat large dimension and convertible into squared logs is still to be had but rare. Sir D. Brandis mentions on p. 359 of his "Forest Flora of N.-W. and C. India" having measured in the Khandesh Dangs teak trees 60—70 feet long to the first branch. The principal other species common to the intermediate deciduous and Deccan deciduous jungles are Blackwood (Dalbergia latifolia), Jamba (Xylia dolabriformis), Ain (Terminalia tomentosa), Harda (Terminalia Chebula), Hela (T. belerica), Kindal (T. paniculata), Temru (Diospyros melanoxylon), Awla (Phyllanthus emblica), Ghela (Randia dumentorum), Parati (Pavetta indica), Mohwa (Bassia latifolia), Jambul (Eugenia Jambolana), Kumbia (Careya arborea), Apta (Bauhinia racemosa), Phulas (Butea frondosa), Karmal (Dillenia pentagyna), Heddi (Adina cordifolia), Kalamb (Stephegyne parvifolia), Kura (Ixora parviflora--an evergreen), Tewas (Ougeinia dalbergioides), Kapila (Mallotus philippinensis). There are few natural orders and genera peculiar to the deciduous forests, nothing similar to the characteristic Myristicas, Dipterocarps and Palms of the evergreens. A list of the principal species indigenous in these moist intermediate deciduous forests is given in a former paragraph.

DRY DECCAN DECIDUOUS FORESTS.

These small forests which cover large areas both in the eastern parts of the Konkan and Deccan districts are confined to the zone with an annual rainfall below 50 inches. They degenerate into mere scrub jungles further towards the east and are easily distinguished from the moist deciduous class by the smaller size of the few, mostly gregarious constituent trees and their more open distribution. The struggle for existence is not between the constituents of the flora but against the inhospitable physical surroundings, and owing to the dry climatic conditions, on a soil exposed for most part of the year to a hot sun, the trees common to both classes are stunted and seldom attain large dimensions. A number of distinct drought resisting resinous Burseraceæ, thorny and prickly species (Euphorbias, Mimosas, Acacias and spinous Rubiaceæ) are also characteristic of these forests. The influence of the annual forest fires is very great and effectually prevents the stems from attaining large dimensions. The principal trees and shrubs indigenous in these forests and not found in the other classes are Mimusops hexandra (probably not found south of Thana), Prosopis spicigera, Hardwickia binata, Cæsalpinia sepiaria, Mundulea suberosa, Rhus mysorensis, Dodonæa viscosa, Vitis auriculata, V. quadrangularis, Ximenia americana, Chloroxylon Swietenia, Azima tetracantha, Jasminum auriculatum, Acacia arabica, A. eburnea, A. tomentosa, A. leucophlœa, A. suma, A. Catechu, var. sundra, A. ferruginea, A. latronum, Carissa spinarum, Mimosa rubicaulis, M. hamata, Cordia, all five species, except C. myxa, which is also found in the moist deciduous, Salvadora persica often on saline soil, also found near the sea coast in North Kanara, Soymida febrifuga, Boswellia serrata, Balanites Roxburghii, Ailantus excelsa, Anogeissus latifolia, Argyreia cuneata, Gardenia turgida, Feronia Elephantum, and Aegle Marmelos, Grewia salvifolia, G. populifolia, G. hirsuta, Cochlospermum gossypium, Capparis grandis, C. sepiaria, C. aphylla, C. zeylanica, Cadaba indica, Mærua arenaria, Lantana indica, large Euphorbias (E. Tirucalli, E. tortilis, E. neriifolia, E antiquorum) and others. Along the North Kanara border and extending some way into the

Dharwar district the principal trees of economic value are (Tectona grandis) teak, (Terminalia tomentosa) ain, (Anogeissus latifolia) dindal, (Schleichera trijuga) kusumba, (Dalbergia latifolia) blackwood, (Terminalia chebula) harda, (Pterocarpus Marsupium) honne, (Santalum album) sandalwood, and (Adina cordifolia) heddi Cassia auriculata, C. glauca and Carissa Carandas prevail in the undergrowth. Dendrocalamus strictus is the only bamboo, and Phœnix sylvestris, the only palm indigenous in these dry forests. In May, before the monsoon commences, the vegetation becomes active and the jungle is quite green before the regular rain falls. Cassia auriculata, is one of the most widely spread and abundant shrubby species of the Deccan area and is found in open situations and as undergrowth in many of the forests from the Mysore frontier in the south to the Panch Mahals in the north. In the Sholapur district one of the principal sources of forest revenue is obtained from the sale of the bark of this shrub. Dense impenetrable thickets of Lantana aculeata, cover large areas of waste land in the S. M. country and North Kanara. This bush (not to be confounded with L. indica, an indigenous species), was introduced as an ornamental shrub some forty years ago, and has now invaded even the moist region of Belgaum and North Kanara, where its eradication has become a forest problem of some importance. On the deep "Regur" black soil of the plains, considerable areas are covered with open forests of the valuable Babul (Acacia arabica) mixed with A. eburnea and A. leucophlœa. The small trees and undergrowth of these grassy woodlands consist of Cassia auriculata, Calatropis gigantea and C. procera, closely allied species, distinguished principally by the different forms of their coronal appendages. Capparis divaricata, Balanites Roxburghii, Prosopis spicigera, Dichrostachys cinerea, Ziziphus nummularia, Hibiscus trionum, Mormodica cymbalaria and Anisomeles malabarica. A reference was made to the Dharwar series of transition rocks in the opening chapter. The downs and low hills surrounding the town of Dharwar constitute part of this formation and the soil is mostly red, ferruginous, hard and barren on the higher levels. The annual rainfall which is somewhat uncertain

and variable seldom exceeds 25 inches. The ligneus vegetation of this region has been reduced by constant cattle grazing and cutting of the trees and shrubs for firewood and field fencings. There is only a scanty scrub left consisting principally of clumps of thorny stunted trees, shrubs and climbers.

The principal are :—Gymnosporia montana, Acacia Catechu, A eburnea, A. leucophlœa, Flacourtia Ramontchi, Carissa Carandas, Streblus asper, Capparis divaricata, Flueggia microcarpa, Dodonæa viscosa (often gregarious), Grewia pilosa, Ixora parviflora, Canthium parviflorum, Ehretia buxifolia and Bridelia stipularis. During the rainy season the showy purple bell-shaped flowers of Argyreia cuneata are conspicuous. Sopubia delphinifolia, Biophytum Reinwardtii, Ocimum canum, Blepharispermum subsessile, and Ionidiun suffruticosum are common herbs.

A few of the principal climbing species are :—Celastrus paniculata, Cæsalpinia sepiaria, Cylista scariosa, Zizyphus Œnoplia, Asparagus racemosus, Capparis sepiaria, Cocculus villosus, Cadaba indica, and Grewia hirsuta.

Five or six miles to the north of Dharwar are small protected jungles, not altogether destroyed by collectors of firewood. In addition to the above mentioned species, they contain small stunted trees of Anogeissus latifolia, Balanites Roxburghii, Bauhinia racemosa, Tectona grandis, Santalum album, Cassia fistula, Butea frondosa, Diospyros montana and Alangium Lamarkii. The leafless Sarcostemma brevistigma, Jasminum auriculatum and J. arborescens are to be added to the list of climbing shrubs.

On the dry stony Kuput hills in the Dharwar district the forest vegetation is very scanty, and the principal trees are usually of very small size and sparsely distributed. In the more favourable situations Acacia arabica, a variety of Morinda tinctoria, Stereospermum suaveolens, Carissa spinarum (an evergreen prostrate or erect shrub with small sweet berries) Pongamia glabra, Canthium parviflorum and Cassia auriculata are the principal species in these almost barren hills, 30,000 acres in extent, and over a large proportion of which even Opuntia and the columnar Euphorbias do not grow. Only spear grass, affording scanty grazing early in the

season for herds of sheep and antelope, appears to thrive. At the base of the hills "babul" mixed with Acacia latronum, Mimosa rubicaulis, M. hamata, Capparis divaricata, and the red-berried C. aphylla constitute the scrub. Near Badami in the Bijapur district, on the Kudapah sandstone formation, the flora is peculiar and varied. Owing to the xerophitic conditions in a dry almost desert climate and a rocky or sandy soil, the trees are small and stunted, but in favourable seasons when rain falls abundantly the vegetation contains quite a number of distinct species, probably evidence of the remains of an ancient flora. The following is a list of some of the more remarkable plants found in this locality.

TREES AND SHRUBS.

Melia Azadirachta Linn, Gyrocarpus Jacquini, Roxb., Ailantus excelsa, Roxb., Mundulea suberosa, Bth., Chloroxylon Swietenia, DC., Wrightia tinctoria, Br. var. Rothii, Vitis vitigenia, Roxb. (a small thick stemmed tree), Mimosa rubicaulis, Lamk., Grewia salvifolia, Heyne., Cordia fulvosa, Wight., C. monoica, Roxb. and Ficus tomentosa, Roxb.

UNDER SHRUBS AND HERBACEOUS SPECIES.

Sida cordifolia, Linn., Crotalaria bifaria, Linn., C. ramosissima, Roxb., C. hirsuta, Willd., Indigofera tenuifolia, Rottbl., I. argentea, L. var. coerulea., Alysicarpus monilifer, DC., Rothia trifoliata, Pers., Desmodium Rottleri, Baker., D. rotundifolium, Baker, Eleiotis sororia, DC., Tephrosia Hookeriana, W. and A., T. purpurea, Pers., Cleome tenella, Linn., Mollugo Cerviana, Seringe., Aerua monsonia, Mast., Allmania albida, Br. var., Convolvulus Rottlerianus, Chois., Justicia glauca, Rottl., Sesamum laciniatum, Klein., Mollugo nudicaulis, Lamk., Andrographis echiodes, Nees., Lepidagathis cristata, Willd., Kalanchoe spathulata, Nees., Ipomœa pestigridis, L., Pouzolzia Bennettiana, Wgt., Barleria tomentosa, Roth., and Actinopteris dichotoma, Forsk., (a remarkable fern).

In the eastern parts of the Belgaum district on similar quartzite sandstones the small deciduous forests contain amongst other species the showy flowered Sophora Wightii, Chloroxylon Swietenia, Ximenia americana, Cochlospermum gossypium, Colum-

nar Euphorbias and Opuntia, Strychnos potatorum (Nermali), Mundulea suberosa, Ficus tomentosa, also found near the sea coast, Wrightia tinctoria, Vitis Linnaei, Cordia Macleodii, C. fulvosa, Dalbergia paniculata, Clerodendron phlomoides, Grewia pilosa, G. villosa, G. populifolia, Limonia acidissima, Dolichandrone falcata, Givotia rottleriformis (Palki), Gyrocarpus Jacquini (Zaitun), and Hardwickia binata (Anjan); this latter tree is sparsely distributed in these dry forests. A small forest of Anjan is found near Renebennur in the Dharwar district, and only in Khandesh does it become fairly common on the basaltic trap of the Satpuras, where it is met with sometimes of fair size, large enough to yield railway sleepers, mixed with Bombax, Teak, Ougeinia dalbergioides, Terminalia Arjuna, Sterculia urens, Bassia latifolia etc. Some of the hills near Dhulia are covered with an open growth of "Anjan" which is only preserved from extinction by the continual lopping of young branches and leaves for fodder, by its strong capacity for shoot reproduction. Another remarkable species constituting almost pure open forests, extending from the Khandesh Satpuras into the Central Provinces, is Boswellia serrata (salai). This white barked tree which belongs to the same order as Balsamodendron and Garuga (Burseraceæ) is of African (Arabian) origin and yields a kind of balsam or frankincense (kundar or labana). The forests of salai with the associated karai (Sterculia urens) situated on the trap of the Satpuras present during the dry season a weird and desolate appearance.

There are traditions of the Deccan being well wooded in former (prehistoric) times. If this was so the conditions of climate and soil must have since radically changed over vast areas. Human agency and the indiscriminate browsing of sheep and goats have assisted in the denudation of this region, but it is also open to doubt whether real forests ever did exist in many of these semi-desert tracts of country. For more than 30 years futile attempts at reboising these barren regions have been made, and much money has been spent on broadcast sowing and other practically useless operations. Nurseries for the distribution of seedlings, proved to be failures, have had to be abandoned.

Where water is not available it is beyond the wit of man to transform stony wastes into leafy forests.

S. Kurz in his introduction to the "Forest Flora of British Burma" refers in an appendix, to the jungles where bamboos are predominant. In the Bombay Presidency the distribution of the various kinds of bamboos is intimately connected with the different evergreen and deciduous floras, and the jungles in which bamboos are the prevailing element can scarcely be considered as forming either a sufficiently extensive area or a separate distinct class of forest. The indigenous six species belonging to four genera are distributed as follows:—

BAMBUSA ARUNDINACEA, RETZ.

The hollow glabrous bamboo, the Dougi or "Spiny bamboo" of Western India and the largest of our indigenous species, is generally spread throughout the Presidency both in deciduous forests and along moist river and nallah banks. The bamboo clumps are associated with the members of the local floras, more or less choked by the dense shade and usually sparingly represented. Bamboos are light loving species and do not thrive in the undergrowth of the tropical evergreens from which forests they are conspicuously absent. The Dougi attains great perfection in the intermediate deciduous ghat forests of North Kanara. In favourable localities clumps of 80—100 culms, 100 ft. long by 5 ft. with 8 in. as the diameter of the thickest internodes. This species flowers generally and dies down after long and irregular periods of more than 30 years. In the forests of North Kanara, from Arbail inland, there was a general flowering of the large bamboo from 1864 till 1866. This fact is well authenticated as there was a scarcity or partial famine in those years when the natives of the ghat and coast districts collected the seed which served them in lieu of cultivated grain. The writer remembers seeing in these forests in 1878, eleven years after the general flowering took place, the large fallen and partially decayed clumps. These dead and dry masses of highly inflammable material were surrounded by the continuous and dense undergrowth of young seedling bamboo two to five feet high, in many localities quite impenetrable.

The clumps did not differentiate until several years afterwards. No general flowering of Bambusa arundinacea has taken place in North Kanara or Belgaum since 1864—66. The conditions which favour a general flowering of the different kinds of bamboo, arrived at maturity, are very obscure and only vague conjectures on this subject have hitherto been hazarded. It has been stated that isolated clumps of Bambusa arundinacea in flower are met with in various localities. The writer has never seen during a residence in India of over 28 years either a general or partial flowering of this important species although living in the region where this bamboo is found in abundance and anxious to observe and record the fact. During the season of 1905, whilst travelling through the North Kanara thorny bamboo area, it was observed that a number of the culms in each clump were dead. It will be interesting to note whether this is an indication of a fresh flowering being imminent, or whether if the favourable conditions necessary do not occur the clumps now 40 years old will die without flowering at all. Owing to the prevalence of the large curved spinous branches at the bases and some way up the culms the natives usually cut off and content themselves with 40 or 50 feet of the culm tops, many bamboo clumps of this species therefore present a mutilated appearance. The new yearly culms appear during the rainy season and grow with very great rapidity. Bison and sambhar are very fond of these young shoots.

BAMBUSA VULGARIS, WENDL.

The yellow and green striped bamboo, a native of Ceylon, is only found as a cultivated usually ornamental species in the Bombay Presidency.

DENDROCALAMUS STRICTUS, NEES.

The medium sized, deciduous, unarmed glabrous "Male bamboo" or Shib, sometimes found with solid culms ("Mace") is very widely spread and abundant in most of the Bombay forests, except of course the tropical evergreens. It is often associated in the intermediate deciduous or mixed hill forests with the thorny bamboo, and like that species it flowers after considerable intervals. These intervals are however of shorter

duration and the flowering does not take place simultaneously over such large and extensive areas. Isolated clumps and for that matter large patches of forest of Dendrocalamus in flower are comparatively frequently met with. The record of these general flowerings is now more carefully kept and an accumulation of the relative observations will help to clear up some of the present obscurity in our knowledge of this subject. There is only one species of Dendrocalamus generally distributed throughout India. The annual culm shoots appear in September or October, and growing with the greatest rapidity soon elongate sufficiently to escape the attacks of bison, deer and other animals.

OXYTENANTHERA MONOSTIGMA, BEDD.

The culms of this small bamboo are covered when young with brown tomentum. They are much softer in texture and are generally more solid, that is, with a smaller stem cavity, than either of the foregoing common glabrous species. Owing to the abundance of these O. monostigma ("Choua") has small commercial value. The presence of this bamboo in the deciduous intermediate forests of the ghats and Konkan is of considerable botanical interest as it is confined to these and does not extend either into the evergreen or dry Deccan regions. The choua is usually found with the culms separated and does not affect growing in clumps nearly to the same extent as either Bambusa or Dendrocalamus, and it does not in consequence exercise the same strangling influence on the general vegetation within the radius of its distribution. Flowering clumps are frequently met with in North Kanara and there was a general flowering of this bamboo in the hill forests of the higher Satara ghats during 1904.

OXYTENANTHERA STOCKSII, MUNRO, *konda, k.*

A strong almost solid bamboo, used for punting, poles, etc., in North Kanara is generally cultivated near the villages along the Kanara and Konkan coasts. It is very rare in the ghat forests.

OCHLANDRA RHEEDII

VAR. *sivagiriana*, GAMBLE, *Hooda, k.*

This slender, unarmed, rough stemmed and hollow bamboo, often scarcely more than a very large reed, growing in dense clumps

of many (several hundred) culms, is found in the moist and heavy rainfall zone along the ghats where it is very common and it also extends down into the Konkan on the west. The Hooda is abundant in North Kanara along the banks of streams and nallahs and is sometimes found along the borders of the tropical evergreens. The slender whip-like culm tips bend and where they meet with support become scandent and grow to considerable lengths. This species flowered generally over large areas in 1896 in North Kanara, where it had, as far as I can ascertain, never before been seen to flower. It is of small economic value but is sometimes used in the construction of the temporary bridges on the Kanara ghats during the south-west monsoon.

The principal gregarious trees in the deciduous forests are Teak (Tectona grandis), Jamba (Xylia dolabriformis), Babul (Acacia arabica), Catechu (Acacia Catechu), Salai (Boswellia serrata) and the Ichil (Phœnix sylvestris). In the humid laterite ghat region various Strobilanthes, Sun ichil (Phœnix humilis), and Tale (Corypha umbraculifera) cover considerable areas often to the exclusion of other species.

CORRESPONDENCE.

TO THE HONORARY EDITOR OF THE INDIAN FORESTER.

THE AVENUES AND FRUIT GARDENS OF QUETTA.

I

SIR,—In the interesting article which appeared in the October number of the *Indian Forester* on the avenues of Quetta there was one name to which, I venture to think, sufficient prominence was not given. I refer to Mr. (now Sir Hugh) Barnes, the first Political Agent of Quetta. General Edwardes certainly brought out the English fruit trees which are or were in the General's garden, but the station, as a whole, was planted out by Mr. Barnes who was placed in charge of Quetta after the return of the troops from Kandahar in 1881 at the end of the second Afghan campaign.

At that time, as photographs show, there was hardly a tree in the station. There were plenty of apricots and mulberries in the villages around and the white poplar was frequent, but the peach was practically unknown, except perhaps in the neighbouring village of Kirani. The plane, the Kabuli willow, the weeping willow and the Lombardy and black poplars did not exist. All these trees grew in fertile Kandahar, with which place Quetta presented a bleak contrast, and with Sir Robert Sandeman's consent Mr. Barnes undertook to plant out the station. The wide ride along the Lytton road was made by taking a strip from all the compounds along it and was continued as far as the house of the Commanding Royal Engineer, for the civil station extended to that point in those days, and other walks and rides were aligned. They were then planted with slips, two or three hundred camel loads of which had been obtained from Kandahar where the natives at that time were not uncivil. Every roadside ditch was filled and the Residency garden stocked with Kandahar peaches. The results are to be seen now. A few years later woodcock spinney was laid out and the plantation planted below the gymkhana. Many a joke was made about the bare sticks in "Barnes' garden"! In all this Mr. Barnes was greatly assisted by Mr. Ingle, the Treasury Officer, and two or three Kandahari gardeners were employed under the control of some of the Kandahari *mirzas*, one of whom, Yakub Ali Khan, is now British news writer at Herat. Doubtless many of the peaches now in Quetta were propagated from grafts of the English trees introduced by General Edwardes and of the American trees imported by Colonel Gaisford in the nineties, but it is doubtful if any of the foreign peaches can better some of the Kandahar kinds.

I venture to hope that this further light on the history of the fine avenues and coppices now existing in Quetta will be of interest to your readers.

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Baluchistan.

II

SIR,—I have read my friend Mr. Hughes-Buller's letter with great interest and am sincerely sorry to hear that in my article I should have seemed to belittle Sir Hugh Barnes' well-known work and interest in the tree-planting operations in Quetta. As Mr. Hughes-Buller is aware I endeavoured to obtain details of the progress of the work from its initiation from the Hon'ble the Agent to the Governor-General's Office and also from that of the Revenue and Judicial Commissioner. After a thorough search had been made Major Archer informed me that no files on the planting operations could be found. It was therefore not without considerable difficulty that information on the subject was procured. Should the article result in the full history of the planting of Quetta finally being placed upon record it will have achieved the purpose for which it was written. The work was of such a remarkable nature and so well carried to the desired end, that it would have been a great misfortune had its origin and originators disappeared in that thick haze of oblivion which so quickly enshrouds and forgets good work done in India.

E. P. STEBBING.

III

[Speaking of the Quetta Command in my article on the above subject, I make use of the words "Sir George White and Sir Donald Stewart, both of whom followed him in the Quetta Command Sir Donald was in command of the Southern Afghanistan Field Force, of which the Quetta Garrison formed part)....." These words convey a wrong impression of the true facts of the case and my friend Lieutenant-General Sir Robert Hume, G.C.B, in drawing my attention to this point, has kindly favoured me with the following notes of historical interest upon the subject.—E. P. S.]

SIR,—Sir Donald Stewart went up to Kandahar through Quetta in 1878 and marched across from Kandahar to Kabul (fighting the Battle of Ahmed Khel on the way) to relieve Roberts who was shut up at Sherpur in 1879. He remained at Kabul until he handed it over to the new Amir, "Abdur Rahman," and brought the force back to India by the Khyber in 1880, having sent Roberts across to Kandahar to relieve General Primrose who

was shut up there by Ayoub Khan after the Battle of Maiwand. Roberts returned to India in September 1880 *viâ* Quetta and was sent up to command the S. A. F. F. at Kandahar in November 1880 Quetta was then held by a strong garrison on the lines of communications between Sibi and Kandahar and was commanded by a senior Colonel. In April 1881, I handed over Kandahar to the Amir's Governor and troops and brought our force back to Quetta where I arrived on 4th May 1881 accompanied by Colonel St. John, R.E., Head Political Officer at Kandahar, and Hugh Barnes, one of his young Assistants (afterwards Sir Hugh Barnes). The S. A. F. F. was broken up and Quetta was made temporarily into a Division. I remained in command there until November 1881, when Quetta was made permanently a 1st Class Brigade and I handed over the command to Colonel Stanley de B. Edwardes, who had been Chief Director of Transport in the S. A. F. F. with me. Colonel St. John remained at Quetta acting for Sir R. Sandeman until November 1881, and he and I left together, but Barnes remained on as Assistant Political, and I am sure had much to do with the development of Quetta and its surroundings for many years until ultmately he became Agent to the Governor-General for Baluchistan. Mr. Bruce and Mr. Ingle were both at Quetta with me and I remember Mr. Ingle especially as taking the greatest possible interest in the new station which was then only being laid out. Practically Colonel Stanley Edwardes was the first permanent G. O. C. at Quetta and evidently was a first rate man for improving and developing the place. He was made K. C. B. some years afterwards. When I got back to India in November 1881, Sir Donald Stewart was Commander-in-Chief never having been in command at Quetta itself, although it was under him when he commanded the Kandahar Field Force. Sir George White commanded at Quetta after Stanley Edwardes, but I do not remember the date. This is a long story, but you are so interested in Quetta that I am sure you will be glad to hear all about its origin as a Cantonment.

18th February 1906. ROBERT HUME.

A NEW METHOD OF FIRE-PROTECTION.

On page 669 of the *Indian Forester* for December 1905 "F. G." invites opinions on forestalling incendiary villagers by a system of early and light firing. The following remarks on the subject are offered with reference to the forests of the Surat Division.

The forests of the Mandvi and Bulsar Chikhli ranges are being successfully protected, so that there is no necessity for introducing a new system. But the Dangs forests, which comprise an estimated area of 656 square miles, have probably been overrun by fire from once to three times annually for hundreds of years, and protective methods have only recently been started. Left to themselves the inhabitants of the Dangs take no precautions whatever against firing the forest. While burning rab, smoking out rats, clearing the grass from under trees to facilitate the collection of mhawra nobody would ordinarily trouble to put out any fire kindled. The result is that the forests in the Dangs burn as soon as ever the grass is dry enough to be ignited by the hundred and one ways in which the Dang natives strew the country with fire. The Forest Department have no need to help or encourage the people in starting these early fires which commence in normal years in December, but in famine years as early as October. If the Forest Department once approved of such fires it would be a hopeless task to ever get people of the nature of the Dang natives to understand that fires are injurious to the forests and really not wanted. In the Dangs, therefore, "F. G.'s" scheme has been in force from time immemorial. In spite of these fires, however, the Dangs contain fine forests, and any injury apparent to the growing-stock is as much from the axe (lopping for rab) as from fires. Mention has already been made of attempts made at introducing fire-protection into the Dangs. Comparatively small areas have been experimented with. The results have generally ended in the successful protection of the area up to February or March and then a very bad conflagration, far worse than any early fire. But such protected areas are burnt once only, while the rest of the forest burns twice for certain (grass first and then leaves) and often is overrun a third

time. It is possible, therefore, though no one can say for certain, that an area overrun twice or three times in a season by fires of moderate intensity is as much damaged as if subjected to one fire only of greater intensity. Even allowing that the one intense fire does do more harm, the three more moderate fires also do, as can be seen, considerable harm, and are probably sufficiently intense to destroy vast quantities of seeds and seedlings. From what has been written it is, it is hoped, clear that the early burning of the forest in the Dangs is the normal condition of things. Having allowed the forest to burn early, or as "F. G." suggests had it burnt departmentally early, no amount of explanation would induce Dang natives not to fire the forest a second and a third time when the leaves fall. The second fire is more intense than the first; it is a widespread fire that licks the ground clean of useful leaves and of any unburnt patches of grass that escaped the early fires. It is the second and third fires that consume most seed. Hence the adoption of a scheme of early firing entails second and third fires and exposes the forest to serious injury. It would be, in the Dangs, the adoption of the *status quo*, a method calling for no exertion on the part of the forest establishment, and resulting in no improvement. At present when one sees the Dang forests blazing in all directions (a very pretty sight at night), one may possibly be excused for feeling at first something akin to despair. The Mandvi forests, however, which are only 64 square miles in extent, afforded food for reflection for nearly ten years before fire-protection showed signs of a successful issue. A quarter of a century would not be too much time to expend in experimenting in fire-protection in a place the size of the Dangs. When, however, a certain area has been protected up to March, a little more effort and expenditure will extend the period to the rains, and gradually a larger and larger area can be taken in hand. In this way perseverance, experience and expenditure will end, it is believed, in the whole Dangs being successfully protected from fire, provided from the beginning the people are taught to consider fires as the forester's deadly enemy, unacceptable in the forest in any shape or form.

E. M. HODGSON.

REVIEWS AND TRANSLATIONS.

THE FORESTER.

"The Forester"—by John Nisbet, D. OEc —Blackwood, London.

Dr. Nisbet has brought out a new book on Forestry entitled "The Forester," in two handsome volumes, the first dealing, after a lengthy "Introduction," with Sylviculture and what he terms "the British Sylva"—an account of each tree by itself—and the second with the rest of the subject. We may here consider Vol. I.

The preface shows that "The Forester" is yet another amplification of Brown's book of that name, but is in reality quite a different book. This is clear enough from the contents, a great deal of which could never have appeared in the original book. Dr Nisbet states that "The Forester" incorporates the essence of all the books he has written on the subject during the last thirteen years, besides new material. In these days scientific books cannot contain a great deal of original material, but must for the most part, if they are to be complete and useful, be a compilation of the best that has been thought and written to date upon the subject, and such "The Forester" appears pretty well to be but with many shrewd deductions and observations of Dr. Nisbet's own.

"The Forester" seems to be the nearest approach to Dr. Schlich's classic Manual that we have yet had in English, in so far as usefulness is concerned, and although one might at first be inclined to doubt the need for a second Manual on these lines, still the new book is more directly addressed to owners of British woodlands than is Dr. Schlich's Manual, which was of course drawn up with a different essential object.

"The Forester" is to be welcomed as a weighty addition to progress in true forestry in Great Britain. Dr. Schlich is, we think, the first and the chief exponent at home of what has naïvely been called "The New Forestry," and Dr. Nisbet is, these days, ably seconding him. Indeed the very book with the above naïve

name to which we allude is itself a most gratifying sign of a rational and progressive movement among Foresters in England, and incidentally we commend it to our readers.*

"The Forester" should be a real help to English Forestry, nor need any susceptibilities, tender though they are, be hurt, for although Dr. Nisbet states, directly enough, that there is much to be desired in British Forestry, and indicates the weak spots; he yet writes, we think, sympathetically and, in some directions, hopefully. and he indicates—what has probably not been sufficiently done in the past—that the conditions governing forest work in England are not in every respect similar to those of the Continent not merely economically, but also sylviculturally speaking.

We gather from this book that Dr. Nisbet is inclined to think that there is not, after all, such a very open field for Forestry in the British Isles as has been stated. He no doubt thinks there is a fair field, but he appears to consider it to be more restricted than is generally supposed. He estimates that of the 16¾ million acres of waste only some three and a half millions would probably be plantable with a fair chance of profit, and he points out that to be really profitable forests must be formed in large blocks, which could only be done by the State and some few large land-owners.

The estimates as to profits have, he considers, been based on two problematical data. On "National Economic" grounds, however, Dr. Nisbet is more thoroughly in favour of the formation of British forests than on the ground of a profitable speculation. The difficulty is said to be that forest industries are not, as on the Continent, in existence. Yet that there are centres absorbing great quantities of forest produce is clear enough from the fact that Great Britain's imports of wood, or wood materials, are some £30,000,000 annually, and are rising. Forest industries surely would gradually develop as the forests developed, and this might be taken as a certainty. It is the fuel and the produce of intermediate thinnings that sometimes fail to find a market, for material of this class cannot bear a great deal of carriage, but

* "The New Forestry"—Simpson (Dawson and Brailsford, Sheffield, 1900).

when timber has grown large it, at least, would bear carriage. It is admitted that the British Isles could grow as good timber as the Continent. Surely, then, forests grown on correct principles of Forestry could not fail in the long run to take up as great a part of the vast, and ever-growing, market as they had produce to supply. As the State forests grew, and with them forest industries developed, private land-owners too would, we think, also find the planting of woodlands profitable. And even in the matter of expense there is not such a great deal to be reckoned with; the usual fault is that too much, rather than too little, is done in woodlands. We must say we remain optimistic on the subject of British Forestry, but nothing can be done without perseverance, and in forestry more than in anything else—a fact we ourselves in India, professional foresters, constantly forget. What numberless experiments are dropped as failures because they are not immediately successful. Of course they are not, and if we would only stop to think we would realise it. It is, we think, one of the weakest spots in our administration, how entirely insufficiently we work out our experiments. Nor is it merely haste, we fear, and a desire to get forward; if we were quite honest we should admit that often our predecessor's experiments did not interest us and that we wanted to get on to one of our own. But nature will not be hurried, and if we will not be patient, we shall not know her secrets. The difficulty of course with us in India is the constant transfer of officers, but we hope the time is coming, not indeed when transfers shall cease—for they have some points of advantage—but when we shall have a central body charged with the collection and classification of data, and with the *continuous* carrying out of experiments, working these really to a finish.

The "Introduction" must have required much care and research It gives a history of forestry in England from the earliest times, and we do not know that this is anywhere else to be found in such a complete and compact form. *Shikar* was of course the beginning of things. Saxon kings assumed the overlordship for this purpose, and royal woods arose, of which the first mention is in 827, under Egbert, but the value of woods for

pannage of swine was recognised as early as 690. The forests were probaby composed of oak, beech, birch, pine and hazel, but the pine disappeared for a season, to be reintroduced in 1776. It was under the Norman kings, who were very keen sportsmen, that forest laws first crystallised into definite shape or at least were strongly insisted on, and most severe they were. Shikar has ever been the cause of much feeling and jealousy, no doubt as being a primitive instinct. The forest enclosures were sometimes most cruelly made, and for centuries there was a constant conflict between the kings and the barons about forest matters. Doomsday Book (1016—1086) mentions the following forests—New Dean, Windsor, Whichwood (Oxfordshire), Wimborne and Gravelinges (Wilts)—but these were by no means the only forests. In Essex, for example, was one, and the way in which the king would extend this forest (on one occasion even to the whole country) and the barons then make a "perambulation of the bounds," and cut away vast areas, was extraordinary. In 1184 the Assize of Woodstock was the first genuine code of forest laws having general application throughout the realm, which was then put upon a definite footing and made independent of the common law, as it long remained. To show how much stress was laid on the forest law it may be mentioned that even the very powerful clergy, who were at one time exempt from the common law, were not exempt from the forest law. This was an arbitrary code, but at least it abolished death penalties and mutilation. Magna Charta itself was concerned with the forest law, for King John had enclosed large areas as forest. The tyranny of the forest laws gradually became less and less, and departed with the Commonwealth. There were special forest Courts, held at the "Justice Seat," at intervals, under very exalted judges indeed, termed "Justices in Eyre." Besides the Justices in Eyre the forest administration consisted of rangers, verderers, regarders, foresters, agistors, and woodwards. These were practically only concerned with the game and the forest laws concerning game, except the woodwards, who were the only real forest officers as against game keepers. From among all these old forest terms (and there were many others) the English have

always a large body of tradition upon which to draw when a forest nomenclature is required, so why the Americans should use such a term as "field assistant" is not apparent. "Forest guard," one is always inclined to think of as a foreign term, yet it is a direct translation of "woodward," and thus more English than many of our other terms. In point of fact the use of woodwards only gradually dawned on people, as was natural when there was an excess of forest, and although they existed from early times the value of the trees of the forest does not appear to have been much appreciated till after the Wars of the Roses. Thereafter, as the centuries went by, more and more anxiety as to the national outlook from a forest point of view was shown, and a continuous string of Acts of Parliament, apparently barren of result, is to be found on the Statute Book down to our own times. The last important step of the Legislature was the appointment of Mr. Hanbury's Commission in 1902, from which some minute benefit appears to have resulted.

Chapter II of Part I is very important from the point of view of foresters at home, but we have already touched on it above. It concerns forestry prospects generally in Great Britain and the subject of forest education.

Part II is the "British Sylva," and takes each tree individually. A very large number of the trees mentioned will interest the arboriculturist rather than the sylviculturist. The method adopted for the forest trees is a useful one, namely to take each tree under separate heads, generally distribution, description, economic value, soil and situation, cultivation, sylvicultural characteristics, and sometimes continental notes. This last is a particularly happy idea. Dr. Nisbet is an advocate of conifers in Great Britain, that is, he believes that conifers as a general rule may preferably be planted, notably the larch, Douglas fir and Scots pine. The larch is, as we know, improperly grown in pure woods in Britain, and the error is being bitterly punished by the *Peziza willkommii*. Nevertheless in mixed woods there is a great place for the larch. The Douglas fir is an exotic species which shows signs of being very usefully introduced, but it has,

like larch, its own special enemies and these must be carefully watched. It is not only a very good timber but fast growing. This part of the book will be useful for reference. We think the heads under which each tree is treated might be further subdivided with advantage, for if, for example, the student desired to find, for any species, the aspect principally affected, or the altitude, or the extent to which it demanded light, or whether it grew normally as pure forest or in mixed forest, and so on, he would require to hunt a little, and as it is precisely isolated points like these that have generally to be looked up, it would have been a gain had they been given as definite heads in the description.

Part III, some 176 pages, is Sylviculture proper, and this part will really interest the forester most in a book of this kind. In the first place we do not like the plan adopted of splitting up the great Methods of Treatment into parts which are to be found in places separated by many pages. From page 359 there are some eight pages concerning coppice and high forest. Thence we go on to page 434, where cleaning and thinning are dealt with in eleven pages, and this is followed by regeneration, up to page 474. In the opinion of the writer of this review (with which no doubt many people may differ) the methods of treatment are preferably given the principal place in a book on sylviculture, and dealt with at length, each method being considered by itself, save where comparisons are necessary, and thrown up into high relief. Then the suitability of the principal species for the various methods of treatment might be considered, and the special ways of dealing with these principal trees in any given method (*e.g.*, how differently to deal with oak, or with beech, in a given high forest system) might follow. The other sylvicultural facts should, we think, be given a subsidiary place ; the general physiological facts, classification of soils, and so on, coming first. Thus we would not treat of thinning as a separate matter, but would deal with it when describing the method called by Dr. Schlich " shelter wood compartment," and other names by other persons. When thinning came in again under " selection " (another imperfect term, as our author truly remarks), or other method, less would need to be said on the point.

We would treat regeneration in its own place under each method of treatment, rather than take it separately with a consideration of its relation to each method of treatment in turn. Our reason for thinking this is that we believe less confusion results in the student's mind when the method is the skeleton to which the various facts of sylviculture are attached, rather than the other way about. It is important to have your method of treatment very clearly defined in your head when you set out to make a forest operation.

We have seen considerable confusion result when the operator set out to mark trees and was rather vague as to the system on which he was marking. Incidentally it may be remarked (though this is not exactly *à propos* of the present question) that in India the various methods of treatment are not as clearly defined as they should be, and are variously interpreted by different people. Undoubtedly we want here an authoritative arrangement of systems, with different names authoritatively laid down, not only for the well-known systems or methods, but also for the several varieties in systems which at present are included under one name. Confusion results otherwise. That by the way ; in the present case we are merely saying that we think the great European methods of treatment should be brought out into high relief, for although trained foresters know all about them manuals of sylviculture are for students also, and in the present case for persons not fully acquainted with continental forestry. We are not impugning the correctness of the description of the various methods of treatment—we would only arrange them differently. We, however, think that much more could have been added with advantage.

To revert for a moment to the question of nomenclature above mentioned, we think that besides the need for an authoritative definition of the different Indian methods of treatment there is a great need also for an authoritative set of general technical terms—a technology which both the Instructors of future Indian foresters at home and Indian foresters out here accepted and held to. This at least we think all will agree to. Thus Dr. Nisbet objects, correctly as we think, to the term "selection," as being misleading, but then still less do we like his term "sporadic, or casual fellings." Still we

are not prepared off-hand to find a substitute. For such a purpose nothing short of a committee, with much discussion, is requisite. Dr. Nisbet calls the " shelter wood compartment system," or " mode des éclaircies et de la régénération naturelle " (quoted by him as " futaie regulièr-e-procédé par coupe successives ")—" regular partial clearances," or " uniform natural regeneration." Surely D'Arcy's term " successive regeneration fellings " would be preferable. But who is to settle all this? Authority, we think, should take the thing up.

To take Part III more in detail, Chapter I gives the scientific foundations of sylviculture—the physiology of forest trees, agricultural chemistry and soils, both chemically and physically dealt with. These things are dealt with in twenty very interesting pages. We then pass, in Chapter II, easily and naturally to the sylvicultural characteristics of forest trees—climate, soil and situation, relative demand for light, shape of root, stem and crown, rate of growth, reproductive power, maturity and longevity—in easy sequence. Then come general characteristics—gregarious or other tendencies of species, density and canopy, and then we come, rather suddenly, upon notes concerning coppice and high forest.

Chapters III and IV are about artificial restocking and give much useful information. There is also much interesting matter concerning the planting up of sand dunes and other waste. If ever artificial afforestation is taken up at home it is satisfactory to feel that this part of forestry is thoroughly understood there. There is this to be said about artificial regeneration, as opposed to natural, that nature's way appears to be to alternate the species. A.M. Gerdil in France has lately drawn attention to the curious fact that if in a mixed forest of, say, silver fir and spruce the former is in the minority its natural regeneration will be the more successful, and *vice versâ*. Whether it be wise or not to go against this law it can apparently be overcome only by artificial restocking. Votaries of the French school, which lays so much stress on natural regeneration, are perhaps inclined to take only a limited interest in artificial restocking, yet they will admit that under certain circumstances reliance on artificial work may actually be wiser than reliance on natural regeneration, not merely in large blanks, but in forest of a normal type also. We

fear it is the fact that the modern trend of things in Europe is rather to discard natural regeneration, for somehow it seems regrettable. The writer of this review has seen a spruce forest in Austria where the coupes were clear-felled and restocked artificially with only five per cent of failures. And there are cases even in India where artificial regeneration is necessary—babul forest, for instance, is simplest regenerated, we think, by artificial sowing, and in some deodar forests the opening of the canopy by felling or girdling to induce a natural growth of young deodar often results merely in an impenetrable growth of weeds (Indigofera, Desmodium, etc., etc.). Fortunately the way to artificially restock deodar forests has been fairly well learned and the work can be done successfully and cheaply, while as regards babul artificial sowing, in years of normal rainfall, is perfectly easy and extremely cheap. Still we in India must in the main of course trust to natural regeneration with our vast areas. Although we so often find a wonderful advance growth in our fire-protected forests we must not be misled into thinking natural regeneration easy. The sad fact that several of our principal species have a tendency to spring up and then die back for a series, some times a long series, of years must be reckoned with. Were we to take, say, mature sal forests, with a complete canopy, and attempt a natural restocking according to the method of successive regeneration fellings as carried out in Europe, it would probably take us a great number of years, because of this unfortunate tendency in sal. Artificial regeneration being out of the question our proper way would probably be to open out the leaf canopy of the old forests a number of years in advance gradually, but eventually more freely than is usual in this method of treatment, and so avoid a long period of waiting till the young plants had become strong enough to go ahead, and even then we might not be successful. Probably the Group method is really preferable, for in that way we should be able to pick and choose our spots for felling throughout a whole periodic block, and not be tied down to the restricted area of a coupe. And it is important to reflect that, owing to the above-mentioned tendency of dying back and also to the rapid growth of grass and weeds in an Indian forest when much opened out, we shall be forced, at the

time of our regeneration felling, to *first find* our advance growth on the ground before removing the overhead or neighbouring cover, and shall not be able to act as in the Group method in Europe when, at the period of the regeneration felling, they fell groups of trees in order to allow space for seeding in groups. Of course the "preparatory thinnings" of the previous rotation will remain necessary, but when the actual moment for what would otherwise be the seed-felling arrives we must, we think, in India have our young growth already there; we shall have in India to *follow* the young growth with our main fellings rather than precede it as in Europe. But even in Europe there is often difficulty about regeneration, and the subject is capable of much useful discussion. We think the Methods of Treatment might advantageously have been dealt with at greater length.

In Chapter V we have much discussion on the principles of thinning, that subject upon which foresters differ so often. We gather that Dr. Nisbet is not in favour of the French system of leaving suppressed trees, because of the risk arising from fungi and insects and because the removal of suppressed trees leads to a better circulation of air. The French, however, lay stress on the protection given to the boles of the remaining trees and to the additional cover. We think that it is not perhaps sufficiently clearly brought out, that it is often necessary to reduce the congestion in a pole crop in order to help the trees of the future even when the crowns are all on a level. Dr. Nisbet has much to say against the vice of English forestry, over thinning.

In Chapter VI we find most of what is given on the subject of methods of treatment, but, as we have said before, the methods are treated as, in a sense, adjuncts of regeneration, instead of the other way about, and are but slightly dealt with. There is much of interest concerning the peculiarities of the various principal species in connection with their regeneration. The volume closes with a chapter on arboriculture.

This volume of "The Forester" is full of interest, and the style is so clear and lucid that it is easy reading. We hope it may effect its object and help forward the cause of forestry in England.

CURRENT LITERATURE.

In FORESTRY and IRRIGATION for December 1905 there is a note to the effect that Mr. George B. Sudwort, Dendrologist of the United States Forest Service, recently inspected the progress of the new turpentine investigations which the Service is carrying on in co-operation with the Hilman-Sutherland Land Company, near Jacksonville, Florida. These investigations are to test an improved system for tapping trees for turpentine. Some years ago the Forest Service perfected a new system of turpentining called the cup and gutter system, presumably the one in use in India. This system, it is held, however, is still not satisfactory since large "faces" are chipped from the trunks, causing wounds which limit the productive life and vitality of the trees. The turpentine industry like the lumber industry is so extensive in America that there is need to use all possible economy and the present experiments are designed to prolong the productive life of trees worked by the use of a new method of chipping without, it is hoped, reducing the average annual yield. We trust to be able to give our readers the results attained at a later date.

We have received a copy of the REPORT of THE AFFORESTATION SUB-COMMITTEE of the City of Leeds. The Report deals with the afforestation of the Washburn Valley Estate belonging to the City of Leeds and has been drawn up by Professor W. R. Fisher, Assistant Professor of Forestry at Oxford and Mr. Samuel Margerison. In October 1904 the Corporation of the City of Leeds appointed through their Waterworks Committee an Afforestation Sub-Committee. The latter visited the Washburn Valley and satisfied themselves that the Corporation owned a large quantity of land which would be suitable for growing timber. During the summer of 1905, Messrs. Fisher and S. Margerison visited the area and reported to the Committee as to the most suitable trees to plant, the land best adapted for planting, and prepared a scheme of work for the Sub-Committee to continue for five or six years on the assumption that the annual expenditure would be about £1,200. Work of a preliminary character has now been carried out at Swinsty Moor and tree-planting has been commenced, about 40 men, mostly from the unemployed citizens of Leeds, being at

present employed on it. The number of seedlings to be planted in the nursery is 638,000 and consist of spruce, Corsican pine larch, Scots fir, beech, birch, sycamore, mountain elm, ash, black alder, white alder. Seed will also be sown so that future planting may be undertaken without having to purchase the young plants. It is hoped to plant 150 acres per year. This would seem to be a most excellent commencement. Incidentally we learn that the Liverpool Corporation have already taken afforestation work in hand having laid out plantations and nurseries on the Vyrnwy Watershed.

The Department of Agriculture, Madras, have published a Bulletin (No. 55, Vol. III), on The GREAT MILLET or SORGHUM IN MADRAS by C. Benson and M. R. Subba Rao. This contains some interesting information on this crop. We read that in British India from 20 to 24 million acres of sorghum are raised annually, this crop ranking as far as cereals go in respect of area next to paddy. About 4½ million acres are grown in the Madras Presidency. Although not as important a food produce as paddy the importance of the crop is very great, as it not only produces a food-grain for a large section of the community, but also yields a very large supply of first-class fodder for cattle. It follows that sorghum cultivation in the neighbourhood of valuable forest reserves should be encouraged since in this way grazing in the latter could be lessened.

SHIKAR, TRAVEL, AND NATURAL HISTORY NOTES.

THE GIR FOREST LIONS.

The following note recently appeared in a daily paper anent the lions of the Gir forest:—

"His Highness the Nawab Sahib of Junagadh having granted permission to shoot lions in the famous Gir forest, Colonel Kennedy, Agent to the Governor of Bombay in Kathiawar, with Lord Hawke, Captain Berthon and K. S. Ranjitsinghji proceeded in a special train placed at their disposal by His Highness from Jetalsar to Verawal *en route* for Lalala, one of the Gir centres, where a good camp had been arranged. On March 2nd *khabar* was received at

the camp of two lions, one lioness and two cubs lying in a nalla called Popatdi, and the party at once proceeded to that place and took up seats in a machan. A drive was organised *by which the animals ran past the machan* and both lions *fell to admirable* shots from Colonel Kennedy and Lord Hawke." (The italics are ours). "The party returned to Rajkot on Monday, the Agent alone halting here to see His Highness the Nawab. The shooting arrangements were excellent and were under the supervision of Nawabzada Sherjumakhanji, who is himself a good sportsman (*sic*). Last year eight lions were shot by different friends of His Highness."

Such is the account of the performance of men termed "sportsmen." The use of the word in such a connection is to be deplored. It is time that the attention of all true sportsmen was drawn to this question of the Gir lions. Instances are on record, plenty of them, of the extinction, within the period that man has occupied the globe, of various species of animals. Perhaps amongst the most startling and notorious of recent cases are those of the North American Bison (now almost extinct) and the African Quagga (supposed to be actually exterminated). The loss of these animals to the world, and the latter is one of unprecedented folly since the Quagga was the natural horse of South Africa, easily tameable and immune to the fatal horse diseases of the country, is entirely the result of the actions of such "sportsmen" as the Gir forest lion-slayers of the above paragraph. Blanford in the *Fauna of British India* states that "In India the lion is verging on extinction. There are a few living in the wild tract known as Gir in Kattywar, and a few more in the wildest parts of Rajputana, especially southern Jodhpur, in Oodeypur and around Mount Abu." In the seventies of last century lions were common near Mount Abu, several were shot near Gwalior, Goona and Kota and a few still existed near Lalitpur, between Saugor and Jhansi. One is said to have been killed near Goona in 1873. In 1864, one was killed near Sheorajpur, 25 miles west of Allahabad; and when the railway was being made between Allahabad and Jubbulpore, in 1866, a fine lion was shot by two of the Engineers near the 80th milestone from Allahabad. About 1,830 lions were common near

Ahmedabad. Several years previously, in the early part of the century, lions were found in Hurriana to the northward and in Khandesh to the south, in many places in Rajputana (one was shot in 1810 within 40 miles of Kot Deji in Sind) and eastward as far as Rewah and Palamow. It is probable, says Blanford, that this animal was formerly generally distributed in North-Western and Central India.* Eastward and north of India the lion is not found, and almost the only part of Western Asia in which it is common is in Mesopotamia and part of South-Western Persia. There can be no two opinions on the fact that the lion has approached perilously near to extinction in India, and the question which faces and causes the gravest anxiety to the true sportsmen and zoologist is how to preserve the few which remain from the hand of the butcher. Sport in the killing of them there can be none. In the above account of the most recent "shoot" we read of two of the wretched beasts being driven, probably at a walk or trot, past the "sportsmen" safely ensconced in machans and falling to "admirable" pot shots. Lord Curzon set a good example a few years back by not only refraining from shooting any of the poor brutes but in refusing to be a party to or to countenance their slaughter. This example should, one would have thought, have proved sufficient for all sportsmen resident in the country. It is the ignorant globe-trotter, who is often far from what we in India term a sportsman, that has to be guarded against, and we trust the Government of India, after this latest example, will endeavour to take steps to prevent the extinction of such an interesting animal zoologically as the Gir lion.

EXTRACTS FROM OFFICIAL PAPERS.

EXPERIMENTAL CULTIVATION OF PLANTS, SHRUBS AND TREES YIELDING LEAF MANURE IN MADRAS.

Resolution—Forest No. 257, dated 17th November 1905.

In their letters the Conservators of Forests report, with reference to paragraph 2 of Government Order, No. 676, Revenue

* J. A. S. B., XXXVI, part 189; P. A. S. B., 1868, p. 198; Journal of the Geographical Society, 1870, p. 204.

dated 29th June 1904, the results of the experimental cultivation of plants, shrubs and trees yielding "leaf manure" during the forest year 1904-1905.

2. In Board's Proceedings, Forest No. 73, dated 4th May 1904, recorded by Government in the order mentioned above, the Board accepted the proposals of the Conservators of Forest, Central and Southern Circles, to sow the seeds of suitable varieties in selected places in the reserved forests in Tanjore, Trichinopoly, North Salem, North Arcot and Chingleput districts of the Central Circle, and in the unreserved lands and reserved forests of Madura and Tinnevelly, respectively, of the Southern Circle. The Collectors of other districts, who considered that the existence in their districts of a sufficient supply of green manure rendered such measures superfluous, were requested to see that the supply available was placed at the disposal of the ryot at a price suited to his means. The Board at the same time observed that every encouragement and assistance should be given to ryots who wish to grow such plants, shrubs and trees on their own patta lands.

3. The reports from the Conservators show that experimental cultivation was undertaken on a limited scale in the districts of Chingleput, North Arcot, Tanjore, Trichinopoly, Madura and Tinnevelly, and proved a failure except in Madura, owing generally to the unfavourable character of the season. In Madura, two blocks of unreserved lands were selected with an aggregate extent of 70 acres, lying in the Periyar zone and easily accessible. Seeds of avaram (*Cassia auriculata*) mixed with a small quantity of seeds of other species were sown broadcast: and the Board is glad to note that seedlings have sprung up over three-fourths of the area sown and are thriving although, owing to scanty rainfall, their growth is not so good as it might otherwise have been. The Conservator, Southern Circle, hopes that after from three to five years they will be sufficiently mature for their leaves to be cut and used as manure. The Conservator, Central Circle, has not explained why no experiments in this direction were undertaken in North Salem, but states that two plots with a total area of 168 acres have been prepared and will be

sown during the current year. The scanty rainfall appears to have affected the demand for leaf manure during the year.

4. As regards the steps taken by the Collectors to encourage the use of green manure by the ryots and to assist them in growing it on their own patta lands, the reports furnished by the Conservators give little information; nor do they deal with the question whether the price now charged for leaf manure cut in the reserved forests is such as to place it within the reach of the ryot. The special attention of all Collectors will again be drawn to the importance of placing a good supply of leaf manure at the disposal of the ryots, at moderate rates wherever the want of it is felt. In Tinnevelly, the offer to selected ryots in the Srivilliputtur, Sankaranayinarkoyil and Sattur taluks of grants of assessed waste lands under the "cowle system" free of assessment for five years for the purpose of cultivating kolingi (*Tephrosia purpurea*) and other shrubs suitable for leaf manure met with no response.

MISCELLANEA.

SOUTH AFRICAN SCHOOL OF FORESTRY.

REGULATIONS PUBLISHED.

The Gazette yesterday contains particulars of the establishment of a South African School of Forestry, which are as follows :—

The South African School of Forestry is being established by the Government of Cape Colony for the scientific training of Forest Officers and for research in South African Forestry. The aim of the school is to provide a thorough course of instruction in forestry with special reference to South African conditions.

Provision is being made for ten resident students at Tokai. Five of these will be candidates for two Cape Forest vacancies in the upper grade of Forest Officers and accommodation will be reserved for five students nominated by the Governments of other Colonies in South Africa.

The science departments of the South African College and any other similarly equipped College in the Colony will be used for the theoretical work of the School of Forestry.

A Reading Room and Reference Forest Library will be provided for students at Tokai.

The herbarium at the Conservator's office and the forest timber collections both at the Conservator's office and at Tokai will be available for purposes of instruction.

The Tokai arboretum, which now comprises the largest collection of timber trees in South Africa, affords unique opportunities for practical instruction in sylviculture. To this will be added the pineries and sand-reclamation planting in the Cape Flats, together with the fine arboreta and forests at Ceres-road, comprising forest estates of 20,000 acres. Such instruments as are required for practical forest work, including plane tables, barometers, chains, dendrometers, and calipers will be provided.

Arrangements will be made for granting certificates or diplomas signed by the Senate or Council of the College concerned, and countersigned by the Chief Conservator of Forests on behalf of the Government, to students who have satisfactorily completed the course in forestry.

The terms and vacations will be according to the advertised prospectus of the College concerned.

The charge for tuition, including use of all laboratories, and athletic fee may be obtained on application.

The boarding arrangements at Tokai will be in charge of the Conservator of Forests, Western Conservancy, and under the management of the local Superintendent of Plantations. The inclusive charges for board, etc., are £13 10*s*. per term ; every student will be required to pay an entrance fee of £5 to cover provision of bed linen, table linen, etc.

Residence, when permitted during the vacations, will be charged at the rate of £1 10*s*. per week.

All fees are payable in advance. Cheques for tuition fees should be made payable to the College Registrar, and for boarding fees to the Superintendent of Plantations, Tokai.

Students will require to travel between Tokai and the College for lectures and laboratory work, and will make their own arrangements for transit to and from Tokai and Retreat Stations.

Students will be admitted in 1906 to the first year of the regular forestry course on producing evidence that they can profit by the course.

Students will be admitted in 1907 to the preliminary scientific course for forestry, on conditions which will be published at a later date.

Two appointments as District Forest Officers in the Cape Forest Department will be allotted on the completion of the course. The method of selection will be the following :—Four candidates will be chosen in order of merit on the results of the final examination, and the two appointments will be made from this list by a committee of Forest Officers (under the presidency of the Chief Conservator of Forests), who will be guided partly by the results of the final examination and partly by the results of a supplementary examination on the instruction given in the indigenous forests of Knysna and the Eastern Districts of Cape Colony or the Transkei on the conclusion of the course. Accommodation at Tokai will be reserved for five students nominated by the Governments of other Colonies in South Africa. The school will also be open (with the sanction of the Government) to members of the Forest Department, who will, however, make their own boarding arrangements. Facilities will also be afforded to students from abroad who may wish to avail themselves of the opportunities offered.

Those who may wish to take part of the course will be afforded opportunities for doing so. They will, however, make their own boarding arrangements.

The regular course in forestry covers a period of two years, preceded by a preliminary scientific course of one year, specially arranged for those students who are not qualified to enter the regular course. The courses of instruction are: (*a*) Preliminary Scientific Course for Forestry.—General Botany, 6 hours a week ; General Chemistry, 6 hours a week ; General Physics, 5 hours a week ; Pure Mathematics, 3 hours a week ; French or German, 3 hours a week ; General Geology, 5 hours a week ; Introduction to Forestry, 3 hours a week. (*b*) First Year Forestry Course.—Botany (2 terms Physiology, 2 terms Mycology, 2 terms Forest Botany), 6

hours a week ; Chemistry (soils and plans, 2 terms), 6 hours a week ; Climatology and Meteorology (1 term), 3 hours a week ; South African Geology (1 term), 3 hours a week ; South African Arboriculture and Sylviculture, 4 hours a week ; Survey and Elementary Engineering, 6 hours a week ; Forestry (lectures and field work), 6 hours a week. (*c*) Second Year Forestry Course.—Forestry (lectures and field work), 6 hours a week ; South African Arboriculture and Sylviculture, 4 hours a week ; Climatic Influence on Forestry, 2 hours a week ; Forest Entomology, 3 hours a week ; Forest Law, 1 hour a week ; Forest Geography and History, 1 hour a week.

The above subjects are for two terms only, the third and fourth terms being entirely devoted to work in the forest.

On the conclusion of the course, arrangements will be made for tours of instruction in the indigenous forests of Knysna and the Eastern Districts of Cape Colony or the Transkei.

The cost of such tours will be as little as is consistent with efficient instruction.

Application for further information and for admission to the School of Forestry should be addressed either to the Chief Conservator of Forests, Cape Town, or to the College Registrar.

Every applicant will be required to furnish a medical certificate.

It is very desirable that applicants should be of robust constitution, and able to ride and to shoot.

Note.—Continual residence in the Government boarding establishment and admission to the classes will depend on satisfactory conduct, attention to work, and physical health.—*Cape Times, December 25th*, 1905.

ARBORICULTURE IN THE PUNJAB.

From a Resolution just issued by the Punjab Government it appears that two hundred and eighty-six miles of avenues were added by District Boards during the years 1902—05. Five hundred and ninety-eight miles were planted, but in 148 miles the arboricultural operations were not successful, the failures being 24 per cent of the length planted, as compared with 67 per cent in the previous triennium. The districts in which most activity

was shown belong to the arid group, Mianwali and the two Canal Colonies. Fifty-three per cent of the roads suitable for arboriculture are now stocked with trees. The area under groves managed by local bodies showed a fall of almost 700 acres. The failures equalled 61 per cent of the area planted (48 acres). There was an extraordinary fall of 2,331 acres in the plantation returns, but it is explained that out of this area 1,580 acres should not have been recorded as plantations at all. Nurseries and gardens have also diminished; but the gardens at Amritsar and Gujranwala are reported to maintain their popularity.

Regarded financially the arboricultural operations of the District Boards can hardly be termed successful, as they are conducted at a deficit of about a lakh and a third of rupees. The needs of arboriculture will, however, be considered by Government in distributing the 6½ lakhs grant made by the Government of India to District Boards.

The Irrigation Department during the triennium planted over a thousand miles of avenues, more than half the total length suitable for tree-planting having now been stocked. The greater part of the planting operations took place in the arid districts in the west of the Province, where the water of the Jhelum and Chenab Canals enabled a high percentage of success to be achieved. Some 2,700 acres of nurseries were started with excellent results, the failures representing only one-fifth of the whole. Arboricultural operations cost the department over three lakhs of rupees, as compared with just under two lakhs in the previous period of report.

The Buildings and Roads Branch of the Public Works Department, on the other hand, make tree-planting profitable, realising Rs. 16,404 net revenue from their operations. About two-thirds of the total length of the roads considered suitable are now planted with trees, and the percentage of failures is commendably low.

The Lieutenant-Governor observes with pleasure that on the whole more care than previously has been devoted during this triennium to this important subject, and trusts that it will continue to engage the attention of all officers concerned. He hopes that district officers will keep in view the two chief means to successful

tree culture, namely, (1) the enlistment by their own interest in the matter of the active help of the villagers, and (2) the employment of a properly trained expert as district forester, whose time will not be taken up chiefly in the auctioning of dead trees but in the care of living ones.

THE SLADEN EXPEDITION TO THE INDIAN OCEAN.

In the last volume of this Journal, p. 606, we shortly mentioned that an expedition was being undertaken for the exploration of the Indian Ocean.

Mr. J. Stanley Gardiner, M.A., Lecturer in Zoology and Fellow, Caius College, Cambridge, leader of this Expedition, who returned to England recently, has given an interesting account of the work of the Expedition, which was accommodated on board His Majesty's surveying ship "Sealark," Commander Boyle Somerville, and was financed by Mrs. Percy Sladen in memory of her late husband, and by the British Association. A grant was also made by the Balfour Memorial Fund in Cambridge. Mr. Gardiner said: "From Colombo we shaped a course for the Chagos Archipelago south of the Laccadives, which is believed to be on the line of a former land connection between India and Madagascar, and the site of submerged land. Between all the different atolls and banks of the group soundings were taken, and these went to show that if land had existed there the subsequent depression must have been very great indeed. I do not think there is any question that land existed at one time or other between Colombo and Madagascar. It may be said that the great depth of water in that region rather goes against any supposition of that kind. The enormously strong currents, however, must be taken into account. These could easily have worn away the bottom and increased the depth, more especially in view of a discovery we made, namely, that these currents extended right down to the bottom. This is an interesting point, as up to the present it had been believed that currents were active only to a comparatively small distance below the surface. From Diego Garcia we sounded right on to Mauritius, where we spent a

fortnight examining the reefs and amplifying the existing charts. Cargados was our next stopping place, soundings being taken all the way, while dredging operations were also resorted to. We then steamed on to Saya da Malha and Coetivy. We had thus completed the line between Mauritius and the Seychelles, and we now ran a line from Madagascar to the Seychelles, doing similar work all the while. As far as land animals were concerned we were exceedingly disappointed. None of the specimens were indigenous. All seemed to have been brought to the islands by artificial means. Each reef was different from its neighbour, and all were different from those in the Pacific Ocean or other parts of the world. An important point which we ascertained was that all the reefs are extending outwards on their own remains or *débris* on the same principle as a moraine is formed at the base of a glacier. All these masses of rock were literally covered with various growths and animals. Enormous stems of black coral—the rarest variety—seven feet high, were secured. The reefs we found were mainly formed of white coral. One of the most interesting discoveries we made was that floating life is exceedingly abundant at all depths down to about 1,200 fathoms in seas 2,500 fathoms deep. By floating life I mean animals which form the food of whales and deep ocean fish, and which, up to the present, have been believed to live on or very close to the surface. A variety of enormous squids were fished out as well as jelly fish, and prawns fully six inches long. Some of these latter were blind, while others had huge eyes, but nearly all of them had phosphorescent organs, which would naturally be due to the fact that they live at a depth where almost total darkness prevails. The blind varieties had enormous feelers or antennæ, some of them extending to twice the length of their bodies. Speaking broadly, this is the first time that an expedition has taken a small area and has examined it thoroughly. The great "Challenger" Expedition practically touched every part of the globe, except the Indian Ocean, and a thorough examination was of necessity out of the question. His Majesty's ship "Sealark" on the other hand only took the western half of the Indian Ocean, and made a thorough

and exhaustive work of it. Compass variations were also most carefully ascertained and noted in the course of our cruise. In many places we found that the changes were such as to constitute a real danger to navigation. The Admiralty charts of the regions we worked in will be corrected and brought up to date in accordance with my reports.

PUBLICATION OF RANGERS' NAMES IN THE PUNJAB GAZETTE.—We have received a communication from an aggrieved correspondent who pertinently enquires why the names of the Rangers on the subordinate establishment in the Punjab are not gazetted in the Provincial Gazette. He states that this is a real grievance to the Punjab Rangers for the following reason. Many of them are stationed in the interior of the Himalayas with little communication for months with the outer Forest World. Their chief connection in this respect is the *Indian Forester* but, although Rangers in other Provinces appear in the *Indian Forester* Gazettes, the Punjab ones never do and thus they have not this means of ascertaining what transfers are taking place. Our correspondent would rather seem to imply wonder as to why the Honorary Editor of the *Indian Forester* does not supply the omission of the Punjab Government. We can only reply that the *Indian Forester* Gazettes are made up from the weekly Provincial ones, and that until Rangers' appointments are gazetted in the Punjab Gazette we have no means of obtaining information of such. We would draw the attention of the Conservator of the Punjab to this grievance of his Rangers, and would ask whether it would not be possible to gazette transfers of the Ranger class as is done in other Provinces in India.

PROPOSED SCHOOL OF FORESTRY FOR WALES.—The question of the establishment of a school of forestry for Wales has lately received prominent attention from the representatives of the seven Welsh counties affiliated to the University College at Aberystwith. Mr. E. Robinson, of Boncath, on Tuesday introduced a discussion on the subject at the annual meeting of the Agricultural Society of the College. He said that if the respective citizens would vote on an average £300 each and give an annual

subsidy of £100 each for eight years, the proposed school of forestry after that period could easily be made self-supporting. It would be most opportune to establish a tramp labour colony in connection with the school, and to a certain extent this would solve the problem of these pests of society. The Government must come forward to second the efforts of the County Councils by advancing money to landowners at a reasonable rate of interest. Mr. J. Herbert Lewis, M.P., said that the question of afforestation was rapidly becoming one of national concern. The Departmental Committee had made it clear that a shortage in the world's supply of timber may be looked for in the near future, and that millions of acres of waste land in the United Kingdom are suitable for afforesting. Our large municipalities could do much, following the example of the Liverpool Corporation at Vyrnwy, by afforesting their catchment areas. Birmingham appeared to have a great opportunity in this direction in South Wales. At a later stage forestry and other agricultural questions were discussed privately by a joint committee of County Council representatives with the view to the adoption of an extended scheme of instruction during the coming year.

TASMANIAN TIMBER FOR SOUTH AFRICA.—The Tasmanian representative in South Africa, Mr. H. J. Rhodes, has forwarded a despatch to the Premier of Tasmania confirming his cable of August 25th to the effect that the shipment of mining timber forwarded by the "Kent" had given much satisfaction, and that further important business had been secured. He now reports that there is every probability of a large trade being opened up with South Africa in timber for mining purposes. The prejudice which formerly existed there against the use of Tasmanian timber has, to a certain extent, been removed, at any rate, so far as it applies to the use of stringy bark in the mines, with the result that substantial orders have been given for large quantities of it. If the conditions applying to the orders are strictly complied with, Mr. Rhodes has no hesitation in saying that most important business will result, and he therefore trusts that shippers will be very careful to supply only timber which will be a credit to the State.

Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by G. S. Hart.

A LOG-ROLLING ROAD IN BASHAHR, N. W. HIMALAYAS.

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FORESTRY TUITION AT OXFORD AND DEHRA DUN.

A study of the course of tuition laid down for the instruction of the probationers of the Imperial staff of the Forest Service at Oxford has suggested that a comparison of that course with the one given to the recruits for the Subordinate Executive Service at the Imperial Forest School, Dehra Dun, may prove of interest and, perchance, of use

THE IMPERIAL FOREST SERVICE.

We alluded recently to the fact that the entrance examination for those wishing to follow the Oxford course and obtain appointments in the Upper Controlling Staff of the Forest Service consisted of the subjects Mechanics and Physics, Chemistry, and Botany ; the standard being the low one of the Preliminary Examination in the Honour School of Natural Science at Oxford. Candidates must have previously passed Responsions at Oxford or some equivalent examination. A qualifying examination in German is also included.*

* *Vide* Delegacy for superintending the instruction of probationers for the Indian Forest Service and for granting Diplomas in Forestry. Oxford Clarendon Press (1905).

The course of study at Oxford extends over a period of three years, and the probationer for the Department must attend all the lectures and obtain the Diploma of Forestry within the period. This Diploma is, however, granted to all members of the University who have—

(1) Pursued the approved course extending over two years.

(2) Undergone a course of practical work.

(3) Satisfied the examiners in the prescribed examinations.

THE COURSE OF STUDY.

The following is the prescribed course of study :—

1st Year.—Mathematics, Chemistry of Soils and Organic Chemistry, Geology, Botany, Forestry (Sylviculture, and either Protection or Utilisation), Geometrical Drawing and Elementary Forest Engineering, German.

2nd Year.—German, Geology of India, Botany (Pathology, structure of timber and special systematic botany), Entomology, Forestry (forest management, administration, utilisation or protection), Forest Law, Surveying, Book-keeping in relation to Indian Forest Accounts.

We will consider these subjects briefly in detail :—

1. *Mathematics*--Up to and including Plane Trigonometry.

2. *Chemistry.*—(*a*) Soils—constituents, origin and formation, classification, properties. Physical and chemical analyses. Exhaustion and restoration of soils. (*b*) Organic determination of composition and molecular weight of organic bodies. Laws of isomerism. Method of formation and general reactions of various substances. Outlines of vegetable chemistry.

3. *Geology* (*1st year*).—Morphology and Physiology of the earth. Volcanoes, hot springs, earthquakes, mountain-building and dislocations. Development of earth. Scenery, structure and history of the British Isles. Fossils as a means of identification of strata. Economic application of geology. (*2nd year*).—A course on the geology of India will be given.

4. *Botany* (*1st year*).—Physiology. General Morphology and Anatomy of Fungi and Vascular plants. Classification. Candidates

should also attend the general course given by the Sherardian, Professor of Botany. (*2nd year*).—Pathology including diseases and injuries caused by fungi and other plants. Special botany of timber trees. Systematic botany of Indian trees, shrubs and other forest plants.

5. *Forestry* (*1st year*).—(*a*) Sylviculture—Foundations of sylviculture. Locality in relation to forest vegetation. Development of forest trees. Character and composition of woods. Sylvicultural systems. Formation and regeneration of woods (preliminary works, direct sowing, planting, natural regeneration). Tending of woods (pruning, thinning). Sylvicultural notes on forest trees. Practical work in forest garden, Baghley wood and other excursions. (*b*) Forest Protection—Protection against man. Boundaries. Forest offences and rights. Protection against animals and plants, atmospheric influences, and against water, avalanches, shifting sand. (*c*) Utilisation—Harvesting, conversion and disposal of wood and minor forest produce. Auxiliary Forest Industries (antiseptic treatment of timber, saw mills, wood carbonisation, extraction of oil of turpentine and resin, preparation of tannin and paper materials, &c. (*2nd year*).—Forest Management (Mensuration, valuation, foundation of forest working plans (working scheme), preparation of working plans). Administration (utility of forests, the state in relation to Forestry, Forestry in the British Empire).

The text-books are Schlich's Manual of Forestry.

6. *Geometrical Drawing.*—Construction of scales and reduction of areas ; use of instruments ; preparation of plans, &c.

7. *Forest Engineering.*—(Based principally on Indian practice.) Use, characteristics and manufacture of materials. Road construction, type designs of small bridges, culverts, bungalows. Timber slides, tramways, wire rope bridges, &c.

8. *German.*—A Public School course in this language.

Note.—French is omitted.

9. *Entomology.* Outlines of elementary Zoology. Hydra Lumbricus. Study of anatomy, &c., of an insect type.

Classification of insects, metamorphosis. Diseases and enemies, relationships. Other Arthropoda of importance.

Note.—The Vertebrata are left untouched.

10. *Forest Law.*—Indian Penal Code, Criminal Procedure Code, Evidence Act, Forest Law of India.

11. *Surveying*—Vernier and Sextant, Plotting and Computation of areas. Mapping, topographical details, conventional signs, colouring and finishing of plans. Prismatic compass, levels, theodolite, chain surveying, traversing, plane tabling. Abney's level.

12. *Forest Accounts.*— As required by the Forest Service.

THE PRACTICAL COURSE.

This course comprises nine months from the early part of October to the beginning of the following July. For seven months the students are placed with selected German Forest Officers, the remaining time being passed in visiting specially selected districts and forests. We shall allude later to this part of the course.

EXAMINATIONS.

There will be two examinations (partly written and partly oral) for the Diploma.

The subjects of the first examination are—Botany, Geology, Entomology, and of the second Forestry, theoretical and practical, including sylviculture and protection, utilisation, management and administration. A candidate at the final examination must present certificates showing that he has attended approved courses of instruction in 2, 3, 4, 5, 6, 7, 9, 11; satisfy the Delegates that he possesses a sufficient knowledge of Mathematics and has passed examinations approved by them in Organic Chemistry and in Surveying.

Probationers for the Forest Service must also satisfy the Delegates that they have a sufficient knowledge of the Geology of India, Indian Forest Accounts and Forest Law. A candidate for the second examination must have passed the first one and present certificates showing that he has satisfactorily completed the prescribed course of Practical Instruction in Forestry.

The examination will be held about September 20th in each year.

THE SUBORDINATE EXECUTIVE SERVICE.

In an article in this Journal last month it was shown that the upper grades of the Subordinate Executive Service received their Forest education at the Imperial Forest School at Dehra Dun. The Subordinate Executive Service is the Service from whence the Provincial Service is recruited and the students at Dehra are candidates for the former Service only. Two courses are given at the School, one in English and the other in Hindustani. We shall only consider here the course followed by the Upper Class in English. It may be remarked, however, that the utility of the lower vernacular course is open to considerable doubt, since it can only be delivered in one vernacular and is consequently only available for natives of the northern parts of the Continent. In a country like India, where the languages vary with the races, this fact from the first depreciates the value of the course.

The English course lasts 23½ months and the students are prepared for a certificate in Forestry by the Higher Standard.

THE COURSE OF STUDY.

The following are the subjects taught in this course:—

Forestry (sylviculture, utilisation, forest working plans, both theoretical and practical), Mathematics (elementary), Physical Science (Chemistry, Physics, Physiography, Geology, Mineralogy and Soils), Botany (theoretical and practical), Zoology, Drawing, Surveying, Forest Engineering, Forest Law and Forest Accounts and Procedure.

Taking these subjects in detail we find that the lectures delivered by the Instructors and the standard required from the students at Dehra Dun compare not unfavourably with the present course prescribed for the Imperial probationers at Oxford. Considering the subjects in the order already given above—

1. *Mathematics.*—Is practically identical with that required for the Imperial Service

2. *Chemistry.*—A general course is first given, the lectures being accompanied by experiments conducted by the lecturer (who is a professional chemist). No practical work is done by the students themselves. This is followed by lectures on soils on the

lines of those delivered at Oxford. A course is also given in Elementary Physics.

3. *Geology.*—Physiography, &c., on the lines of the course given at Oxford. Particular attention is paid to Indian Geology and the distribution of the fauna and flora. Mineralogy is also dealt with.

4. *Botany.*—Morphology and Anatomy. Physiology. Wounds and diseases. Classification. Geographical Botany. Indian Trees Chief classes of Indian forests.

5. *Forestry.*—(*a*) Sylviculture. Constitution of Forest. Climate and Forest. Soil and effect on growth. Composition of forests. Economic constitution of forest. Sylvicultural systems. Working of forests. Protection against climate, animals and plants, fires, &c. Artificial crops. Direct sowing, planting; artificial forests. (*b*) Utilisation.—Properties of wood and their classification for sale. Wood industries. Tools, felling and conversion, disposal and sale of wood. Minor forest produce. Regulation of hunting, shooting and fishing. Mineral products. Minor Forest Industries (manufacture of charcoal, cutch, distillation of sandal wood oil, resin, and turpentine, impregnation of timber). (*c*) Working plans (general principles, field work required in connection with their preparation ; preparation of plans for various forest systems, working plan report).

6. *Geometrical and Freehand Drawing.*—The course is practically identical with the one given to Imperial students. A course of estimating is also given.

7. *Forest Engineering.*—Much the same course as given to Home students, but probably a more practical one. Building materials. Building. Road-making. Bridges. Transport of timber. Construction of wells. Water and river bank works. Demarcation.

8. *German.*—Not given.

9. *Forest Zoology.*—Elementary biology, systematic review of the animal kingdom with detailed descriptions of those groups of importance in Forestry. Anatomy of insects. Classification. Detailed accounts of families important in Indian Forestry. Life

histories of noxious and useful insects. Anatomy of Vertebrata. Classification. Noxious and useful animals in Indian forests. Damage done. Practical work.

10. *Forest Law.*—General Law. Forest Law of India. Criminal Law applied to protection of forests and their produce in transit. The Forest Service (Nature, appointment of officers, responsibilities, protection of officers by law ; offences and legal powers of officers).

11. *Surveying.*—A theoretical and practical course is delivered on the lines of that at Oxford. The practical course is eminently satisfactory.

12. *Forest Accounts and Procedure.*—General Principles of Book-keeping. Cash accounts. Forest procedure and yield returns. General procedure.

THE PRACTICAL COURSE.

Before joining the School each probationer must undergo a course of some months' work in the forest under a Divisional Officer. The practical course at the School is of considerable length, about two-thirds of each year being spent in camp, *i.e.*, 1st year, from 15th April to 15th June in hill forests ; 1st November to end of March in plain's forests ; 2nd year, from 1st April to end of May on a lengthy tour in the hill forests again, and November 1st to end of February in the plain's forests in the United Provinces and Punjab. As we shall see this course compares very favourably with that given to the Imperial Officers, it being remembered that it is passed *under Indian conditions.*

EXAMINATIONS.

The examinations are of two kinds :—

(*a*) Monthly to test progress ; (*b*) Final.

The monthly examinations are held on the last two working days of each month, the finals being held in March of the second year.

The certificates obtainable after the final examination are a "pass" and an "honours" certificate. The former is granted to

students who obtain over 50 per cent. of the aggregate marks allotted to all subjects (this must include 50 per cent. of marks given for each of the subjects Botany, Forestry, Surveying and Engineering). The honours certificate is given to students who obtain over 75 per cent. of the total marks, including over 50 per cent. in each individual subject. These certificates are only granted under the orders of the Board of Control.

GENERAL REMARKS.

The above brief résumé of the two standards will, we think, suggest to the minds of our readers that the course given at Dehra compares satisfactorily with that given at Oxford, our opinion being that the latter, or at any rate the theoretical portion of it, requires stiffening up very considerably. In some ways the Dehra course is perhaps superior to the Oxford one. Undoubtedly the greatest advantage possessed by the Indian forest subordinate is that he is trained in the country in which his future work is to be carried out, that he becomes acquainted in his practical course with forests of a similar nature to those in which he will have in future to work, and is thus the sooner able to apply the knowledge he has acquired in the lecture hall. For, instead of having his mind steeped in minute and precise, and perchance narrow and crystallised, methods of forestry, applicable and peculiar solely to highly civilised small States, he is from the first placed face to face with the larger areas and wider interests in which forest conservancy has to be practiced in India; he learns the difficulties which confront the Forest Officer in dealing with ignorant native races; he recognises that innumerable rights will have to be defined and treated with circumspection; and discovers the difficulties that exist in growing and extracting his timber, and in collecting and disposing of minor produce, &c., &c.

To the Home-trained probationer these aspects of Indian Forestry remain practically an unopened book, for without a knowledge of the present conditions of the country he must find it difficult to attach the proper relative importance to what may be detailed upon the subject in the lecture room and impossible to

BURMA

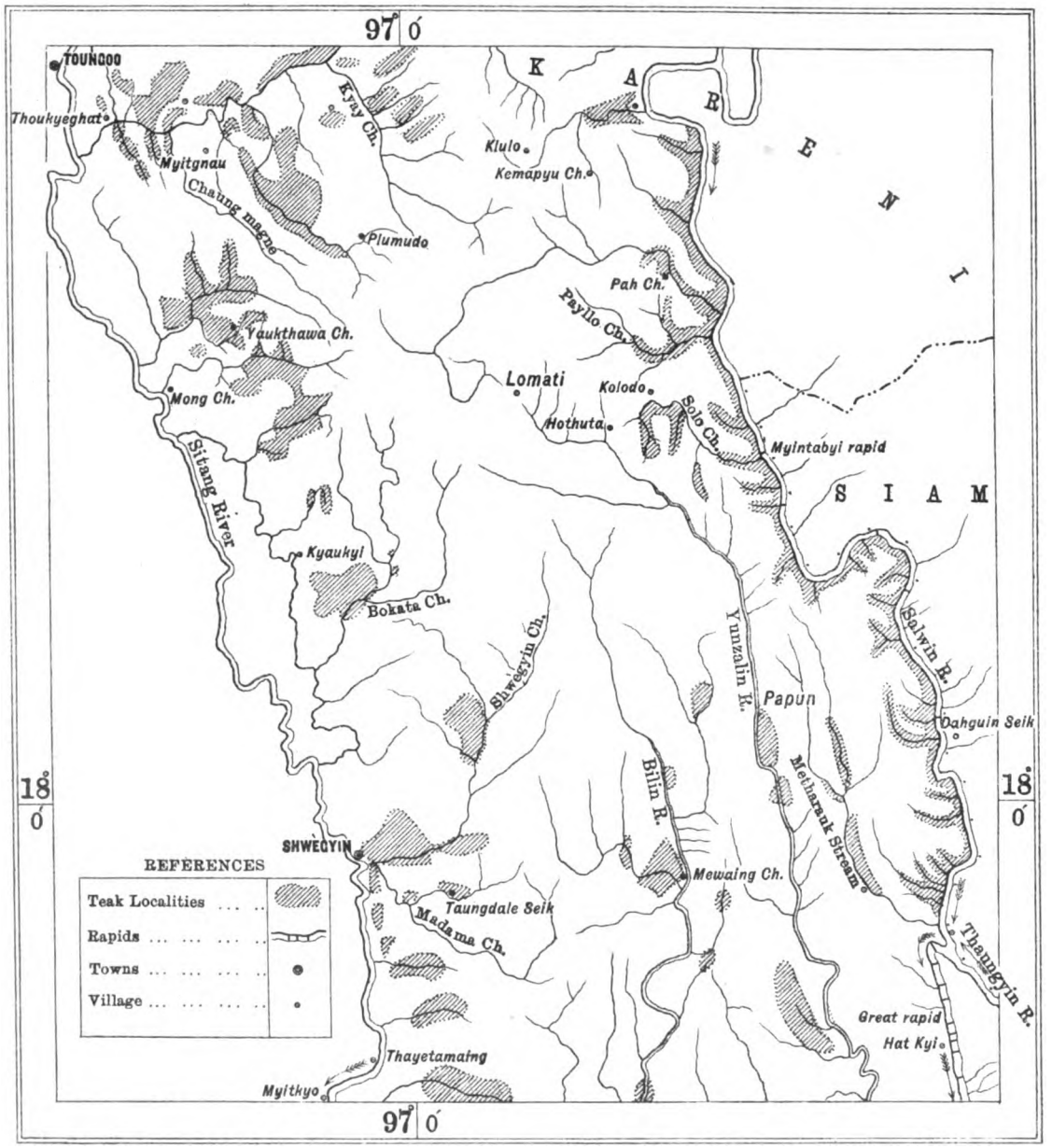
SKETCH MAP

Showing

TEAK LOCALITIES in MARTABAN

between

SITANG and SALWIN RIVERS



Reduced from Map published in Selections from Records Government of India Foreign Department XXIX 1861

Miles 10 5 0 10 20 30 40 Miles

Scale 1 Inch = 16 Miles

apply his theoretical knowledge in the absence of local experience!

In other respects the courses greatly resemble one another In the Home course of tuition the student does not acquire a knowledge of Forest Zoology upon the lines most suitable for India, and he consequently arrives in the country ill-prepared to continue his studies there, while on the other hand much of the best work done under this head at present has been carried out by Dehra-trained Forest Officers.

SCIENTIFIC PAPERS.

ON SOME BAMBOOS IN MARTABAN SOUTH OF TOUNGOO BETWEEN THE SALWIN AND SITANG RIVERS.

BY SIR DIETRICH BRANDIS, K.C.I.E., F.R.S.

In April last Mr. F. B. Manson most kindly collected for me in the vicinity of Papun specimens of ten species of bamboo, five of which were in flower. They reached me in November, too late for "Indian Trees," but some notes regarding them will be found under Addenda of that work. While examining these specimens it occurred to me that an account of the bamboos in this part of Martaban might be useful to some of my younger friends in Burma. The Teak forests in this part of the country I visited repeatedly in my early Burma days, and in 1861 I prepared a map of the Teak localities in Tenasserim, which I would recommend for reference. It was published in the selections from the records of the Government of India (Foreign Department No. XXIX, Calcutta, 1861), and a reduced copy is appended to this paper.

The bamboos in the valley of the Yunzalin and on the hill between that river and the Salwin* were examined by me in March 1880, on my last tour of inspection in Burma, and notes regarding them will be found on pages 151—157 of my Report, entitled

* The spelling of the geographical names both in the Map and Memoir is that of the Author. We have not deemed it advisable to alter either.— HON. ED.

"Suggestions regarding Forest Administration in British Burma, 1881."

Two remarkable species are found north of Papun, belonging to the genera *Phyllostachys* and *Thyrsostachys*. The former is No. 8 of Manson's collection and the following remarks are mainly based upon the notes and specimens kindly sent by him. It was collected on the hills, generally close to streams, three days' journey from Papun. It is a small kind, single stemmed, with creeping rhizomes but growing densely in fairly large patches, up to 50 acres in one place, sometimes among trees. Average height 12—20, some vigorous stems as much as 30 ft. internodes 5—9 in. long and 1 in. in diameter. It is used for making baskets and pahs and the creeping rhizomes are prized for walking sticks; they resemble the so-called Malacca cane. The joints are used for the bowls of pipes, the stem being made of a small branch. A bamboo similar to this collected on Sinlum kaba at 6,500 ft. in the hills east of Bhamo (*Sèdan*, Burm. *Sinwa*, Kachin) was sent me a few years ago, also in leaf only, by Montague Hill (No. 196), used for pipe-stems, internodes 8 in. long, diameter 5/8 in. Hill, however, does not say that it is single stemmed. **Phyllostachys Mannii* (*Maipang pük*, Shan, imported from China) is cultivated at Bernardmyo and at Shillong.

Phyllostachys is closely allied to the large genus *Arundinaria* of which many species are well known to foresters in the Himalaya, in the Khasi and Naga Hills. These two genera can easily be distinguished by the younger culms and principal branches being flattened or grooved on their inner side above the axillary bud and hence angular. The branches from each node are less numerous than in most species of *Arundinaria*, usually 2—3 only, and the uppermost leaves often in pairs, the internodes between these two last leaves being very short. Fig. 1 represents a small portion of a leaf of this species, the longitudinal nerves are 33 on 1/4 in. and the transverse veins are very prominent, dividing the leaf into squares or short rectangles. Some species of *Arundinaria* (for

* The specific names are those adopted in "Indian Trees," hence I have as a rule omitted authorities.

instance *A. falcata*) have the transverse veins obscure, others (*A. spathiflora*) have the transverse veins prominent, but far apart, so as to form long rectangles with the longitudinal nerves.

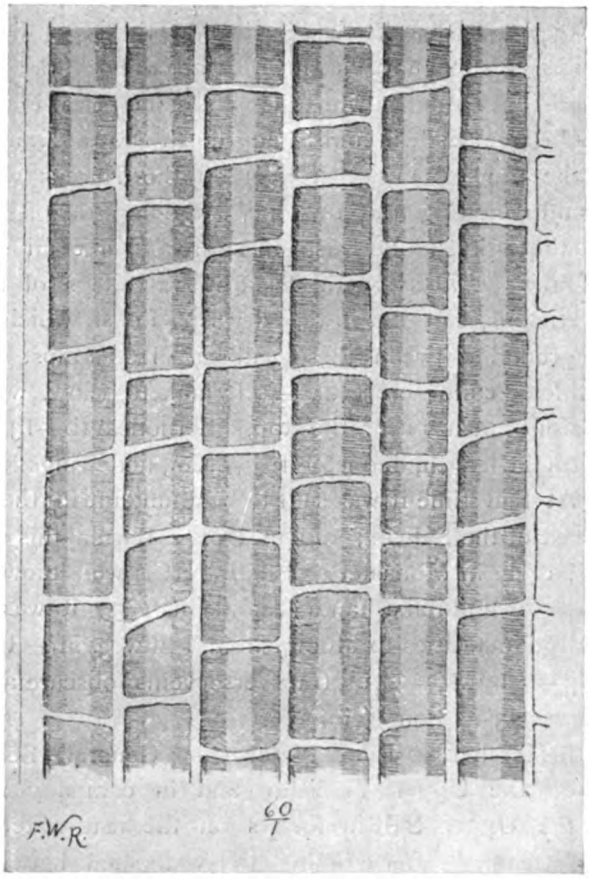


FIG. 1.—PHYLLOSTACHYS S.P.—Piece of leaf (×60) showing 6 fine and one stout longitudinal nerve (33 n. on ¼ inch) and the bright bands of the silica cells alternating with the nerves. Transverse veins conspicuous, straight, oblique or slightly bent, dividing the leaf into squares and short rectangles.

An *Arundinaria* with leaves similar to this species of *Phyllostachys* is *A. elegans*, discovered by Kurz on Nattaung east of

Toungoo at 5—7,500 ft. also known from the Naga Hills, and which will probably be found elsewhere on the hills of Burma.

Thyrsostachys siamensis (*Ti-wa*, *Ti-yo-wa*, Burm.) I found in May 1859 between the Solo and Kèmapyu Chaungs. The Solo passes Kolodo and joins the Salwin river at the Myintabyi rapids. Thirty miles further north a much larger stream, the Kèmapyu empties itself into the Salwin. This stream rises in the high mountains between Salwin and Sitang north-west of Khulo village, where at the time of my visit in 1859 the Karens were busy roasting and smelting the tinstone, large deposits of which are found on those hills. Between these rivers, not far from the Salwin I found the *Ti-wa* with Teak in the valleys of the small mountain streams, but not in the dry Eng forest, which occupies the high ground between these valleys. It is a most handsome bamboo, tufted, culms erect 25—40 ft. naked below, with dense half-whorls of branches near the top, internodes 10—13 in. long, very uniform in length, diameter 1½—3 in., node-rings horizontal, elegant. At that time it was said to be abundant in the Siamese territory east of the Salwin; and in Upper Burma this species is cultivated largely in Monastery gardens. It is well known as the best bamboo for umbrella handles, and in 1859 it was brought down in large quantities to Moulmein and Shwegyin. The leaves are small, 3—6 by ⅓—½ in. transverse veins obscure and longitudinal nerves 33—48 on ¼ in.

On 6th March 1880 I met Major (now General) Seaton near Hothuta on the Upper Yunzalin and in company with him examined the Upper Salwin forests on the head-waters of the Metharauk stream. After crossing the watershed between Yunzalin and Salwin, we found ourselves in the region of one of the gigantic bamboos known as *Waklü* by Karens and as *Kyellowa* by Burmans, which was called *Bambusa Brandisii* by Munro and *Dendrocalamus Brandisii* by Kurz. It is No. 9 of Manson's collection. This, like many species of the same genus, flowers frequently, the heads of spikelets are glodose ⅓—½ in. diameter arranged at regular intervals in long spikes resembling a necklace. The leaves are large, the culm sheaths thick, coriaceous, with a long,

linear-lanceolate blade. I have measured culms 120 ft. high, the internodes are 20—27 in. long and 5—7 in. diam. This species is common in the lower Thaungyin valley, chiefly on limestone. I have also found it in the Attaran district and specimens have been sent from Upper Burma. It is similar to and perhaps identical with *D. flagellifer*, a Malay species, which Colonel Beddome found on the lower slopes of Muleyit hill at 2,000 ft. in Tenasserim. I may here mention that the home of the most important gigantic bamboo, *D. giganteus*, with large ovate spikelets, ½ in. long, which is cultivated largely in Burma and India, is not yet known with certainty. I am inclined to think that this species also may yet be found wild in the Martaban hills.

In the Yunzalin valley are other species of the same genus, chiefly *Waya*, *D. longispathus*, a large species, the culms attaining 60 ft. easily known by very long, thin, but long-persistent culm-sheaths, densely clothed outside with black stinging hairs. (Suggestions, pp. 155, 157.) *Myinwa*, (*D. strictus*) is found on dry limestone rocks in the Upper Salwin forests, but is less common in Martaban than in Pegu.

D. membranaceus, *Hmyin-byu-wa* Burm. *Wa-myi*, Kar. (Manson No. 10). Like the common *Myinwa* this species has small leaves, the flowers are in dense globose heads consisting of numerous spinescent spikelets. In *D. strictus* the heads are hairy, in *D. membranaceus* almost glabrous.

Nearly allied to *Dendrocalamus* is the large genus *Bambusa*, of which three species are known to me from this part of Martaban: *Thaik-wa* (*B. tulda*), *Kyakat-wa* (*B. arundinacea*) and *Kyathaung-wa* (*B. polymorpha*). The chief distinction between these two genera is that in *Bambusa* the caryopsis has a thin, membranous pericarp, adherent to the seed, while in *Dendrocalamus* the seed is enclosed in a hard, crustaceous or cartilaginous pericarp. The flowers of *Dendrocalamus* as a rule have no lodicules, while in *Bambusa* the lodicules are prominent. (Fig. 2, *b*.)

Thaik-wa grows in the Sitang valley, elsewhere it is perhaps less common in Martaban than in Tenasserim, Pegu and Upper Burma. It is readily distinguished by the large, wavy fringed

auricles at the top of the culm sheath on both sides of the triangular blade, the palea is sharply acute, a little shorter than the glume, the lodicules are large and the anthers are bidentate at the tip-

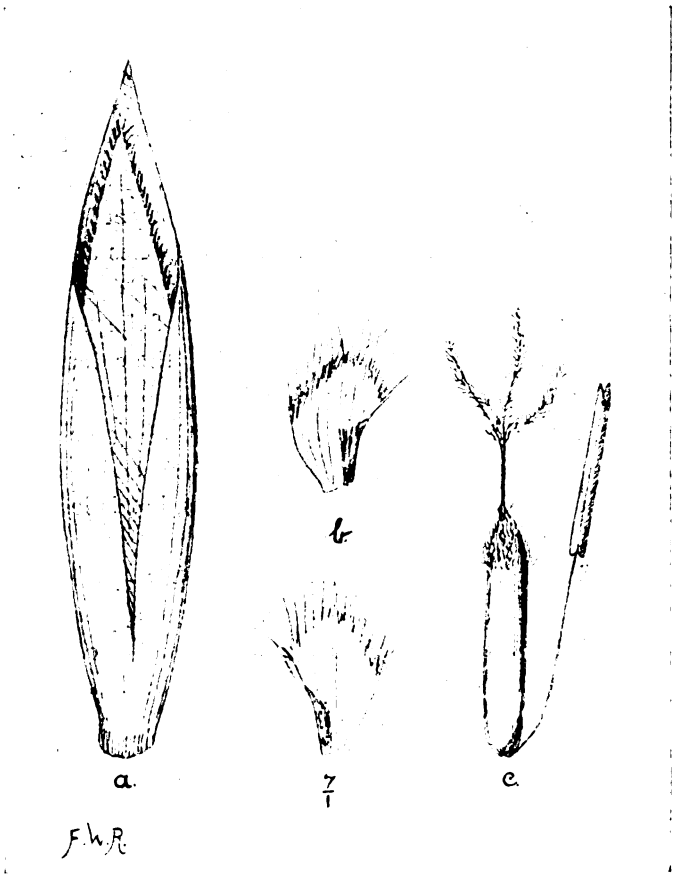


FIG. 2.—BAMBUSA TULDA, ROXB.—(×7)—(*a*) Front view of glume and palea, the latter shorter. (*b*) Two lodicules, large and well developed in this species. (*c*) Ovary, hairy at the tip, style glabrous, with three densely papillose branches. Stamen, the anther emarginate at the apex.

(Fig. 2, *a*—*c*.) *Kyakat-wa* is common along the banks of the larger rivers, for instance, on the Salwin near the mouth of the Kèmapyu Chaung.

Kyakat-wa is readily known by its spinescent branchlets, the culms closely packed in large clumps, not quite straight, but slightly zigzag at the nodes with thick walls. The culm sheaths are shorter than the internodes, coriaceous and prominently ribbed on the inside. The spikelets may at once be recognised by the palea slightly longer than the glume, densely set with long stiff hairs at the keel. (Fig. 3, *a*, glume, back, palea onger, tip visible ;

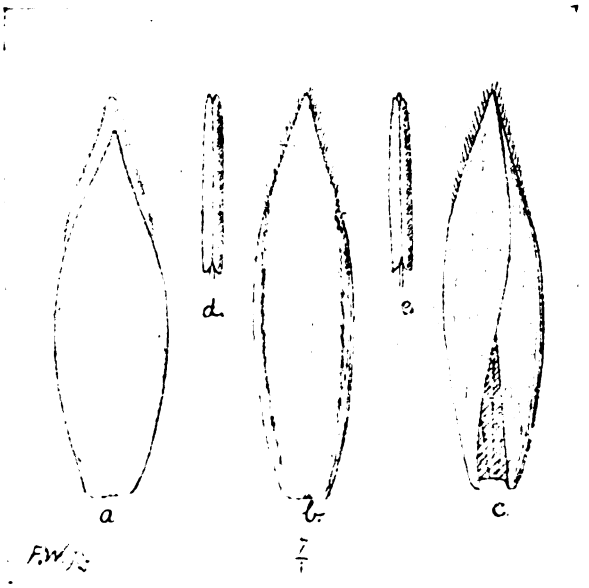


FIG. 3.—BAMBUSA ARUNDINACEA, WILD.—(×7)—(*a*) Back view of glume and palea, the latter longer. (*b*) Back view. (*c*) Front view of palea. (*d*) Anther, tips emarginate. (*e*) Anther, tips acute.

b c, palea back and front view.) The tip of the anthers varies I have found them blunt or slightly emarginate in some mucronate in other cases. (Fig. 3, *d*, *e*.) *Kyathaung-wa*, the most elegant of all Burmese bamboos, well known to foresters, is found in the Sitang valley on hilly ground, and, as stated on p. 151 of my Report of 1881, is associated with Teak in the Upper Salwin forests.

Thaik-wa at times flowers gregariously, while at other times single clumps will be found in flower. The two other species always flower gregariously, *Kyakat-wa*, as far as known, at intervals in the same district of 32 years, while the length of the flowering period of *Kyathaung-wa* is not yet known.

(*To be continued.*)

ORIGINAL ARTICLES.

SELECTION BY AREA.

BY A. G. HOBART-HAMPDEN, I.F.S.

It may be of interest if I describe a somewhat novel form of Selection that has lately been prescribed in a Working Plan.

Our usual plan in India in applying Selection is to make a partial enumeration of the stock, to divide the forest into the same number of coupes as there are to be years in the felling cycle, making these approximately equal, and then to calculate the maximum number of trees which may be felled annually.

It is assumed that by multiplying the number of trees on the percentage of the area enumerated by the total area of the forest the result will give sufficiently nearly the correct total number of the trees in the forest. In point of fact this is a very wild assumption, and in my experience nearly always wrong—at times exceedingly so. In my opinion these partial enumerations, with a high forest method of treatment in view, are so much waste of time and money, and if enumerations are made at all they should be complete, and made for the three highest girth classes.

To equalise the outturn of the coupes, while keeping them of approximately equal area, the earlier numbers are put in the richer parts of the forest, and it is assumed that this will sufficiently nearly result in an equal annual outturn and render it permissible to safely apply our figure of annual maximum number of trees for felling. This again is obviously the very wildest of assumptions. It is done without calculation and purely on surmise, and that

being so how can the figure of trees prescribed for felling be anywhere near right for each coupe?

Either of these assumptions would be enough in itself to completely vitiate the figure of trees to be felled annually—even though this figure is laid down for safety's sake as a *maximum*. But there are other assumptions also before this figure is arrived at.

The number of trees annually to be felled is arrived at by adding the whole of the trees that are mature to that proportion of the next class which during the felling cycle will enter the mature class, and dividing by the number of years of the felling cycle. (This is in cases where the girth classes are normally represented; when this is not the case the arrangement has to be altered, as is shown on pages 136 and 137 of D'Arcy's Working Plans).

To find the number of II class trees which in the course of the felling cycle will enter the I class (the lowest dimension of which is here supposed to be the size of maturity) the number of years which a II class tree of the lowest dimension will take to reach the size of maturity is found by reference to sample plot measurements. This is perhaps all that can be done, but it is to be noted that the rate of growth really varies all over a forest according to efficiency of protection, soil, aspect, density of crop, altitude, etc., etc., and may very well not be truly represented by the few individuals that it is possible to measure in sample plots. Moreover, it is exceedingly difficult to really properly locate plots which are true samples of the whole forest. My experience is that good crops are generally chosen for sample plots, and not average ones. There is therefore a very considerable possibility of error in arriving at the number of II class trees which will become exploitable in the course of the felling cycle.

In addition there is to be considered the proportion of II class trees which will fail to survive. For this we have nothing but assumption to go on.

It is thus the fact that when a Selection forest is to be worked on the basis of the number of stems to be felled annually there is

room for the very widest error. If the figure is placed too high we shall not find the number of mature trees present; if the figure is placed too low we shall have to leave (probably all at one end of the coupe) a number of trees which sylviculturally and economically ought to come out—*and this error is a vital one.* It is taken for granted that we must not take II class trees to make up our total; this, in my opinion, would be utterly inadmissible.

Assuming even that we had pitched on the right number of trees to fell annually the fact that there is also an area check (that of the coupe) will constantly put us wrong, for if in one coupe we find less mature trees than may annually be taken, the balance of trees must, by the hypothesis, be elsewhere. Yet we are unable to take them when we do find them in another coupe, because the annual figure for felling is a maximum. To be consistent a Selection forest worked on the basis of stems should have no area check.

On the other hand if—as in the case of the Working Plan to which I am referring—we confine ourselves to prescribing that all the mature trees found in the coupe are to be removed, and at the same time adjust the areas of the coupes in such a manner that in each year we shall find an approximately equal number of mature trees present, we cannot go far wrong. Even if our coupes thus formed do not in fact turn out to have in them, at the time of felling, an equal number of mature trees, the error is not a vital one, such as a sylvicultural error would be.

Exception is sometimes taken to coupes varying considerably in size. Yet I cannot see why; a coupe does not need to be a fixture-block and compartments give all that is required in the way of permanent divisions in a forest.

The problem, then, lies in the differentiation of our coupes. To arrive at this satisfactorily the enumeration of the highest three classes of trees must be carried out completely and *localised*, that is, recorded separately for separate areas, in which of course there is no difficulty. The enumeration compartments must be small, so as to enable us to tell how the stock stands from point to point

throughout the forest. In each small compartment we learn the number of mature, of II, and of III class trees standing, and we thus obtain a true picture of the forest at the time of enumeration. In laying out the boundaries of the coupes from this information it is necessary to work with two of the assumptions of the ordinary form of Selection. These are the number of years it will take a II class tree of the smallest dimension to enter the I class, and the percentage of II class trees which will not survive to become I class, but if either of these assumptions turns out to be wrong the result is not a sylvicultural error—it is merely an error in the figure of annual outturn available. Moreover these errors can be corrected in a short time by prescribing—as has been done in the Working Plan which is in my mind—that, after say ten years, one or two compartments just about to be felled shall be re-enumerated, and compared with the statement for these compartments as it was calculated they would be at the time of felling. We may even dispense with this enumeration and simply compare the actual result in trees felled in the various compartments with what it was calculated they would contain at the time of felling. In the light of the error discovered the boundaries of the remaining coupes of the cycle can be readjusted, if necessary, so as to produce an approximately equal outturn.

By adding the number of mature trees in the forest to the II class trees which will become mature during the felling cycle, and dividing by the number of years of the cycle the annual number of trees available is found. The direction of the fellings will be from the richest part of the forest towards the poorest. Coupe I is then laid down from a consideration of the enumeration of the trees in the (small) enumeration compartments. The other coupes follow, it being always remembered that the number of the coupe gives the number of years that will have elapsed since the enumeration—and that accordingly that number of years growth must be added to the II class trees enumerated on the area in question in order to find how many of them will have become mature in the year for which the felling is fixed.

For example, our annual number of mature trees for felling is, say, 2,200. We are dealing, say, with Coupe VIII, and the areas adjoining Coupe VII (already laid down) are :—

Block K. Cpt. I, in which there are 1,132 I class trees and trees of the II class which will to the number of 125 have become I class in the 8th year.

Block	K. Cpt.	2	...	*nil*	(I class	...	*nil*	(II class)
„	„	3	...	74	„	...	18	„
„	P. Cpt.	4	...	140	„	...	14	„
„	„	3	...	480	„	...	54	„
	Total		...	1,826			211	=2,037

There is thus a deficit of 163 trees to be made up.

The adjoining area is Block P. Cpt. 2, and it contains 465 I class trees and 79 II class trees which will be mature in the eighth year ; total 544. As, however, we only require 163 trees to complete the coupe we arrive at the number of acres of Block P. Cpt. 2. to be added by dividing 163 by 544 and multiplying by 157 (the area of Block P. Cpt. 2). This gives 47 acres, and 47 acres of this compartment are accordingly added to make up Coupe VIII.

This may possibly seem complicated, yet it is not really very much so, and it will be found comparatively simple to distribute the total number of trees to be felled during the cycle through the area of the Circle. Note that the enumeration compartments can be as small as we like—they have only to be laid down on a map, and natural or artificial features are generally available in any quantity, while even if they are not, as in a forest on a flat, correct measurements can be easily laid down on a map.

Of course it may be objected that some of the mature trees will have to be left for seed-bearers, there not being always at hand other seed-bearers of lower classes. This, however, would not amount to much, and it would apply, more or less, alike to all coupes. As a matter of fact in the Working Plan which is in

my mind this is not a difficulty, because it deals with a Deodar forest in which it has been found by experience that reliance cannot be placed on natural regeneration, since the only result of fellings is, as a rule, not a young crop of Deodar but an impenetrable growth of weeds. As, then, artificial regeneration, has been shown by experience to be, in that place, both successful and inexpensive the Working Plan deliberately prescribes the removal of all mature trees and their replacing by artificial regeneration wherever required.

It will be recollected that we have been dealing with an example of a forest in which the age classes are fairly well distributed as shown by the enumerations, but in order to be sure of this it was necessary to enumerate the III class, as well as the I and II. Should the I class be in excess, or the II class in deficit, various adjustments may become necessary, but for our present purpose--the comparison of ordinary Indian Selection with this special method—it is useless to consider this; it would be no more difficult to apply such adjustments to this method than to ordinary Selection.

In the enumerations for the Working Plan which has served as the basis for these remarks it may be noted that far greater accuracy than usual (in regard to the number of trees passing up from one size class to another) was assured by the simple plan of dividing the colour classes on the callipers by white lines into three sub-classes, with one, two and three white dots respectively in the three divisions.

This method of treatment might suitably be called "Selection by area" not that "Selection" is a good word, but it is at least understood by foresters, and a substitute is difficult to hit upon. It is claimed for the method that it is not based on so many assumptions as ordinary Selection, that such assumptions as it does make use of can be easily corrected at short intervals, and that even if its single aim (an approximate equal annual outturn) is not, after all, achieved the error is of no great importance, while sylvicultural errors (from which it is free) are very much so.

C. C. HATT.

The death of Mr. C. C. Hatt, Deputy Conservator of Forests, which took place at Rajabatkhawa, in the Buxa Division, on the 14th January 1906, has deprived the service of one of its most capable officers and many of us of a true and valued friend. Hatt joined his appointment in India in 1891, and served in Bengal till the formation of the new Province of Eastern Bengal and Assam to which he was transferred with his Division. In the early part of his service he chiefly distinguished himself by his work, including the preparation of first working-plans, in the Puri Division and in a neighbouring State, Mohrbanj, to which he was deputed for nearly two years. A severe attack of cholera obliged him to take furlough from 1900 to 1901, and after his return he undertook the preparation of first working-plans for the Kurseong and Buxa Divisions. To this difficult task, and the development of the Buxa Division of which he held charge for the greater part of the time, he devoted the whole of his energy, regardless of the exposure in very unhealthy tracts which was a necessary part of the work; and his working-plans, of which the last was finished only a short time before his death, will be durable monuments to his zeal and capacity. His devotion to his profession did not prevent his taking an active interest in manly forms of sport. He played football for his county and for Cooper's Hill, and was one of the best bats in the Cooper's Hill cricket team of his time; and in recreations, as in work, he endeared himself to his associates by his unselfish keenness and modesty.

FELLING WORK IN BASHAHR, N.-W. HIMALAYAS.

BY G. S. H.

The felling of large trees uphill on steep and difficult slopes is often held to be dangerous, and no doubt it is extremely so without the aid of ropes to assist in directing the fall of the stems; but where a man can be got to go up the tree, lop the main branches and fix a rope in the upper [illegible] there is no danger to speak of and the success of the operation should be certain.

Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by G. S. Hart.

DEODAR, 15 FEET GIRTH.

Felled up hill with the aid of ropes; butt resting on stump.

Of course it is necessary to place the cuts properly, that is, for the cut on the uphill side to be taken well past the centre of the stem and for the cut on the opposite side to be brought down on to the former from a slightly higher level, while the bases of both cuts must be kept approximately parallel to each other and at right angles to the axis of the stem and to the direction in which it is desired that the tree shall fall. If this is done the tree, just before falling, rests on a long wedge and it is almost impossible for it to fall except as desired or in the opposite direction. The men at the end of the rope see to this, and as it takes a long strong pull to bring the tree over there is always plenty of time for the axemen to get clear. The butt of the stem felled should remain on the stump end ; in the majority of cases it does so ; but where it jumps from the stump the whole stem goes down hill end on, and does little damage either to itself or to standing trees. The photograph (Plate XV) shows a tree of 15ft. girth felled as described in the Sakalatpa forest of the Pandrabis Range. The ground is particularly bad, so much so that although the forest is situated within three miles of the Sutlej river and, up to the year before last, had never been touched, no fellings were proposed in the first working plan. The average girth of the trees cut in this forest was a little over nine feet, and the average cost of felling was about one rupee a tree, that is to say, about 2½ times as much as the cost of felling without branching and without the use of ropes ; but the extra cost was nothing compared to the loss that would have occurred under the latter method. No serious accidents have occurred in the fellings either in this forest or elsewhere, though a very large number of trees have been felled in this way in Bashahr.

There is so much sawing work now in the more accessible parts of the hills in the Punjab and United Provinces that it is difficult to get a sufficient number of sawyers to come to Bashahr. The best men we get come from the neighbourhood of Datapur in the Hoshiarpur District and, as is shown in the photograph of "Sawyers at work", Plate XVI, three of these men work together at one saw. One such "Jori" does a good

deal more work than two pairs of hill sawyers. The two remaining photographs show rolling roads in connection with the extraction of logs from the Panwi forest in the Paranda Range. One of them, Plate XIV, shows an ordinary rough rolling road on an easy hillside, but the other, (XVII), is unusual for it represents the bed of a stream transformed into a rolling road. The last bit of ground leading down to the river was such that neither rolling road, shoot nor slide could be constructed, and so there was nothing to be done but to clear out the bed of the stream, lay down poles and roll the logs down to the Sutlej. The work of propelling the logs along these roads looks easy enough, and it would seem to be far less dangerous than the job of felling trees uphill. Yet fatal accidents on the log roads are not very uncommon. The heaviest logs go first occasionally and the workmen omit to support the leading log sufficiently. One unfortunate steps on to it and starts it off, with the result that he is thrown in front and, well, more or less flattened out.

CORRESPONDENCE.

TO THE HONORARY EDITOR OF THE INDIAN FORESTER.

FOREST MUSEUMS.

SIR,—With reference to the interesting article in the *Indian Forester* for January 1906 on Forest Museums, I think there can be no one who does not entirely concur with the proposal of forming provincial or circle museums, and it is to be hoped that officers in charge of circles will take up the suggestion energetically, especially as they have such an excellent precedent in the case of the Gass Museum at Coimbatore in Madras.

The warning about limiting the scope of the museums to forest specimens only and still further to specimens obtained from the particular circle only, is an excellent one, and should certainly be rigorously adhered to.

Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by G. S. Hart.

SAWYERS AT WORK.

As the writer of the article appears to have had access to several important forest museums it would probably add a further stimulus and serve a useful purpose if he would be kind enough to contribute a further article giving an outline of what he considers would constitute an ideal forest museum for a circle or province.

15th February 1906. MUSEUM.

A CURE FOR WHITE LEPROSY.

SIR,—I cannot forbear commenting upon the article "A Cure for White Leprosy" which appeared in your Journal of February last, having myself been subject to the hateful disease, best known by the name of leucoderma, for the last eight or nine years.

I tried the medicine prepared with the farraginous ingredients as indicated in the article for nearly six months. After an application for three or four days on the affected parts, they commenced to become red and gradually assumed a red colour all over. Seeing their deep reddishness I was fascinated as I was told that this was the sign of the cure; this reddishness continued as long as the application was made. After a trial of nearly six months I stopped the application with a view of seeing whether the white spots were turning into the natural colour of the skin or not. I have not words with which to express my deep sense of sorrow when I found that the reddishness began to disappear and whiteness to make its reappearance. With the stoppage of the application for a week or so, whiteness became predominant and the skin turned to its original colour. The seed of Psoralea corylifolia (bukchi) has only the power of turning the skin into momentary reddishness and nothing else.

UMBICA CHURN BHUTTACHARJEE,
Forest Officer.

REVIEWS AND TRANSLATIONS.

QUINQUENNIAL REVIEW OF FOREST ADMINISTRATION IN BRITISH INDIA, 1899-1900 TO 1903-04.

As an Introduction to the Review of Forest Administration in British India for 1903-04 a quinquennial summary of the progress made in Forest Administration during the period 1899-1900 to 1903-04 is given, in conformity with the usual practice every five years. We propose, instead of confining ourselves merely to the Report of the past year, to briefly review this summary of progress—a progress which, without any self-adulation, we think the Department may consider as remarkable as it is satisfactory.

ADMINISTRATIVE CONTROL.

The Forest Branch of the General Administration has remained unaffected by the recent changes made on the formation of the new Department of Commerce and continues to be administered by the Department of Revenue and Agriculture. During the period under review the Hon'ble Members of Council in office were Sir Charles Rivaz, K.C.S I., and Sir Denzil Ibbetson K.C S.I.; the Secretaries during the period being Mr. M. Finucane, C.S.I., Mr. Holderness, C.S.I., Mr. J. B. (now Sir Bamfylde) Fuller, C.I.E , Mr. R. G. Hardy, C.I.E., Mr. J. O. Miller, C.S.I., and the present Secretary, Mr. J. Wilson, C.S.I.

Mr. B. Ribbentrop, C.I.E., filled the post of Inspector-General of Forests till his retirement on 31st October 1900, when Mr. Hill was appointed. Mr. R. C. Wroughton officiated for Mr. Hill from 20th April 1902, and on the latter's death, was confirmed in the appointment. He was absent on furlough from February 4th, 1903, when Mr. S. Eardley-Wilmot was appointed to officiate as Inspector-General, and continued to hold the appointment at the close of the period under review. Messrs. F. B. Bryant, J. H. Lace, L. Mercer, and M. Hill have respectively held the post of Assistant Inspector-General of Forests during the period, the

Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by G. S. Hart.

A LOG-ROLLING ROAD
IN THE BED OF A STREAM, BASHAHR, N. W. HIMALAYAS.

latter filling the appointment at the end of 1903-04. Mr. G. S. Hart held this appointment for three months during the latter part of 1897.

ADMINISTRATION.

The administration of the State forests during the period under consideration has been in accordance with the general principles enunciated in the Resolution issued by the Government of India in October 1894, where it was laid down that "the sole object with which State forests are administered is the public benefit."

FOREST LEGISLATION.

Considerable progress was made in Forest Legislation during the period. The Indian Forest Act was amended in 1901 so as to give Local Governments power to deal with cases of incendiarism in protected forests, by suspending rights to pasture and forest produce in such forests. The Burma Forest Law of 1902 was introduced in place of the two separate Acts previously in force in Upper and Lower Burma. An Act was passed by the Punjab Government in 1899 to deal with the damage caused to agriculture by the erosion and sand drift of the torrent beds of the Siwaliks. This empowered Government to extinguish certain noxious pasture and forest rights on payment of compensation. Rules under Forest Acts were issued in many provinces.

ORGANIZATION.

The following changes in the Organisation of the Department took place:—In consequence of the demand for officers for foreign service the number of extra special posts allotted for the purpose in the Imperial Service was raised from three to five in 1901 and to nine in 1904. This demand for the services of officers of the Department to fill posts in the Colonies and Native States, whilst displaying indubitable evidence of the efficiency of the staff, has served to show how much undermanned that staff really is; the present strength scarcely serving to keep the work in an efficient state. We trust that the next quinquennial report will be able to look back to a more satisfactory state of affairs.

Progress is said to have been made in the transfer of appointments from the Imperial to the Provincial Service, that curious arrangement known as the "Pilot" business. We wonder how many really understand the unpleasant vagaries of the "Pilots" as they go up the lists! The subordinate service has been reorganised in Burma and a complete revision of the office establishment throughout India was sanctioned in 1901.

CHANGES IN AREA.

There has been a considerable increase in the areas of all classes of forest lands under the control of the Department. This is shown very clearly in the Report as follows :—

	Square miles.
Reserved and leased forests	84,148
Protected forests	8,483
Unclassed State forests	29,565

or a total of 122,196 square miles, the proportion of forests to the whole area of all the provinces being 12·88 per cent.

At the close of the quinquennium the areas were :—

	Square miles.
Reserved and leased forests	91,567
Protected forests	9,865
Unclassed forests	131,269

or a total of 232,701 square miles, the proportion of forests to the total area of all the provinces being 24 per cent It will doubtless come as a surprise to many to find that the Department holds sway over a fourth of British India!

The increase in the unclassed forests is almost entirely due to additions in Burma.

FOREST SETTLEMENTS.

The area finally settled at the end of 1903-04 was 96,466 square miles as compared with 81,869 at the close of 1898-99. The largest increase was in Burma where large areas were selected for permanent reserves after the annexation of Upper Burma.

WORKING PLANS.

At the end of 1898-99 20,348 square miles in Bengal, 139 square miles in Madras and 1,319 square miles in Bombay (21,806 square miles in all) were under sanctioned working plans. At the close of the period under review the areas were, respectively, 24,407, 5,103 and 4,170 square miles or a total of 33,680 square miles. This increase of 11,874 square miles, or approximately 54 per cent., is considered satisfactory. A feature in this connection, however, which is by no means so pleasing is that the training of the lower subordinate staff has by no means kept pace with the technical work with which divisional officers are now finding their hands filled.

FOREST SURVEYS.

We recently alluded to the work of the Forest Survey.* Satisfactory progress has been made in this branch, 22,309 square miles of forests having been surveyed on the 4-inch and larger scales; of the total area 6,353 square miles were in Madras, 3,581 in Bombay and 12,375 in the Bengal Presidency.

Forest Surveys are now in advance of working plans and it is hoped that by 1908 most of the immediate requirements of the Department, except perhaps in Madras, will have been met.

DEMARCATION.

The total length of the artificially-marked boundaries at the close of 1898-99 amounted to 100,264 miles; at the end of 1903-04 to 121.501 miles.

ROADS AND BUILDINGS.

The average *annual* expenditure on roads and buildings and other works during the quinquennial period 1894-95 to 1898-99 amounted to Rs. 4,17,000, whilst for the period under review it amounted to nearly 5½ lakhs. The increased expenditure which occurred principally in the Bengal Presidency has been justified, as is pointed out, by the increased revenue and value of the forests. To the knowledge of this fact is perhaps due the increased outlay of 1903-04 when nearly Rs. 5,00,000 were expended in this Presidency

* Page 77 of the present volume.

alone under this head. Whilst this is satisfactory for the Presidency as a whole there are, however, still circles in it which have by no means grasped the necessity of efficient accommodation for the staff. For instance, whilst Bengal and Burma, until recently, both backward provinces in this respect, have now begun to go ahead, we see that Assam spent only Rs. 4,373 on buildings during the year 1903-04, the forest staff of this province being probably the worst housed in the three Presidencies.

FOREST CRIME.

There was a considerable increase in forest offences during the quinquennial period, for which the large increase in the areas of reserved and protected forests cannot be taken as entirely explanatory nor yet the increase of the forest staff on the increased area under systematic working. The chief cause, as the Report states, is probably to be found in the fact that famine was experienced in parts of the country and petty thefts increased on this account.

FIRE PROTECTION.

The average area under systematic fire protection during the preceding quinquennial period amounted to 31,295 square miles the average of failures being 7 per cent.: the area was increased during the period under review to an average of 35,236 square miles, the failures amounting to 8 per cent. The increase in the areas brought under protection occurred principally in Burma, the Central Provinces and the United Provinces.

YIELD AND OUTTURN.

The following statement shows the average annual outturn of the forests for the two periods :—

		Timber and Fuel. Cubic feet.	Bamboos. No.	Minor produce. Rs.
1894-95 to 1898-99 ..	Bengal ..	158,165,000	157,609,000	25,75,000
	Madras ..	15,376,000	29,953,000	9,78,000
	Bombay ..	53,351,000	7,916,000	11,30,000
	Total ..	226,892,000	195,478,000	46,83,000

		Timber and Fuel. Cubic feet.	Bamboos. No.	Minor produce. Rs.
1899-1900 to 1903-04 ..	Bengal ..	173,687,000	175,712,000	28,54,000
	Madras ..	19,234,000	33,960,000	11,98,000
	Bombay ..	43,095,000	4,833,000	7,04,000
	Total ..	236,016,000	214,505,000	47,56,000

The average outturn of timber and fuel increased 9 per cent. in the Bengal Presidency, and 25 per cent. in the Madras Presidency; it decreased 19 per cent. in the Bombay Presidency.

The extraction of bamboos showed an increase of 11 per cent. and 13 per cent. from Bengal and Madras, respectively, and a decrease of 38 per cent. in Bombay. The revenue from minor forest produce increased 11 per cent. in Bengal and 22 per cent. in Madras, and decreased 38 per cent. in Bombay.

FINANCIAL RESULTS.

The average annual financial results for the two periods are shown below :—

		Revenue. Rs.	Expenditure. Rs.	Surplus. Rs.
1894-95 to 1898-99 ..	Bengal ..	1,25,59,000	63,08,000	62,51,000
	Madras ..	21,11,000	15,07,000	6,04,000
	Bombay ..	30,46,000	19,81,000	10,65,000
	Total ..	1,77,16,000	97,96,000	79,20,000
1899-1900 to 1903-04.	Bengal ..	1,46,00,000	75,94,000	70,06,000
	Madras ..	24,91,000	17,33,000	7,58,000
	Bombay ..	25,67,000	19,42,000	6,25,000
	Total ..	1,96,58,000	1,12,69,000	83,89,000

The average revenue in Bengal and Madras increased 16 per cent. and 18 per cent. respectively; it decreased 16 per cent. in Bombay.

The average surplus increased 12 per cent. and 25 per cent. in Bengal and Madras respectively, and decreased 41 per cent. in Bombay. With reference to the revenues for the

quinquennium the Review states :—" The revenues for the period 1899-1900 to 1903-04 were to some extent adversely affected by the famine from which many provinces suffered, and from the effect of which they are now recovering, but the figures given above seem to point to the fact that in two Presidencies increased expenditure has been followed by a larger yield and better financial results."

We think that it is matter for congratulation that the figures show in this marked manner that in two Presidencies, Bengal and Madras, the wise statesmanship which sanctioned increased expenditure has met with the anticipated reward in a satisfactory increase in revenue. The Forest Department in India is still in its young expanding manhood, and with liberal treatment in financial matters should develop into a prime which will probably even exceed the expectations of those who, from a close study of its working, requirements and possibilities, have placed their hopes on no mean a level.

FOREST EDUCATION.

We feel that no apology will be required for inserting the following paragraphs from the report on the subject of Forest Education *in extenso* owing to their general interest.

The Imperial Forest School was opened in 1879 and the statistics given include the period up to the end of 1903-04.

(*i*) The capital expenditure on purchase, extension, and up-keep of buildings amounted to Rs. 1,48,336. Recurring expenditure in salaries, allowances, instruments, apparatus, books, &c., to Rs. 11,27,565, while Local Governments, Colonies and Native States expended Rs. 6,26,236 in salaries, stipends and travelling allowances for their students.

(*ii*) The number of students who passed out of the School was 673, of whom 418 are now in Government service, 135 in that of Native States, &c., while the whereabouts of 120 cannot be ascertained. It may be taken that 91 of these entered Government service and that 29 went to Native States.

(*iii*) The average cost of education per head of passed students amounted, therefore, to Rs. 2,606, without taking into consideration the cost of buildings and sites which were acquired at a very cheap rate and probably represent a higher value than the cost incurred.

(*iv*) The following statements show the sums charged to Provincial and States' Budgets and from them can be judged the local demand for trained foresters :—

Expenditure charged to Provincial Budgets and Native States since the establishment of the Forest School to the end of 1903-04.

I.—British India.

Province or Circle.	Total expenditure to 30th June 1904. Rs.
Bengal	38,921
Assam	27,218
The United Provinces	65,127
The Punjab	54,451
The Central Provinces	98,115
Berar	12,285
Coorg	3,366
Burma	46,893
Madras	1,55,182
Bombay	2,605
Ajmer	664
Total	5,04,827

II.—Colonies and Native States.

Ceylon	20,251
Federated Malay States	182
Siam	20,230
Mysore	17,497
Baroda	3,984
Jaipur	6,811
Patiala	4,677
Rewah	3,107
Alwar	925
Partabgarh	1,599
Sirmur	776
Jubal	729

II.—Colonies and Native States.—(*contd.*)

Province or Circle.	Total expenditure to 30th June 1904. Rs.
Bahawalpur	800
Kohlapur	1.664
Hyderabad	10,889
Travancore	4,746
Jodhpur	3 807
Kashmir	8.712
Tehri	878
Cochin	5,087
Kotah	717
Malkopur	1,172
Mourbhanj	903
Barwani	416
Bharatpur	423
Mandi	427
Total	1,21,409
Grand Total	6,26,236

The average cost per student to Provincial Governments amounted to Rs. 991 and to Colonies and Native States to Rs. 740, while the Government of India paid Rs. 1,675 per head in free education. Continuing the Review says :—

"A consideration of these figures may lead to the conclusion that a system of education whereby the whole-time services of a highly-trained and expensive staff is devoted to the education of forest subordinates may, as a commencement, have been necessary, but that its continuance at this period of forest administration in India is unnecessarily expensive, and that the cost of Forest Education to the Government of India might be very considerably reduced by utilizing the services of the principal professors in research for the benefit of the Department, while entrusting the routine work of instruction to officers of special attainments in the Provincial Service, of whom many are now available."

We feel almost inclined to venture the opinion that the cost to Government of Forest Education, carried on on the lines so

significantly laid down in the above paragraph, will be far more than counterbalanced by the research work accomplished by the principal professors, whilst the benefit to the Department itself will be incalculable.

Up to the year 1902 the training of candidates for the Provincial and Subordinate Forest Service of the Bombay Presidency had been carried out at the College of Science, Poona. In that year, however, after a careful consideration of the question it was decided that the Imperial Forest School, Dehra Dun, should in future be utilized for the training of candidates for the Upper Subordinate Service of the Bombay Forest Department, and thus, with the exception of Burma, this institution now provides a higher forest education for the whole of the Indian Empire.

It was found that there were serious drawbacks to the deputation of students from Burma, and as it was highly desirable that the subordinate executive staff in that province should receive some regular training, the Secretary of State sanctioned the formation of a Forest School in the Province. This School was opened in 1899 at Tharrawaddy, the course being fixed at 18 months, the number of students to be eight. This number was soon found to be too small and in 1903 the number of annual admissions was increased to 20, the course having previously been extended to 24 months. It was further decided to endeavour to attract a better class of students by arranging that specially selected students should be eligible for promotion from the Subordinate to the Provincial Forest Service. Up to the close of the year 15 students had passed out of the School, 11 with Higher and 4 with Lower Standard Certificates. The expenditure on School buildings, quarters for instructors and students, and Museum has amounted to Rs. 41,000. We think Burma is to be highly congratulated on her very successful departure in forest education.

FOREST ENTOMOLOGY.

The report points out that up to the commencement of 1901 little had been done in regard to the investigation of the damage caused to the State Forests by injurious insects. In January of

the year the post of Forest Entomologist was created, an officer of the Imperial Forest Service being appointed to fill it. The progress made in this branch of Forest Science during the period under review is commented upon, some of the more important papers, including two numbers of Departmental Notes on Insects that affect Forestry, being mentioned.

BOARD OF SCIENTIFIC ADVICE.

In order to provide as far as possible "for the co-ordination of Scientific enquiry," as the report concisely and politely puts it, or, in other words, to prevent two or more departments carrying out enquiries on the same subject at one and the same time, without reference to one another, and in which one or more of the enquirers were going beyond their proper limits, the Government of India in 1902 took a most wise step and constituted a Board of Scientific Advice. This Board comprises the heads of the Meteorological, Geological, Botanical, Forest Survey, Agricultural and Veterinary Departments and the Superintendent of the Indian Museum, together with such other Scientific Authorities as may from time to time be invited by the Government of India, to serve upon it. Sub-Committees were formed to deal with the investigation of special subjects in the various departments, and Sub-Committee D, of which the Inspector-General of Forests is Chairman, undertakes enquiry into questions relating to forest products. Since the constitution of the Board Sub-Committee D has paid special attention to Cassava, Resin, Turpentine, Plantain Fibre and Rubber, much research having been devoted to the collection and analysis of the latices of various plants. Enquiries into the preparation of paper from wood pulp, from bamboos and soft-wooded trees for which there is at present no demand, have also been made and the services of an Expert to carry out experiments in Burma and elsewhere have been requisitioned. Considerable scepticism as to the good the constitution of such a Board as the Board of Scientific Advice was likely to accomplish was expressed at the time of, and for some time after, its formation. We are of opinion that it has already more than justified its existence and firmly believe

that it will be the means of incalculable advantage, both to the economic work of the various Departments, and in the cause of Science itself.

In conclusion, we would extend our heartiest congratulations to the Government of India and the Inspector-General of Forests on the mass of evidence to be found in this review pointing unmistakably to the great strides towards efficiency and prosperity the Department is showing itself capable of.

INCENDIES EN FORÊT.

A BOOK ON FOREST FIRES.

Few Indian Foresters will have heard of a French book that has now reached its second edition, *viz.*, "Incendies en Forêt," by M. A. Jacquot, Inspecteur des eaux et Forêts. This is a work approved by the Minister of Public Instruction, awarded gold medals by the National Agricultural Society of France and by the Society of French Agriculturists, and altogether worthy of these honours. It is a study of forest fires from their attempted prevention to the final assessment of damages against the responsible parties, and the alterations in working plans that may be needful, done with minute and logical thoroughness.

The idea of *really* making the incendiary pay the damages (in addition to any punishment) is one for which India is not yet ready. There is some pretence of doing it, but the native press and the magistracy alike would hold up their hands and eyes in pious horror if a ryot were asked to pay Rs. 50 damages in addition to the fine of Re. 1 which the Court might consider sufficient punishment for the offence. The Forest Act indeed contemplates the possibility of both punishment and damages, but cases must be extremely rare in which an incendiary has been heavily mulcted in damages. Even the Railway Companies, sinners that they are, have hitherto escaped generally the consequences of their carelessness in this country, though they are made to pay up in Europe. France is supposed to lose ten or

fifteen million francs a year by forest fires, whilst the United States in five years lost an average of 675 million francs annually. Forest fires lay open a country to devastation by floods (the great Mississippi flood for instance), but this damage is not included.

The work is in four Parts. Part I covers the law and procedure in detail for all cases; likewise the measures for prevention and extinction of fires, the kind of report to be drawn up, and the steps to be taken for discovering the offender. Part II discusses the general principles of valuation and the financial position as regards rent and interest. Part III details the mode of assessing damages, in all kinds of forest and at all periods of their history; for indeed the system of treatment, and the state of the forest with regard to that treatment, must influence the amount of damage. Part IV consists of sample reports, detailed instructions, and tariff tables.

The principal base of valuation is the idea of *restoring the owner to the financial position in which he stood before the fire.* Some authorities would do this *by the most speedy means*, even though the cost might bear heavier on the party responsible. In seeking to carry out this object there are two rival principles that may be relied on—

(1) to discount the sale value of the mature coupe from the date of maturity back to that of the fire;

(2) to refund the cost of formation, with interest, and interest on the soil value from the beginning up to the date of the fire.

The first method is the one employed by Foresters in valuing forests, and is the only just one. The second method is employed by some Assurance Companies, but it is iniquitous in so far as it disregards the value and effect of the Forester's skilled labour, and treats thrifty, well-kept, flourishing woods no better than those that have been badly mismanaged.

The number of factors causing loss is considerable. Among these the most difficult to appreciate is the actual physiological damage accruing through the death or deterioration of the cambium. These effects are seen at once in extreme cases, but

M. Jacquot quotes a case in which crops merely injured at the age of 23 and 24 years remained for ten years, the increment just balancing deaths and no more, so that the loss was ten full years' growth and interest. Other factors of loss are (1) the cost of cutting back; (2) the diminished sale value of wood prematurely cut as compared with that of mature pieces; (3) weakness of the stems that will have to be marked as standards at the next passage, owing to their having to start again from the soil in mid-rotation. This will result in the bending and loss of many; (4) loss of height-growth in the standards. The taller the standards the greater their value, but if the coppice is burnt the standards form low crowns and may lose important branches at the next rotation when the coppice attains its full height; (5) possible loss of a year's growth if the season of cutting-back be too late in the year. Shoots of June—August not only are very liable to destruction by early frosts, but in their second year they are no bigger than shoots arising six or nine months later than they; (6) inferiority of artificial transplants, where these have to be resorted to; (7) renewal of the struggle with grasses and scrub which had, at the time of the fire, been overcome by the crop. Frequent interruptions of the canopy encourage scrub and deteriorate soil; (8) cost of extinguishing the fire; (9) injuries which can hardly be fiscally compensated, aesthetic and ornamental considerations, vexation, disturbance of the sustained yield and of the regular market, loss of game, &c.

The rate of interest at which the soil and capital are supposed to operate is a most difficult matter to determine. It has been written upon *ad nauseam* by any number of economists who can only agree to differ. M. Jacquot points out that this rate is not (as generally supposed) constant, but varies from time to time and from place to place, according to the age of the crop and according to a number of other things. He also discusses the difficulties surrounding the two main bases from which a valuation is approached, the *absolute*, or land-agents' valuation, based on current market values, and the *relative*, based on methods as scientific in theory as they are uncertain in application. This latter,

unsuitable as it is to the valuation of soils, is nevertheless applicable to that of crops and consequently to damage by fire.

Part III is of importance, being *the way to set about it.* M. Jacquot first establishes the great principle, seldom adopted by our magistracy, that the value of young trees, however small in the market, is considerable in the forest. Such material has no business to be in the market, and those persons who took it there (or destroyed it) must pay the true forest value, and not the trifling market value, *i e*, they must pay for what they have deprived the owner of, and not for what they have appropriated to themselves. The compensation thus becomes a sum in discount and present value. There are, however, many complications due to different kinds of crops and different extents of damage. The simplest case is that of a simple coppice burnt out some years before maturity. Here, the damage is the full value of the future mature crop discounted to the present time. The author discusses seriatim the various cases of total or partial damage in simple coppice with standards, and high forest, at different ages, from the stump or seedling upwards, and concludes that the damage by fire is most difficult to estimate in Selection forests. He then treats of certain *accessory* and *indirect* damage. The accessory ones are the loss of the soil covering or of the humus, with the effects thereof on grasses, scrub, and cultural conditions. He points out that the vigorous growth often seen following a fire is but spasmodic and not maintained. It is comparable to the effect of alcohol on a man. The indirect losses concern principally minor produce, resin, cork, truffles, fibres, gums, fruits, &c., but a fire or series of fires may have important results on the humidity, the water-supply, and the agriculture of the vicinity. If the local climate be already too dry, the further destruction of a forest may make just the difference between the possibility and the impossibility of regeneration on reasonable terms. When this point has been reached there is much talk of famines and famine-areas, and the country has to spend on relief works money that it had infinitely better have invested in forests, and stopping devastation masquerading as agriculture where no agriculture should be. The

pages are strung together in the flimsiest manner, the paper is apparently a glazed compound of pulp and very heavy clay, and that is all the evil that can be said. The book is indispensable to Foresters who can read French.

F. G.

THE FORESTER.

BY JOHN NISBET, D. ŒC.

II.

PART IV.—PROTECTION OF WOODLANDS.

The protection of woodlands is the oldest branch of Forestry. It deals with the methods by which damage to timber and other woodland crops can be prevented or remedied. Woodlands require to be protected against injuries caused by men, farm live-stock game, other animals (vermin), destructive birds, injurious insects, woods, parasitic plants and inorganic agencies. Dr. Nisbet deals with these various dangers in this order.

Chapter I of this part deals with protection against men and human actions. It is pointed out that, without special legislation, individuals would be practically powerless to preserve their forest tracts from injury. In India, France, Germany, etc., there are special forest laws for protecting woodlands against injury. In Britain there is no necessity for such since human actions affecting proprietory rights in woodlands are controlled by the ordinary civil and criminal law. In this connection boundary marks, commonage and rights of user (practically) confined to the crown forests, theft and mischief, trespass and fires are considered. Dr. Nisbet advocates the planting of wide belts of broad-leaved trees (*e.g.*, Birch or Robinia in Scots Pine tracts) along railway lines passing through coniferous forests, the ground below the belt being kept free of inflammable material to a breadth of about 20 yards. Extensive Scots Pine areas should be divided into moderate sized compartments by narrow rides, kept free of inflammable matter. The various ways of extinguishing fires are dealt with in detail.

Chapter II deals with the protection of the forest against live-stock, game and the larger kinds of vermin.

Farm live-stock, consisting of cattle, horses, sheep, goats and swine, cause damage to woods by nibbling buds, leaves and young shoots; by gnawing and stripping young bark; by injuring roots with their hard hoofs and horny feet; by bending back young growth and saplings; by dislodging soil on slopes; by stamping down damp, heavy clay soil and loosening light sandy soil; and by breaking down the sides of drains. The damage done of course varies greatly according to the kind and number of animals present; these are classed by the author in the following order: *goats*, *horses*, *sheep*, *cattle* and *swine*. Sheep and cattle, we are told, are, however, by far the most important in Britain. The damage done by these animals is considered in detail, the chief remedy advocated being fencing.

Turning to game and the various ways of reducing or preventing its destructiveness in woodlands, Dr. Nisbet points out that in British rural economy more attention is generally given to game preserving than to Forestry and usually a higher rental is received from shooting tenants than is otherwise obtainable. Game preservation, as customary on most large estates in Britain, is incompatible with profitable Forestry; and where rabbits are allowed to abound it is almost impossible that woodlands can ever show anything but *a dead loss*, properly chargeable to the game account. "There is only one form of British sport (*sic*) which is really of some advantage to the woodlands and that is the preservation of foxes which help to keep down rabbits and hares. All other forms of game preservation tend to disturb the balance of nature and result in damage to the woodlands. Planting operations cost much more owing to ground game not being kept down to a greater extent. Dr. Nisbet shows that sport and Forestry are not necessarily antagonistic; on the contrary they are closely related and may be easily combined with profit. There is *less shooting* but more *sport* in the true sense of the term in the large forests of Continental Europe than is obtainable anywhere in Britain. The wild boar, red deer and roebuck shooting is more sporting in

continental forests than in the so-called Deer forests of Britain which are only heathery wastes, and the antlers of the forest-bred, stag are far heavier and handsomer. The existing Highland Deer "forests" might therefore be planted up without any danger of ruining the sport obtainable. Red deer and roebuck, hares and rabbits and feathered game all injure woodlands to a greater or less extent. The author considers in detail each of these animals mentioning the trees affected, kind of damage done and methods of preservation. In this latter connection in addition to methods for protecting individual trees the question of fencing is dealt with in a particularly lucid manner. Wire fencing, the different ways of putting it up and the cost, wood fences, dykes, mounds, etc., are all considered in full, the excellent illustrations serving to make the author's remarks perfectly clear.

The chapter next deals with those pests of the Forester, the smaller rodents or vermin (squirrels, mice and voles). The various British species are described, their habits detailed and methods of prevention and extermination dealt with.

Chapter III is devoted to the protection of woodlands against destructive birds. Although on the whole much lighter than the damage caused by insect enemies, or even in many cases than that resulting from deer and ground game, the damage done to woodlands and nurseries by birds is occasionally by no means inconsiderable. On the other hand, many species of carnivorous birds are of decided utility by feeding on small ground vermin and insects; others are useful at one period of their existence and harmful at another, whilst others again are directly harmful.

Birds useful in keeping down ground vermin are the buzzards, stannel hawk, various species of owl, rook, carrion crow, hooded crow, jackdaw and some of the hawks. Amongst the birds decidedly useful in preying upon injurious insects are the cuckoo starling, tits, swallows, warblers, nightingales, wrens, wagtails, owls, nightjar and gulls. More useful than injurious are sparrows, finches, larks, woodpeckers, thrushes and blackbirds jackdaws, rooks and crows, common buzzard, lapwing or green plover and peewit. We are of opinion, however, that the

woodpecker is often most harmful in the forest. More injurious than useful are certain finches, the house sparrow, shrikes, magpie, eagles, hawks and falcons. Our author divides the decidedly injurious birds into four classes—grouse, pigeons, jays, finches. These he considers do very appreciable damage in woods and nurseries. As pointed out by Dr. Nisbet the protection of useful birds cannot be too strongly insisted upon.

Chapter IV treats of the protection of the forest against injurious insects, and here we find that the author is by no means so happy with his subject as elsewhere. Excellent though much of the 80 odd pages devoted to this part are, they would have proved more valuable and more in keeping with the other portions of this excellent work had Dr. Nisbet submitted them, even in proof form, to the eye of one having an acquaintance with the subject. It is impossible nowadays for any man to be, or even pretend to be, a specialist in many subjects, and without the necessary technical knowledge more harm than good results from putting pen to paper. Our author commences with what he terms the "Life History of Insects" under which he describes their external structure and development. The classification adopted will prove, perhaps, useful to those interested in archaic records but appears curiously out of place in a twentieth century work. With such volumes as Sharp's "Insects" in the Cambridge Natural History Series, a commonly-accepted British classification (to mention but one out of many), as a guide, it is difficult to understand how a man of our author's calibre and carefulness could turn to and repose faith in the works of his childhood's days. We regret that it is impossible to consider this part of the book anything but antiquated and in several places misleading. For example, to note one instance, he calls the various species of *Tomicus* (*Fam. Scolytidæ*) mentioned "*Bostrichus*," grouping them under "*Bostrichini*" (p. 56)! On p. 84 he calls *Tomicini* a synonym of *Bostrichini* and includes the genera *Tomicus*, *Xyloterus* and *Xyleborus* all under *Bostrichus*. When it is pointed out that the *Bostrichidæ* are a totally different family of beetles, of which *Bostrichus* is one of the oldest genera, and that, although

many are wood feeders, none as far as is at present known are cambial feeders, the confusion arising from the above treatment will be understood. The division of the bark-beetles (or true *Scolytidæ*) into sapwood beetles, cambial beetles, and true bark beetles, (whatever this latter may mean) is as misleading as it is unfortunate, since the terms applied to these divisions will strictly hold for neither. It is unnecessary to touch here upon such minor inaccuracies as calling the Dung beetles (*Coprides*) *Staphylinidæ* or the inclusion of the *Cleridæ*, which are termed "gold beetles," under the *Malacodermidæ*, etc. Turning now to the manner in which the insects are dealt with we find, near the commencement, a table, arranged according to the classification adopted, giving a list of species to be alluded to under each order. Each order is then taken seriatim and briefly described, as are also the families including injurious species. These latter are then taken individually, a brief description given, followed by a short life history and methods of prevention. Excellent illustrations enable one to make oneself acquainted with the various pests described. This portion of the chapter, whilst capable of a different and, we think, a more adaptable treatment, follows the well-known line adopted by all writers upon this subject and has much to commend it.

Chapter V is devoted to a consideration of methods of protection against weeds and parasitic plants and here we find the author quite at home again. He points out that plants of various kinds may interfere with the growth of timber crops either by overrunning the soil as *weeds*, overtopping seedlings and plants in young plantations or else as *epiphytes* or as *parasites* and *fungi* on or in trees and frequently causing disease. Fungous diseases, it is said, often epidemic, always damage buds, leaves, roots or timber of trees attacked and may cause the death of single trees or large blocks of timber. Fungus diseases, it might have been added, often follow the attacks of injurious insects.

Dr. Nisbet first considers weeds under which he includes all vegetation interfering with the vigorous growth or regeneration of timber crops. He points out how natural regeneration is impeded or prevented, how young seedlings are killed as are

also transplants by the more rapid growing weeds. He divides the more important weeds into four groups according to the nature of the soil they frequent.

(1) On wet boggy or peaty soil :—Sphagnum, Polytrichum, Erica, Vaccinium, Pedicularis, Rumex, Eriophrum, Equisetum, Carex, Scirpus and Juncus.

(2) On fresh fertile humose soil :—Rubus, Rosa, Digitalis, Epilobium, Atropa, Solanum, Urtica, Trifolium.

(3) On dry loam and sandy soil :—Calluna, Vaccinium, Ulex, Sarothamnus, Genista, Senecio, Verbascum, Hieracium, Euphorbia, Carex, Elymus, Agrostis, etc.

(4) On salt soil :—Salicornia, Salsola, Plantago, Glaux, etc.

Amongst shrubs found on fresh soil amongst hills and valleys are Cornus, Rhamnus, Prunus, Cratoegus, Euonymus Viburnum, Berberis, Ilex, Lonicera, Ligustrum, Sambucus.

Weeds are of importance since they not only give a general indication as to the nature of the soil but also to a certain extent indicate its physical properties. Various methods for the prevention and extermination of weeds are given.

The epiphytic plants are next considered, the chief being Ivy-Beard mosses, Usnea and other Lichens. The small climbing plants such as Lonicera, Clematis, Convolvulus and Humulus are also noticed.

Under parasitic plants Viscum and Cuscuta (more harmful to field crops than to nurseries or plantations) are discussed, the rest of this interesting chapter being devoted to fungous diseases. Dr. Nisbet points out that though serious disease and even death may result from the attacks of fungi, neither fungous nor any other diseases of trees can be transmitted through seed collected from infected trees. The external structure and development of fungi are treated of again under the misleading head "Life History." In a note on the prevention and extermination of fungi Dr. Nisbet quotes the late R. Hartig :—"The best preventive measure against the outbreak or spread of fungous epidemics is the formation of mixed woods." Whilst the part of the work devoted to a consideration of the various fungi to be found in British

woodlands is of very considerable interest we must leave our readers to peruse it for themselves. The author classifies them into fungous diseases of the (1) foliage, (2) stem and branch, (3) root and base of trunk, and then gives, following the procedure adopted in considering injurious insects, descriptions, etc., of the various orders and species.

Chapter VI deals with the protection of the forest against injurious influences in the soil and atmosphere. The subject is considered under the divisions I—Protection against non-parasitic diseases of trees such as unsuitability of the soil or situation, giving rise to stunted growth and stag headedness and root-rot; diseases due to external injuries such as wound-rot, premature seeding, bark-bound trees. II—Protection against wetness and aridity of soil in which the question of drainage is considered; also the danger from sand drifts and dunes. III—Protection against injurious atmospheric influences. Damage may be caused in nurseries, young plantations and older woods by wind, frosts, heat, drought, aqueous precipitations (rain, snow, hail, ice, hoar frost), lightning and atmospheric impurities. The effect of storm winds is carefully dealt with, and methods of protecting, as far as is within human capabilities, a forest crop such as judicious thinning, wind breaks, etc., are instanced. The damage which frost is capable of is too well known to need touching upon here. Protection from heat and drought, hail, rain, etc., as well as the action of atmospheric impurities, such as smoke from factories and smelting works, etc., are all dealt with in a concise manner. In concluding this review of this part of Dr. Nisbet's great work, we would offer our congratulations upon the evidence of the great store of minute and carefully acquired learning which it shows its writer to possess. We think the book holds a moral for us in India, for does it not cause us to pause and ask when we shall be in a position to produce such a work for this country?

E. P. STEBBING.

[The review of the first volume of Dr. Nisbet's work was from the pen of Mr. A. G. Hobart-Hampden, Director, Imperial Forest School, Dehra. The review of the remainder of the work will appear in an early issue.—HON. ED.]

CURRENT LITERATURE.

In the BOTANICAL GAZETTE for January 1906, M. A. Chrysler contributes a paper on "The Nodes of Grasses." Although the stems and leaves of grasses have received a good share of attention from anatomists, and the bundles of the internodes are perhaps sufficiently well known, the nodes have been largely neglected. The object of the present paper is, the author states, to trace the course of these bundles of the grass stems and to discuss the significance of certain structures which make their appearance at the nodes, in particular the amphivasal bundles and cambium. The investigation has been confined to forty-five genera representing the eleven largest tribes. The matter is dealt with in a singularly clear manner, two excellent plates of microscopic sections helping to illustrate the author's points. E. N. Transeau concludes his papers on the Bogs and Bog Flora of the Huron River Valley, whilst J. F. Breazeale contributes an insteresting article on the "Effect of certain Solids upon the Growth of Seedlings in Water Cultures."

LE BAMBOU, *son Etude, sa Culture, son Emploi* is the title of the 1st number of a series of bulletins which M. J. Houzeau de Lehaie proposes to issue on the Bamboo. The present number is entirely from the pen of the Editor, but he hopes to avail himself of extraneous aid in future numbers. The present number deals with *Phyllostachys pubescens* said to be a little known bamboo, with the fructification of bamboos in Europe, and with a Japanese method of planting bamboos.

THE RECORDS OF THE GEOLOGICAL SURVEY OF INDIA, Part I (Vol. xxxiii), contains a paper by the Director, Mr. T. H. Holland, F.R.S., on "The Mineral Production of India during 1904," and a note upon the Recent Changes in the Course of the Nam-tu River, Northern Shan States, by Mr. T. D. Latouche, F.G.S. The same author has a most interesting paper upon the famous Natural Bridge in the Gokteik Gorge on the Mandalay-Lashio Railway in Upper Burma. The gorge is situated about half way between the two places. It has been excavated through the limestones of the Shan plateau by the united waters of two large streams

the Nam-pan-hse and the Nam-tang which drain the hilly country to the north. In selecting a site for the railway viaduct advantage was taken of the fact that at about two miles below Chaungzon the river is spanned by a natural bridge, the upper surface of which is 550 feet above the river, and upon this the principal pier of the viaduct, a fine structure of steel, has been founded. The greatest height of the viaduct, at the point where it rests upon the natural bridge, is 320 feet, and the total height from the bed of the stream to rail level is somewhat under 900 feet. The note is illustrated with several beautiful photographs.

The AGRICULTURAL BULLETIN of the STRAITS and FEDERATED MALAY STATES for November 1905 contains a note by the Editor on a "Bark Fungus on Para Rubber." This fungus takes the form of a pinkish white mass coating the bark irregularly so as to often have an appearance of hieroglyphics. Attacking usually the upper branches or occasionally the stem it quite destroys the bark and causes the death of the wood beneath. Fortunately it is easy to see and can be destroyed by burning infected branches or scraping the trunk where affected and treating with copper sulphate and lime. This is the first record of its presence in Perak.

The number also contains an interesting report on the experimental tapping of Para rubber trees in the Botanic Gardens, Singapore, for the year 1904.

SHIKAR, TRAVEL, AND NATURAL HISTORY NOTES.

THE INDIAN FIELD SHIKAR BOOK.

The Indian Field Shikar Book, by W. S. Burke, Editor of *The Indian Field*, (Calcutta). 3rd Edition, Calcutta, Thacker, Spink & Co., 1906. Price Rs. 5.

In a previous volume of the *Indian Forester** we recorded the appearance and briefly reviewed Mr. W. S. Burke's exceedingly handy little Shikar book. That it was a long felt want was soon apparent from the fact that a second edition was called for very shortly after the first appeared. Unfortunately, owing to some claims of infringement of copyright on the part of Messrs. Rowland Ward, the authors of "Horn Measurements," the second edition had to be withdrawn. Our previous review will have shown our readers the great value to the Indian Sportsman of the little work, and it is not too much to say that the enforced withdrawal of the book came as a grievous disappointment to numerous sportsmen who first heard of its existence in its disappearance and were thus unable to procure a copy. Nothing daunted, however, by fate's unkind stroke Mr. Burke set to work to redraft the Shikar book, with the result that we now have before us a third edition, and we may premise by saying that from the Indian Shikaris' point of view it is no whit inferior to the editions which preceded it. Before proceeding to a brief review of the book in its present form we may draw attention to one undoubted improvement. The game registers, instead of being bound up at the end of the book itself, are now inserted in a pocket in the cover and refills can be obtained from *The Indian Field* Office—a decided boon to those who like to keep records of the game they kill.

The author commences with a chapter on the big game of the country, giving the scientific and vernacular names of each speceis mentioned, its habitat, period of gestation (often still uncertain or

* Volume XXX, p 219.

quite unknown), description (a sportman's description unencumbered with technicalities), measurements, habits, the best place to aim at to ensure death and, lastly, record measurements. To the notes upon the latter is usually appended a table giving full details including locality where the specimen was shot and the name of the sportsman or the present owner of the trophy. In this edition the author has made a notable and valuable departure with reference to the measurements of the trophies he enumerates. In his own words "But what I regard as of more value to the present day Sportsman are the numerous measurements of big game shot now-a-days, and which must assuredly be of more interest to the Indian Shikari than records of trophies shot several decades ago."

The habitat given for the Serow (*Nemorrhædus bubalinus*) as "throughout the Himalayas 6,000—12,000 feet" will admit of modification. This animal is found at much lower elevations than 6,000 feet and has been shot in the Siwaliks.

Turning to the Game Destroyers the author points out that owing to the marked decrease in game in many parts of India owing to the increasing efficiency of firearms, the increase in native professionals and the extension of cultivation, it has become urgently necessary for all sportsmen to turn their attention to the game destroyers. Such animals as the leopard and smaller cats (indeed all the *Felidae*), wolves and wild dogs, civets and mongooses, martins and weasels, are all active game destroyers. Crows and owls are egg thieves and chick destroyers, whilst eagles, buzzards and falcons prey upon birds and pigeons. These latter birds of prey, however, also feed upon rats, snakes and other small noxious animals and so do good in this way. The Land Game Birds are next taken in hand and treated in the same way as the big game save that there are no tables of measurements. These are followed by the Water Game Birds and we feel confident that this portion of the work will prove of the very greatest use to 'wild fowlers'; for amongst no other class of sportsmen have we met with such gross ignorance coupled with such confidently-held and expressed opinions as to the names of the various birds

forming the contents of a bag of waterfowl, using the term in its widest sense.

The Sporting fish are divided into three divisions—the river, esturial and tank fish. Under seasons for fishing no mention is made of the United Provinces. On the waters of the Dun Fishing Association and the rivers to the east the best seasons are April, May and September and October. The notes on care of fishing tackle should be of use to the tyro.

Mr. Burke next turns to the great subject of camp equipment, and although, in writing in a journal published under the auspices of the Forest Service, it is scarcely necessary to lay down views on a matter in which each of our readers would consider himself, from long practice, an expert, yet we have found a perusal of the author's chapter on this subject both instructive and useful. *Autres pays autres mœurs* and many a man serving in the distant south of this great Continent may, through Mr. Burke, obtain a wrinkle or two of how things are done in the far north. Space will not permit of our more than alluding here to the excellent Chapter on Guns, Rifles, and Ammunition. We note that the author apparently considers a ·450 No. 2 cordite to be powerful enough for any thing. The ·400 taking the Jeffery 3 inch ·450—·400 cartridge, loaded with 55 grs. of cordite and ·400 grs. bullet on the Jeffery No. 1 is not, in our experience, sufficiently powerful for bison.

The list of dâk bungalows must have been a difficult one to compile. We would point out that there is no longer a dâk bungalow at Mohand (Saharanpur-Dehra road) in the Meerut Division. It was closed several years ago. There is a Forest and Public Works bungalow, each with a chowkidar, at this place. We think Mr. Burke's Shikar wrinkles, which follow, will prove of use as well as interest even to the great body of district touring men who peruse this journal. His Sportsman's Library is excellent, although some of the books included are by no means easy to procure at the present day.

A note upon snake bites and their treatment, which is not quite so up-to-date as it might be, terminates Mr. Burke's work.

The book ends with reprints of the various Shooting Rules in force in the different Provinces of the country.

We are of opinion, an opinion which we pronounce without hesitation, that all sportsmen will join us in extending our heartiest thanks to Mr. W. S. Burke for the trouble he has taken to give us just what we all require when out in the jungles on shikar bent away from our reference books.—"A Sportman's pocket Vade Mecum."

EXTRACTS FROM OFFICIAL PAPERS

CONDITIONS AND EXTENT OF CEYLON RUBBER PLANTING.

(FROM THE "INDIA RUBBER WORLD.")

Two facts of importance in connection with the planting of rubber now in progress in Ceylon—and similar conditions are obtaining in the Malay States—are (1) the wide distribution of the work, involving the interest of very many people, and (2) the systematic manner in which the new culture has been undertaken. It is to be noted, by the way, that all planting of the more important products in those countries is conducted on a comparatively large scale—generally by companies (often owned in England), whose estates are placed in the hands of salaried managers of experience and proved capacity.

The account keeping of these estates is required to be as carefully done as in mercantile houses or the offices of a railway manager; with directors and shareholders to be satisfied in the matter of returns, the estate manager must study every possible economy, while the best possible product must be obtained in order that good prices may be realised. Under such conditions is produced, for example, the Ceylon tea of commerce. Of course there are many privately owned plantations, but their methods do not vary, practically, from those on estates owned by companies. Not the least important consideration is the exchange

of views and results, through the medium of the well sustained planters' associations, by which means whatever progress is made on one plantation results in the common good. It is under such business conditions—it is by the experienced tea planters, as a rule—that the planting of rubber has been begun. The planters who are now reporting a profit from rubber are applying to it the business-like methods of accounting by which they have determined the rate of dividends to be paid on the capital invested in tea planting. There is nothing haphazard, therefore, in the beginnings of rubber in Ceylon, though there doubtless may be mistakes while the planters are gaining experience, just as mistakes occurred in the earlier days of tea culture.

With regard to the distribution of the rubber planting, a reference to the authentic "Ceylon Hand Book" shows that the new culture has been undertaken on hundreds of established plantations, many of which are now beginning to market rubber. The extent of rubber planting promises to increase largely in the near future, in many cases with a view to the ultimate giving up of tea. And there is a growing tendency to concentrate several of the existing plantations under one management, through the formation of new companies of larger capital than in the past.

It may be of interest to some of our readers to see a census of rubber planting in one of the 38 Ceylon districts in which rubber has been planted. The district selected is Kalatura, in which exists nearly one-fourth of the rubber planting in the colony. In compiling these figures from the "Hand Book" for 1905-06, only those plantations are noted on which rubber has been planted; the figures relate to the total acreage under cultivation, the acreage in tea, and that in rubber alone, while in the form of foot-notes is indicated the additional planting of rubber on the same estates.

ESTATES WITH PLANTED RUBBER IN KALUTARA DISTRICT, CEYLON.

Estates.	Proprietor.	Resident Managers.	Acreage. Culti'd.	Tea.	Rubber	Post Station.
Ambetenne	Cooper, Cooper & Johnson, Ltd.	C. Hen'y ...	522	432	*a* 70	Nebods.
Arapolakanda	Eastern Produce & Estates Co., Ltd. ...	H V. Bagot	604	401	*b* 20	Tebuwana.
Bogahagodawatta ...	A. Sirimane	J. A. Sirimane	455	210	*c* 10	Bentota.
Clontari	General Ceylon Tea Estates Co., Ltd. ..	K. A Burne & Cond'r ...	232	195	A 38	Neboda.
Clyde	Clyde Tea Estates Co., Ltd.	G. G. Massy	303	240	63	Kalutara.
Culloden	Rosehaugh Tea Co., Ltd. ...	R. W. Harrison ... ... A. C. Corbetta	1233	789	*d* 444	Neboda.
Eagle's Land	General Ceylon Tea Estates Co., Ltd. ...	J. P. Dove - ...	160	160	*e*	
Elladuwa	Dimbula Valley Tea Co., Ltd.	A. Bawa	285	158	B 127	Kalutara.
Ellekanda	Rosehaugh Tea Co., Ltd.	R. Garnier & Conductor ...	518	426	*f* 83	Horana.
Frocester	J. E. H. Graham Clarke	J. E. H. Graham Clark ...	46	...	46	Neboda.
Gikiyanakanda	Lord Elphinstone	A. G. Glenie	1312	557	C 755	Neboda.
Glanrhos	General Ceylon Tea Estates, Ltd. ...	J. P Dove & Cond'r ...	222	209	*g* 13	Neboda.
Glendon	Heirs of R. Booth	R. J. Booth	300	250	50	Neboda.
Halwatura	Anglo-American Direct Tea Trading Co. ...	F. J. Wright ... .. J. I. Hall.	1172	1072	*h* 100	Ingiriya.
Heatherley	Rosehaugh Tea Co.	R. W. Harrison ... ... C. O. Macadam.	404	340	D 64	Neboda.
Kaluganga	Clyde Tea Estates Co., Ltd. ...	G. G. Massy ... .. A. Wood.	186	135	51	Kalutara.
Lliskillan	Clyde Tea Estates Co., Ltd. ...	G. G. Massy ... ... A Wood	176	143	33	Kalutara.
Mahagoda	T. O. Van Rooyen	A. J. Van Rooyen ...	54	39	6½	Bentota.
Malaboda	Lanka Rubber Co., Ltd.	C. Henly	165	...	165	Neboda.
Middeliena	Government of Ceylon	Conductor	20	..	20	Kalutara.
Millewa	H. J. Pieris, J. P.	E. Fernando & Cond'r ..	1105	1000	10	Padukka.
Miriswatta	H. Don Carolis and L. F. Fernando ...	Conductor	125	35	90	Horana.
Meegama	Rosehaugh Tea Co., Ltd. ..	R. W. Harrison ... ... A. C. Corbetta	227	...	227	Bentota.
Neboda Group	Neboda Tea Co. of Ceylon, Ltd. ...	R. Morison ... .. Alex. D. Callander, Actg.	720	495	225	Neboda.
Neuchâtel	C. C. Mee	C. C. Mee ... ... C. J. Adamthwaite.	800	475	*i* 322	Anguruatota.
Padukka	Rubber Plantations of Kalutara, Ltd. ...	C. L. Vizard	34	...	34	Padukka.
Pallagodda (including St. Columb Kille)	Kalutara Co., Ltd.	L. C. S. Marshall ... H. P. E. Lyford.	818	682	*j* 125	Bentota.
Pantiya	J. H. Strachan	P. W. N. Farquharson ...	563⅜	446⅜	*k* 117	Neboda.
Perth (including Maputugalle)	Ceylon Tea and Cocoanut Estates Co., Ltd.	P T L. Wetherall (R. H. Algie, Actg.)	1047	410	*l* 20	Horana.
Polgahakanda	L. C. S. Marshall	K. A. Burne	243	227	E 16	Neboda.
Putupaula (including Crurie)	Putupaula Tea Estates Co., Ltd. ...	H. A. Tipple	576	400	*m* 176	Neboda.
Rayigam	Rayigam Co., Ltd.	A. J. Dawson ... ... C. T. Sinclair	802	696		
Rogart (including Llangsland)	Heirs of R. Booth	R. J. Booth	...	...	*n* 106	Padukka.
Sirikandura	Mrs. Jeremias Dias	G. M. A. Perera	436	249	187	Neboda.
St. George's Group ...	H. V. Bagot, R. W. Harrison ...	C. Henly	375	370	*o* 5	Matu. 9 Neboda.
Talagalla and Knutsford ...	The Consolidated Estates Co., Ltd. ...	C. L. Vizard	386	...	386	Neboda.
Tempo	F. G. McGuire and J. E. H. Graham Clarke...	J. E. H. Graham Clarke ...	649	617	*p* 21	Padukka.
Tudugalla Group	J. H. Starey	Herbert Inglis ...	478	297	*q* 181	Neboda.
Vogan and Iddagodde ...	Vogan Tea Co., Ltd.	W. N. Tisdall .. ... R V. Grimwood.	792	550	*r* 202	Neboda.
Yatadola	Kalutara Rubber Co.	C. Henly	1085	816	*s* 69	Neboda
			374	100	274	Neboda.

NOTE—The *italic* letters (*a*, *b*, *c*) in the Rubber column indicate the number of additional rubber trees planted among tea on the same estates, as follows:—*a*—10,000; *b*—36,550; *c*—12,000; *d*—78,900; *e*—12,000; *f*—20,000; *g*—16.000; *h*—40,000; *i*—35,000; *j*—14,297; *k*—3.000; *l*—31,210 *m* 40,000; ,,—50,000; *o*—5,000; *p*—47,000; *q*—25,000; *r*—30,264; *s*—24,000; total, 499.321 trees among tea, without the acreage being specified.

The SMALL CAPITALS (A, B, C) in the same column indicate the number of acres of tea interplanted with rubber: A—15 acres; B—30 acres; C—25 acres; —D 340 acres; E—10 acres; total 420 acres.

MISCELLANEA.

AFFORESTATION AND THE FUTURE SUPPLY OF TIMBER.

For some weeks past highly interesting and instructive lectures on the subject of forestry have been given in the Crieff Parish Church Hall by Mr. W. F. Hudson, M.A., P.A.S.I., Cambridge, lecturer in the West of Scotland College of Agriculture The audience on each occasion has consisted largely of land owners, factors, foresters, gardeners, etc., and at the final lecture Mr. Lewis Miller, of Crieff, occupied the chair, and took a leading part in the discussion that followed. We give below the text of the Chairman's speech, which will, we are sure—coming, as it does, from so practical a man—be appreciated by those who watch the fluctuations of our timber supplies.

Mr. Lewis Miller, Benachie, in the course of a few remarks, gave those present the benefit of his lengthened experience in the timber trade in Perthshire, Forfarshire, Aberdeenshire, Invernessshire, as well as in Canada, Sweden, &c. He said between the years 1870—90 he cut down in Scotland growing timber to the value of over £250,000, and for manufacturing and delivering that timber he paid in wages over £250,000. His experience with growing timber in Scotland during the past 30 years, and on the basis of prices ruling during that time, justified him in stating that growing larch, Scots fir, and spruce would give to a proprietor from the time it was planted an average of £1 per acre, apart from the cost of planting. A great many of the plantations he had cut down in Scotland were about 50 years of age, and yielded over £50 per acre, apart from the value of the thinnings taken out of them previous to the time they were finally cut down. To one proprietor in Aberdeenshire he paid over £80,000 for plantations about 50 years of age—about two-thirds larch and one-third Scots fir and spruce, and the price which he paid on the average was more than £50 per acre. One plantation of larch in Aberdeenshire, about 70 years of age, yielded £150 per acre;

another plantation, all larch, about 44 years of age, gave over £100 per acre; and these plantations were, for the most part, grown on pasture or waste land, which would only be worth 1*s.* or 2*s.* per acre for sheep or cattle pasture. He believed there were millions of acres of pasture land in Scotland which at present only yielded proprietors a rental of a few shillings per acre, and which, if planted to a height of 1,500 feet above sea-level would give them not less than £1 per acre on the average, besides giving profitable and steady employment to a large resident population and improving the climate of the country; and he could not too strongly urge upon the Scottish proprietors the desirability of planting up every available inch of waste land, for nothing would be more profitable in the future. He thought the Government should come forward and advance money at a small rate of interest to Scotch proprietors to plant up waste land. The Germans had the best system of forestry in the world at present, and they had a law which compelled every proprietor to plant up waste land.

Larch was the most valuable crop; but it was safer to plant half larch and half fir and spruce. Spruce had now become far more valuable than fir, because the great bulk of the paper consumed in the world was now made out of spruce. The demand for spruce for paper-making had been increasing very rapidly during the past few years, on which account the price of spruce had gone up very much and in the future it was likely to be as valuable as larch. He had also during the past twenty years cut down extensive forests in Sweden, and he had been all through the forests of Norway, Sweden, Finland, and Russia, and could testify that they were all very nearly exhausted. The Swedish Government had now introduced a very extensive and very cheap system of planting seed by small boys, who went in a row about three or four feet apart, and who dug out small holes in the ground with a hand iron and dropped in a few seeds. By that system the Swedish Government could plant the ground on an extensive scale at about 2*s.* per acre; and it would be well for Scotch proprietors to copy that system, as well as the German system, because the system of planting as hitherto carried on in

Scotland was too expensive, especially when it would require to be done on a large scale. He had during the past five years been operating extensive forests in Canada, and had been through a great many of the Canadian forests, and he could testify that those Canadian forests which were accessible were very much depleted. He had also been through the United States, and it was now recognised there that in 15 or 20 years hence there will be no forests left in that country. It was estimated, on good authority, that the pitch pine of the Southern States of America would be exhausted in 15 years' time or so. Within the next 15 or 20 years there would be a timber famine in America, and also in Great Britain, unless some immediate steps were taken to plant on an extensive scale. Great Britain imports annually foreign timber to the value of nearly £30,000,000 sterling—a large portion of which could be grown in our own country, and during the next 20 years timber would be on a much higher level as regards price than it had been during the past 20 years, simply because the accessible forests of the world were nearly exhausted. The United States consumed annually about 90,000,000 railway sleepers to supply its various railways, and the Government there had now become alive to the necessity of introducing an extensive system of planting, as had also the Canadian Government, and Sir Wilfred Laurier, the Canadian Premier, called a meeting in Ottawa a few weeks ago to consider the question of the preservation and planting of forests in Canada. He (Mr. Miller) was of opinion that a large portion of the arable land of Scotland would, if planted with larch, spruce, and Scots fir yield a much better rental to the proprietors than it at present did in arable land. The only difficulty about the matter was that for the first 25 years there was no revenue, and it was there, he thought, that the Government could step in and advance money to proprietors at a low rate of interest, to be repaid when those forests were cut down. After 25 years, and up to the age of 50 years, there would be a regular revenue from thinnings, and then, according to his experience, it was more profitable to cut down a crop of growing timber at about 50 years of age than it was to preserve it to 70 years of age.

If, according to his experience, he was able to prove that growing timber had during the past 50 years yielded on an average £1 per acre for each year of its growth, then he thought he was justified in believing that the timber planted now would yield a much higher price per acre during the next 50 years, for in his opinion timber was bound to stand in the future on a much higher level as regarded price than it had been in the past, owing to the increasing population of the world, and the fact that the accessible forests of the world were very much exhausted, and that the demand in future would be far greater than the supply. In fact it was a pity that Scotch proprietors did not begin to plant on an extensive scale 20 years ago; but he hoped that something would now be done to remedy this condition of matters. There was a great hue-and-cry at present about bringing people back to the land. An extensive system of planting in England, Scotland, and Ireland would do very much to keep the people on the land, and to give profitable and steady employment for a resident population, and prevent them drifting into the towns.—*Timber Trades Journal.*

A METHOD OF KILLING PADOUK.

Mr. H. Carter writes to us as follows upon this subject :—

Some time ago I sent a note to the *Indian Forester** mentioning a report that the Burmans killed Padouk trees by driving splinters of Thitsi wood into the trees. Since then I have tried the experiment and find it absolutely fails. As people have officially quoted as a fact what I only mentioned as a report, I should be obliged if you would put a few lines in to say the report was not true.

CREEPERS AND CATERPILLARS.—Writing upon this subject Babu B. C. Sen Gupta, Forest Ranger, Gairkatta, Eastern Bengal and Assam, points out that only the sal trees were attacked, the other species being left alone. By experiments he found that the defoliators of particular species of trees would always feed upon the leaves of the same species and "they would rather die of hunger

*Vol. XXX, p. 382.

than feed on the leaves of species they do not like." The Ranger noticed that some species of caterpillar fed upon several species of tree but that they remained constant to these species and would not touch any other. Whilst this is the case in the present attack there are instances upon record in former bad attacks of caterpillars in these forests when practically every tree in the forest over large areas was defoliated. In these cases it has been proved that several different species of caterpillar were present, but we have yet to learn much about their habits and to discover exactly which of the many species are responsible for the greater part of the damage.

We regret we are unable to reproduce the photograph sent by the Ranger.

A POISON IN BOXWOOD.—In connection with the recently-formed Liverpool Institute of Tropical Research in the Tropics some important investigations have been carried out, says the *Pall Mall Gazette*. One by Professor R. J. Harvey Gibson, M.A., F.L.S., Professor of Botany at Liverpool University, will prove of considerable value. It appears that shuttlemakers in Lancashire and Yorkshire using "West African boxwood" complained of sickness, and the impression got abroad that this was due to some poison given off by the wood. In two or three cases after intermittent illness these illnesses had culminated in pathological conditions which had resulted in death, the death certificates registering "cardiac asthma" or "cardiac incompetence." Samples of the wood, dust, and shavings, were sent to Professor Gibson, who found that though called "boxwood" it was not a species of *Buxus*. It appeared that the men affected were chiefly those engaged in sawing the blocks and in polishing the finished shuttle with sandpaper. These men were enveloped in clouds of dust during their work. As a result of experiments it was found that the alkaloid present in the "West African boxwood" is a cardiac poison inducing a gradual slowing of the heart beat; that its effect is cumulative, finally producing a cessation of the beat under long exposure of the heart to its influence. The alkaloid is very soluble in saline solution, and the theory is that the alkaloid in the dust is affected by

the perspiration on the hands and bodies of the workers and becomes absorbed into the circulation to ultimately affect the heart.

A SWEDISH SAW MILL BUSINESS IN MADAGASCAR.—Mr. Thure Richmann, who has extensive business in Madagascar, has been interviewed by *Sundswalls Posten* on the conditions in that island. He says the country possesses unheard of wealth in its forests. There are large forest tracts especially on the northern part of the east coast. The difficulty is that no floating can take place ; besides, the ground is very hilly, so that felling conditions are difficult. It is easier to turn to account the forest tracts on the north-west part of the island, where the Betsiboka river constitutes a magnificent floating channel for such woods which float. Here at the mouth of the Betsiboka river is every prospect of a very important wood industry arising with a great sawing business, and in Majunga direct shipping to the near lying South Africa. In Majunga harbour the largest vessels can load. It is also here Swedish enterprise has appeared, and a Swedish saw mill has been erected. Attempts have previously been made by the French to set up a timber industry, but their efforts did not succeed. However, the Swedish attempt has now succeeded extraordinarily well, partly because of the able management of the Swedish enterprise, perhaps also partly because of the superiority of the Swedish machines.

The woods which are sawn are chiefly ebony, pallisander and rosewood. Besides, on the west coast there is a kind of wood which seems to have a great future before it, as it is not attacked by insects. It is called in the native language hazomalanga, and its specific weight is only half of the whitewood tree. There is also a Swedish saw mill on the east coast by Tamatave. Both are very unimportant establishments, but have great possibilities of development. As there is yet no industry on the island all kinds of industrial articles have to be imported. One and a half million francs of wood goods were imported in 1902, mostly from Sweden. Northern wood goods will continue to be imported

on a large scale. Certainly the duty on prepared wood goods is high, and an attempt is being made to carry through a further increase of duty on northern wood goods, but by cutting and planing timber at the Swedish saw mills at Tamatave and Majunga an import of unprepared wood can take place. When also this is possibly closed the Swedish saw mills out there will have developed so that they can deliver prepared wood goods for the requirements of the country from the native forests.

THE FRONTISPIECE IN THE JANUARY NUMBER.—Owing to an unfortunate mistake the Frontispiece in the January number is stated to be "Deodar growth in the Himalayas," whereas the description should read "Spruce with a few Silver Fir in the Himalaya." Mr. Milward, to whom we were indebted for the photograph, writes to us: "It (the forest) is of Spruce with, I think, one or two Silver Fir and the characteristic undergrowth of Strobilanthes Wallichii, on the north-west side of Deoban, looking towards Konain."

Photo.-Mechl. Dept., Thomason College, Roorkee. Photo by H. A. Latham.

ACACIA CATECHU.

VOLUME XXXII NUMBER 5

INDIAN FORESTER

MAY, 1906.

THE INDIAN BUDGET AND THE FOREST DEPARTMENT.

During the discussion of the financial statement for 1906-07 at the Meeting of the Council of the Governor-General of India on the 28th March, the following important references to the working and requirements of the Forest Department were made by Members of Council.

The Hon'ble Mr. Sim said: "The increased provision for expenditure on *Forests*, and the kindly mention of the *Tungabhadra Irrigation Project*, will be greatly appreciated. In regard to the former, I would again put in a special plea for all the liberality that is possible; parsimony in the case of Forests simply means postponement—postponement of all the benefits, which we expect and which we have led the public to expect, the forests will eventually yield in return for present inconvenience; liberality means hastening those benefits, and there can be few departments in which a policy of vigorous development and liberal expenditure will more rapidly repay itself. For the staff, too, I would bespeak the most favourable consideration of Government, when occasion offers,

for the work of a Forest Officer is work of a high order, and the conditions under which it is carried out are exceptionally arduous."

The Hon'ble Sir Denzil Ibbetson said : "As this is the sixth and will be the last time that I shall have the privilege of addressing the Council in connection with the Financial Statements, I should like to say a word upon a subject to which I have not hitherto had occasion to refer, but which is very closely connected with the agricultural interests of the country—I mean the Forest Department of India, for which my Hon'ble friend Mr. Sim has pleaded so eloquently—and the occasion is the more appropriate, since it was exactly fifty years ago last January that Dietrich Brandis, the father of scientific forestry in India, entered the service of Government. I doubt whether the general public realise the enormous actual and potential value of our forest property, the degree in which it already contributes to our revenues, and the success with which it is managed by the admirable service which is in charge of it.

"Twenty years ago the surplus revenue contributed by our forests to the public purse was a little over half-a-crore. The revised estimates for the year which is just expiring put it at a crore and-a-quarter. And this, in spite of the fact that all those measures for the ascertainment, development and protection of our forests, which really represent capital expenditure upon the property, and which are not yet by any means complete, have been and still are paid for from revenue. The selection of forests for reservation or protection, their demarcation, the settlement of private rights in them, their protection from fire, the improvement of communications upon which the profitable extraction of timber depends, and the provision of accommodation for the officers in charge—all these represent non-recurring expenditure which has been met from current revenue ever since we first seriously undertook the management and protection of Indian forests, and which still absorbs a considerable portion of the gross income ; and when these processes are complete, we may look for a still more marked expansion of the net surplus.

"But the question of forestry in India has aspects far more momentous than the mere money value of the timber which is produced. Upon the maintenance of our mountain forests depends the steady flow of the rivers from which our great irrigation canals draw their supplies, while the protection of our hill forests is often (as lamentable experience has taught us) the only safeguard against the devastation of the cultivated plains below them. With the increase of population and the bringing of hitherto unoccupied areas under cultivation, the demand for fuel and small timber is daily increasing; while if the Indian cultivator is ever persuaded to restore to his fields in the shape of manure a fair portion of what he takes from them in the form of fodder, that demand must expand enormously. Our forests, moreover, annually afford grazing to great numbers of the cattle upon which agriculture is dependent, while in time of drought, such as the present, they constitute invaluable reserves of grass. During the year which is just over, the Secretary of State has sanctioned proposals for the expansion and improved remuneration of the higher grades of the Forest Service, and we have under consideration similar proposals in connection with the executive grades, and with the reorganisation of the Provincial Service, and of the school at which it is trained. We are also considering proposals for the establishment in connection with that school (which we propose to raise to the status of a college) of an Institute of Forest Research, which will place Forestry upon an equal footing, in respect of scientific enquiry and instruction, with Agriculture and Veterinary Science."

Readers of the *Indian Forester* will not need to be reminded here that the Hon'ble Mr. Sim is the greatest living authority on the requirements of the forests in the Madras Presidency, nor to be told how much of the success of Indian forest administration is due to Sir Denzil Ibbetson who has guided and controlled the Department for so many years. The pronouncements made in these speeches of the national importance of the Indian forests, of the necessity for their maintenance and improvement, of the means under consideration for ameliorating the conditions of

service and of increasing the facilities for scientific research (to which we shall allude more fully in a subsequent number) must be of the greatest value in educating public opinion to a knowledge of the aims and objects of the Department, while the words of sympathetic praise for work accomplished will, no doubt, encourage its members to renewed efforts in the cause they have so much at heart.

His Excellency the Governor-General in Council conveyed appreciation in the highest form, when in the following words he suggested that the example set by the Forest Department might be followed with equally satisfactory results elsewhere. He said "Expert instruction in agriculture, will too, as years go on, undoubtedly conduce to the same success as has attended the scientific care which has done so much to realise for India the wealth of revenue contained in her magnificent forests." Indian Forest Officers may well be satisfied with this public recognition of their services to the State so generously and gracefully conferred.

SCIENTIFIC PAPERS.

ON SOME BAMBOOS IN MARTABAN SOUTH OF TOUNGOO BETWEEN THE SALWIN AND SITANG RIVERS.

BY SIR DIETRICH BRANDIS, K.C.I.E., F.R.S.

II.

Two species of *Oxytenanthera* are common in this part of Martaban, to which must be added *O. parvifolia*, and a fourth species hitherto known as *Gigantochloa macrostachya*. The most common and best known of these is *O. albociliata*, *Wapya gale*, *Wagôk*, Burm.; *Wahklè*, Kar. (Manson No. 6.) In 1880 this species was common in the Sinzwè reserve and it probably is still so. Not being tall and erect as the other bamboos associated with teak, but forming dense, low masses of culms bending over and nearly horizontal, it is not useful in drawing up the young teak trees and does not therefore tend to clear their stems and to make them tall and straight. This species flowers frequently, the spikelets are slender, curved, ½—¾ inch long and they are marked by the glumes being white-ciliate along their edge. The branches

in the lower portion of the culms are stout and often single, the internodes are 15—24 inches long, 1—1½ inches diameter and the node rings are oblique.

O. nigrociliata, *Wapyu gyi* Burm., *Wamay*, Karen, (Manson, No. 1, on the hills west of Papun). Densely tufted like the last,

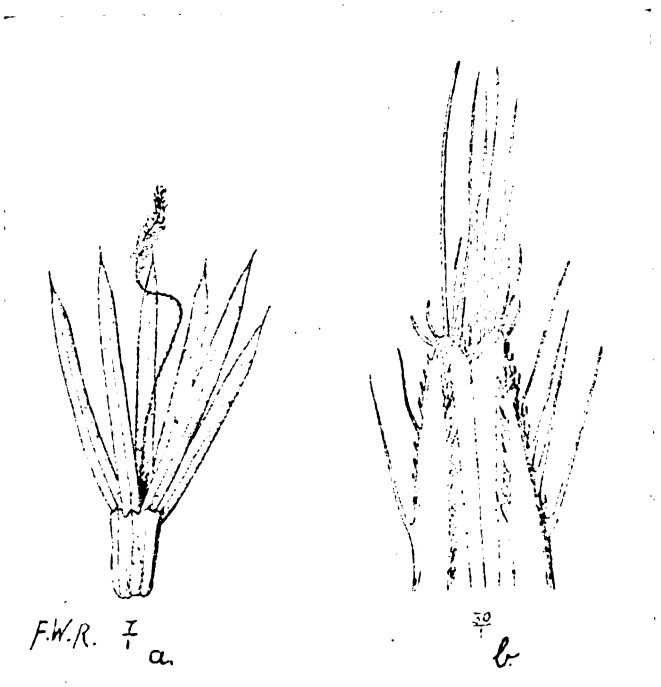


FIG. 4.—OXYTENANTHERA NIGROCILIATA, MUNRO—*a* (× 7) Ovary enclosed in the short transparent staminal tube bearing 6 anthers with long mucronate tips. *b* (× 30) Bidentate tips of palea, with long stiff bristles.

but the stems are erect, the culms 30—50 feet high, nearly naked in the lower half, glossy green, finely streaked with white lines, while young. Culm-sheaths thickly coriaceous, densely clothed outside with dark brown or black irritating hairs which rub off readily, chiefly along the middle line. Two small round auricles at the top. Internodes 16—30 inches long, diam. 2—4 inches.

Glumes conspicuously dark brown, ciliate along their edge, palea bidentate with long bristles at the apex, anthers long, mucronate, style at the end with numerous short papillose branches. (Figs 4, 5.) This is a widely distributed species, from the Garo Hills and Sylhet over the whole of Tenasserim, to Singapore, also found in the Andamans and Nicobars.

Closely allied is a species, described by Kurz and figured by Gamble on tab. 54 of his excellent monograph of Indian bamboos as *Gigantochloa macrostachya* which I found in flower March, 1862, on the hills east of Shwegyin. The flowering specimens are, with many of my old Burma collections, at the herbarium of the Royal Botanic Gardens, Calcutta; but they were most kindly sent to me for examination by Lieut.-Col. Prain, while Superintendent of the Royal Gardens, Calcutta, and I have them now before me. The following description of this bamboo is extracted from a private letter of mine, dated Taung dalay seik, 10 miles east of Shwegyin, March 2nd, 1862:- "The low hills here are all covered with one kind of bamboo (*Wapyu gyi*, Burm.). This is a bamboo peculiar to the forests east of the Sitang river (in another MSS. note of mine I say 'taking the place of *Myinwa* of Pegu'). It is easily known by the white longitudinal stripes on the internodes. The country through which we have passed to-day, everywhere shows the marks of taungya cultivation; we passed over a number of taungyas, where the paddy had been cut in December last. Here, instead of the masses of tall herbs, such as *Blumea balsamifera* and tall grasses, the shoots of this bamboo are springing up from the rhizome, immediately after the paddy has been reaped, and hence the return to the original forest is much more rapid here than is generally the case in Burma." From my notes, written on the spot, I extract the following: "Clumps, lax or loose, not compact, nor large, culms erect, 20—30 ft. high, internodes 18 in. long, 3 in. diam., node rings horizontal. Culm sheaths shorter than internodes, blade triangular. Leaves glaucous beneath, mouth of sheath in the younger leaves with long bristles." On account of these bristles the late Dr. Th. Thomson called this species *Bambusa crinita*, the name was never published

by him and has now (Fl. Brit. Ind. VII., 387) been referred to *B. nutans*—Kurz (F. Fl. II. 557) in describing *G. macrostachya*, which he calls *wanet*, states that the blade of the culm-sheath is produced on both sides into large wavy fuscous fringed auricles; such culm sheaths are figured by Gamble from Kurzs' specimens and from Kurzs' drawings in the Calcutta herbarium. I have no culm-sheaths of this species of my own collecting, nor are they described in my notes, but I accept Kurzs' description, supported by figures 4 and 5 of Gamble's tab. 54.

The structure of the flower is the same as in *Oxytenanthera nigrociliata*, but the fertile spikelets are much larger, 1—2 inches long. In both species the palea is bidentate at the apex and the style is simple. On tab. 60 of Gamble's excellent work the palea of *Oxytenanthera nigrociliata* is represented as entire, pointed at the apex, and the style as bifid at the top. Munro (Trans. Linn. Soc. XXVI., 129) says the style is trifid. I have examined numerous specimens collected by Helfer, Wallich, Manson and others in Martaban and Tenasserim, as well as Andaman specimens collected by Rogers and specimens from the Botanical Gardens, Calcutta, under the name of *O. auriculata*. In all cases I have found the tip of the palea bidentate, though in a young state the teeth sometimes had not separated. The style is neither bifid nor trifid, the lower and greater portion of its length is covered with short stiff hairs, while the upper portion is densely papillose and has numerous short papillose branches. (Figs., 4 a. 5 c.) This species of the hills east of Shwegyin undoubtedly belongs to the same genus as *O. albociliata* and *nigrociliata*. The anthers also, in all three species are alike, with a long, sharp prolongation of the connective at the apex, and the caryopsis is long cylindric. In Addenda to "Indian Trees" I have called it *Oxytenanthera macrostachya*, and I distinguish it from *O. nigrociliata* by the loose, not compact, clumps, the large wavy fringed auricles at the top of the sheath and the larger spikelets.

Eventually the arrangement of the two closely allied genera *Gigantochloa* and *Oxytenanthera* will have to be revised. Kurz

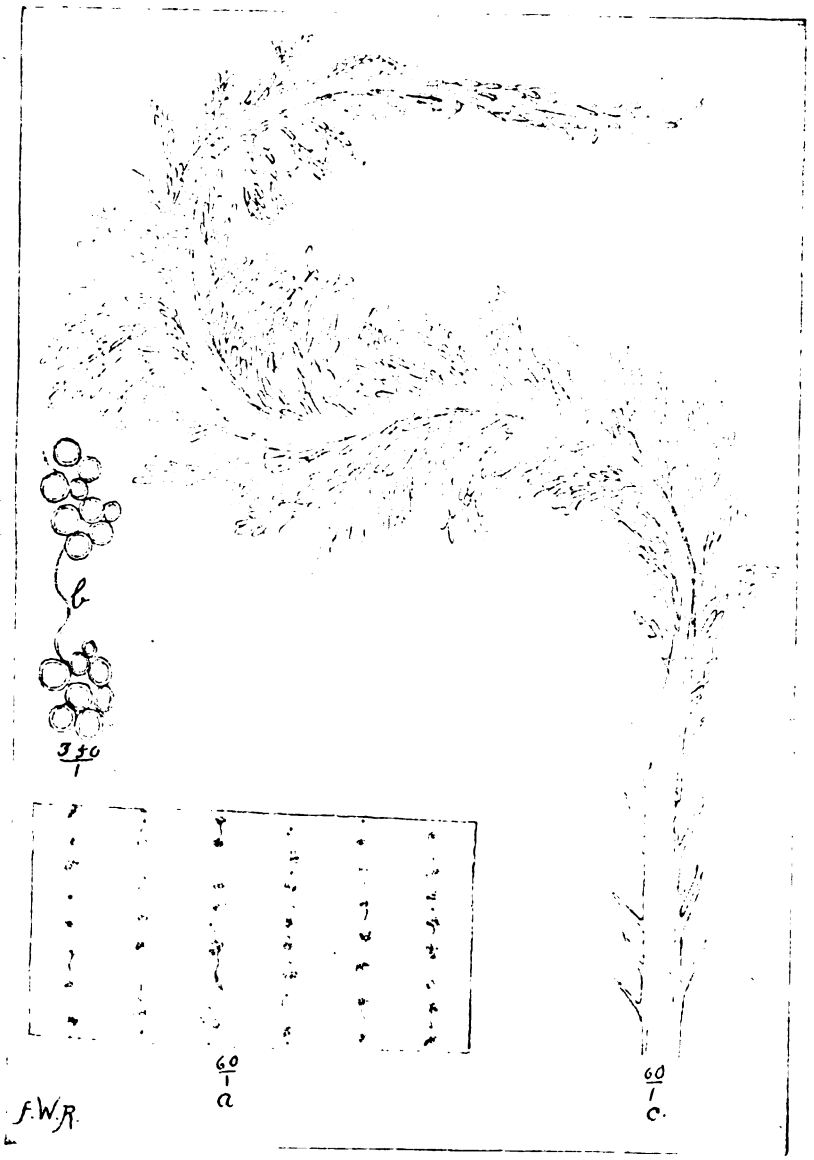


FIG. 5.—OXYTENANTHERA NIGROCILIATA, MUNRO.—*a* (× 60) Piece of transparent staminal tube, which now is 1 inch long, spread out flat, showing patches of torn annular and spiral vessels in 6 lines. *b* (× 350) two patches enlarged. *c* (× 60) Upper portion of style, below with sharp stiff hairs, above with numerous short papillose branches.

placed all Burmese *Oxytenantheras* under *Gigantochloa*, and as the latter is the older name, the names of these four species mentioned may have to be changed. Both genera have one important character in common, *viz.*, that the filaments are connate into a transparent membranous tube, which in the young flower is as long as the ovary, with six fine fibro-vascular bundles leading to the attachment of the anthers. (Fig. 4 a.) As the anther matures, it lengthens out rapidly into a long, thin hyaline tube enclosing the style and elegantly marked by six lines of patches of torn, annular and spiral vessels, the remains of the fibro vascular bundles. (Fig. 5 a b.)

A fourth species of *Oxytenanthera*, *O. parvifolia*, I found, March 1880, in the Yunzalin district in flower with the Karen name *Wamo*. It evidently flowers frequently, for the flower panicle collected by me has leaf-bearing branches. The spikelets are narrow-lanceolate, ⅔ to ¾ inch long and the glumes are almost entirely naked along the edge. From Mr. Manson I have received (No. 3) with the same Karen name, leaves, a piece of the culm and several culm-sheaths. This bamboo was found by him on the road from Papun to Bilin and it was said to cover a square mile or so of country between the Mewaing stream and the Bilin river. A culm 63 ft. long was measured, of which 52½ ft. were nearly naked, with only a few single branches, each branch accompanied by a few small twigs. The internodes 23—26 in. long, diam. 3—4 in. The undeveloped buds are shining, flat, acute, 1 in. high and 1½ in. broad. The culm-sheaths are large, rigidly coriaceous, almost glabrous on both sides, very shining on the inside and with few golden-brown hairs on the outside. Manson adds that the base of the sheath remains attached to the node with a fringe 1½ in. wide near the bud.

The specimens of *Wamo* collected by me in 1880 have this in common with Manson's *Wamo*, that the nodes of branchlets are thick, the two node rims distant, and the base of the culm sheaths persistent, further that the leaves have on their inner edge long, sharp teeth, (thick walled hairs) while the outer edge is without teeth or has only a few small ones. Against their

being the same species is the size of the leaves 3--5 by ½—⅔ in. N. 40—45 on ¼ in. (1880) and 10—12 by 1—1¾ in. N. 24—30 on ¼ in., with a large conspicuous ligule in those collected by Manson in 1905. It is, however, possible that the leaves collected by me in 1880 were all from flowering culms and in bamboos these leaves are frequently stunted. Unfortunately I have no full description of the species which I called *O. parvifolia* in 1880. The Burmans who were with me at that time called it *Thaiktumyintu*, indicating a resemblance to *Bambusa tulda* and *Dendrocalamus strictus*.

Before leaving *Oxytenanthera*, I wish to draw attention to the order in which the flowers open in the spikelet. At the base of each spikelet of O. *nigrociliata* are 3—4 empty and above them 3—4 fertile glumes. Of the fertile glumes or flowers I have always found the uppermost furthest advanced. In several cases I found in the lowest flower the staminal tube short, not longer than the ovary, while in the middle one the staminal tube was 1 in. long, enclosing the style, the uppermost flower containing a mature cylindric caryopsis, ¾ in. long. In other bamboos I have found the lowest flower furthest advanced, which probably is the usual order of development in bamboos. With dry specimens it is difficult to carry research on this point to a satisfactory conclusion, and I would recommend the study of this important question to my younger friends and colleagues in Burma.

The next to be mentioned are two evergreen bamboos which are often climbing, with large leaves and very long internodes. *Teinostachyum Helferi* (*Pseudostachyum Helferi*, Kurz) usually called *Wathabut* Burm., the Karen name of which I noted as *Thochi* in 1859 in the Salwin hills. This is Manson's No. 4, called by him *Thaw-khwè*, Karen and *Wanwè*, Burm., and collected by him on the hills east of Papun. The specimens, pieces of culm, culm-sheaths and leaves agree, and though Manson does not mention the climbing habit, it is indicated by the name *Wanwè*. The internodes are 2—4 ft. long, diam. 1½ in. grey with white appressed bristles, the culm-sheaths 8—12 in. long, tapering gradually to a truncate apex 1½ in. broad with a dense fringe of

persistent bristles, ¼—¾ in. long, blade narrow, erect or recurved. Leaves 12—18 by 2—4 in., nerves 12–21 on ¼ in. (Fig. 6.) The flowers of this species are imperfectly known.

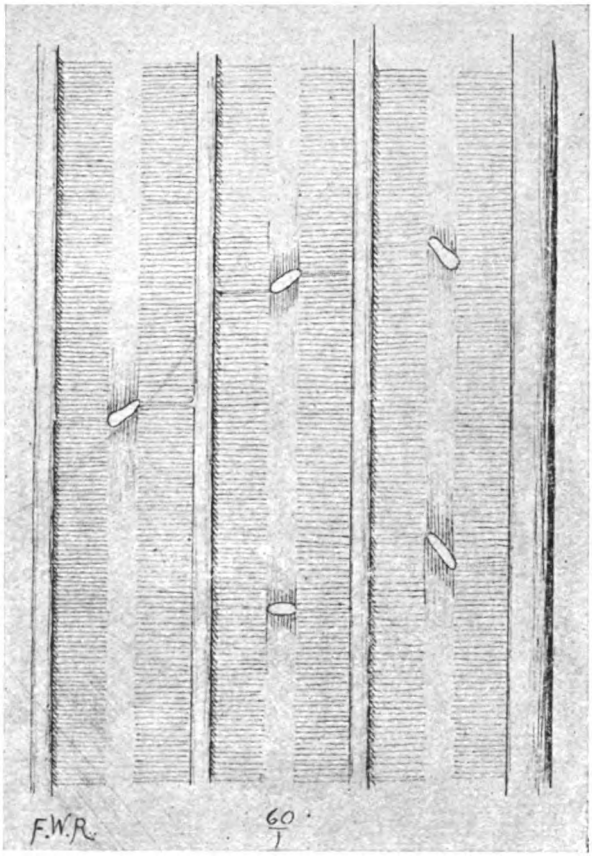


FIG. 6.—TEINOSTACHYUM HELFERI, GAMBLE.—Piece of leaf (× 60), showing three fine and one stout longitudinal nerve with bright bands of silica cells between (18 n. on ¼ inch). Transverse vein 5, obscure, visible as bright spots (transverse pellucid glands, Gamble).

Dinochloa Me. Clellandi. Wanwè, Burm. (*Baw.* Karen; *Sinninwa*, Burm., Manson No. 5.) On the hills east of Papun, near the Metharauk stream. Slender, culms zigzag, nodes much swollen,

internodes 3—4 ft. long, diam. 1 in. At the nodes, both above and below the lower ring (scar of culm-sheath) a band of fine-felted white unicellular hairs, ½ m. m. long. Leaves 12—24 by 2--5 in.

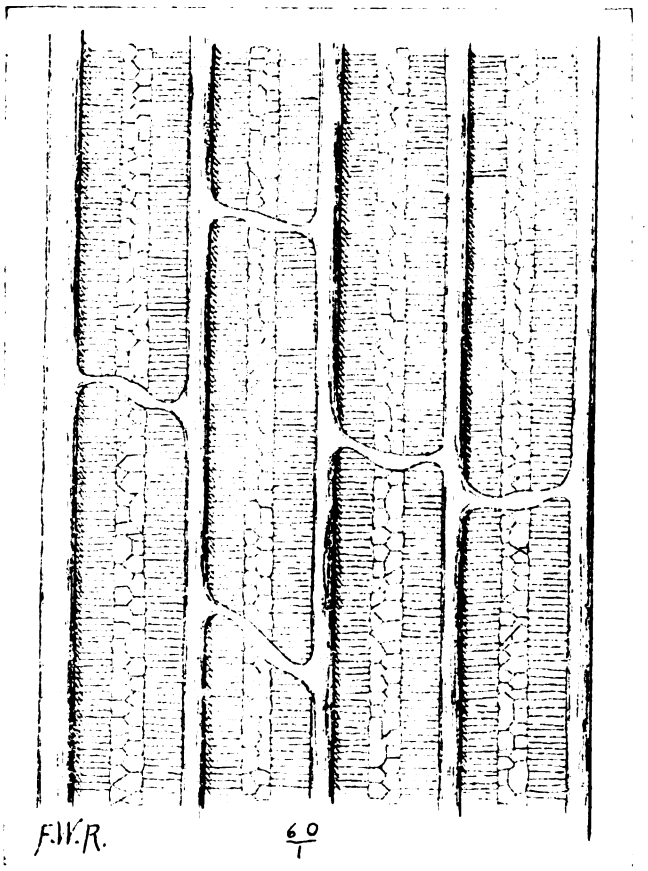


FIG. 7.—PSEUDOSTACHYUM POLYMORPHUM, MUNRO.—Piece of leaf (× 60) showing four fine and one stout longitudinal nerve with bright bands of silica cells between. Transverse veins distant, oblique (21 n. on ¼ inch)

narrowed into a broad stout net. ¼—½ in. long, n. 2—21 on ¼ in. Flowers unknown. Good specimens in flower and ripe seeds of these two species would be very valuable.

Another species with overhanging culms, often supported by neighbouring trees, is *Pseudostachyum polymorphum*, common in Sikkim, Bhutan, Assam, Manipur and Upper Burma, where it is called *Bawa* or *Baukwa*. I mention it here as an instance of a bamboo, the leaves of which have prominent transverse veins, the longitudinal nerves being far apart (18—22 on ¼ in. Fig. 7). All bamboo leaves have transverse veins, which run across from one longitudinal nerve to the next, straight, oblique or with a bend in the middle. In many species these veins are not conspicuous, they can however frequently be seen as bright translucent dots at the point where they cross the transparent band of silica cells which in all bamboos is found halfway between two longitudinal nerves. In his excellent monograph of Indian bamboos, Gamble designates these as pellucid glands. On Figs. 6 and 9 an attempt has been made to represent these translucent dots. In *Melocanna* they are very obscure, they are more distinct in *Teinostachyum*. In all bamboo leaves the transverse veins can be made conspicuous by scraping off part of the tissue filled with chlorophyll or by bleaching re-agents.

ORIGINAL ARTICLES.

FIRE PROTECTION AND THE NATURAL REGENERATION OF DEODAR IN THE FORESTS OF THE KULU DIVISION, PUNJAB.

BY GURAN DUTTA MAL, FOREST RANGER.

Almost all the forests of Kulu are situated near the tops of the ridges, the lower parts of the valley being occupied by cultivation or bare grass lands. There is a fairly continuous belt of forest above the cultivation and grass lands. This feature is most conspicuous in the Kulu Range, which, properly speaking, consists of the Beas Valley.

Prior to the formation of the Forest Department, almost all the bare grass lands, as well as the forests, were annually burnt

to give a good crop of grass to the people. But in the early eighties, the demarcation work was commenced and almost all the wooded area was closed against firing. At that time it was thought proper to allow the people to continue burning the bare grass lands locally called "Phats." A detailed list was prepared, giving the name, approximate area and the boundaries of each "Phat." This practice continued, but in the year 1888 or 1889 for some reason or other, the people were no longer allowed to burn these areas, and the result was that all the forests together with these "Phats" were maliciously burnt by the people from one end of the valley to the other. This led to much litigation and resulted in about Rs. 11,000 being realised as fines from the people in one year.

In those days the system of joint responsibility of the right-holders existed in the Valley, and in the case of every fire, all the right-holders of a village were punished, if they could not produce the real offender. This caused "zulum" in several cases, as a man of one village bearing enmity to the men of some other village would wreak vengeance on them by firing their forests. This system of joint responsibility was therefore abolished in the year of 1891 or 1892.

At the time of the Forest Settlement in the year 1884, efforts were made to include every possible forest area within the demarcated forests, which were taken under strict protection, setting apart the undemarcated "Phats" to be burnt by the people under the control of the Forest Department.

Although this work was carried out with, perhaps, an excess of zeal, many undesirable areas, with a few scattered trees only, having been included in the demarcated forests the result has been marvellous and beyond all expectations. In some cases slopes which were absolutely bare at the time of demarcation about 20 years ago are now densely covered with deodar and kail poles with full or rather too full a leaf canopy. All this has come about naturally. Wherever there was any seed bearer, on the bare slopes or in the forests, young seedlings came up like weeds and covered the area in no time. One who sees such places now can scarcely

imagine that these slopes were absolutely bare only 15 years ago.

Fortunately there has been no serious fire in these forests to kill back the natural regeneration. Luckily the Kulu people never think of propitiating their dieties by burning the forests, as some other hill tribes are in the habit of doing.

The custom of "Phat" burning is still in vogue in the lower part of the valley. The fact that the people of the upper part of the valley can do without "Phat" burning clearly proves that the practice is only a luxury and not a necessity.

"Phat" burning has both its advantages and disadvantages.

The advantages are :—

(1) The people being allowed to burn these "Phats" have no interest in burning the valuable wooded forests.

(2) The "Phats" act as fire lines, for having been burnt in the month of February, they stop any outside fire crossing into our forests in the fire season.

The disadvantages are :—

(1) The burning of the "Phats" does not allow these slopes to be covered with trees and hence no natural reproduction can be obtained. This means that the forests cannot be extended in area, which is however very necessary in order to meet the increasing demand both for local supply and for export into the plains.

(2) A surface layer of soil cannot be formed, and in all these "Phats" bare rocks are cropping up to the surface.

But the total closing of these "Phats" might lead to disastrous results such as were witnessed previously in the year 1888 and 1889. We should now begin to restrict the "Phat" areas by closing small areas adjoining our forests and adding them to the demarcated forests.

In my opinion the people burn much more area than they actually want for their grass lands and the gradual closing of small areas would not entail any great hardship upon them.

CATECHU AND CATECHU BOILING.

BY H. A. LATHAM, I.F.S.

In South Canara one of our most profitable sources of revenue is the extract obtained by boiling the wood of the catechu tree.

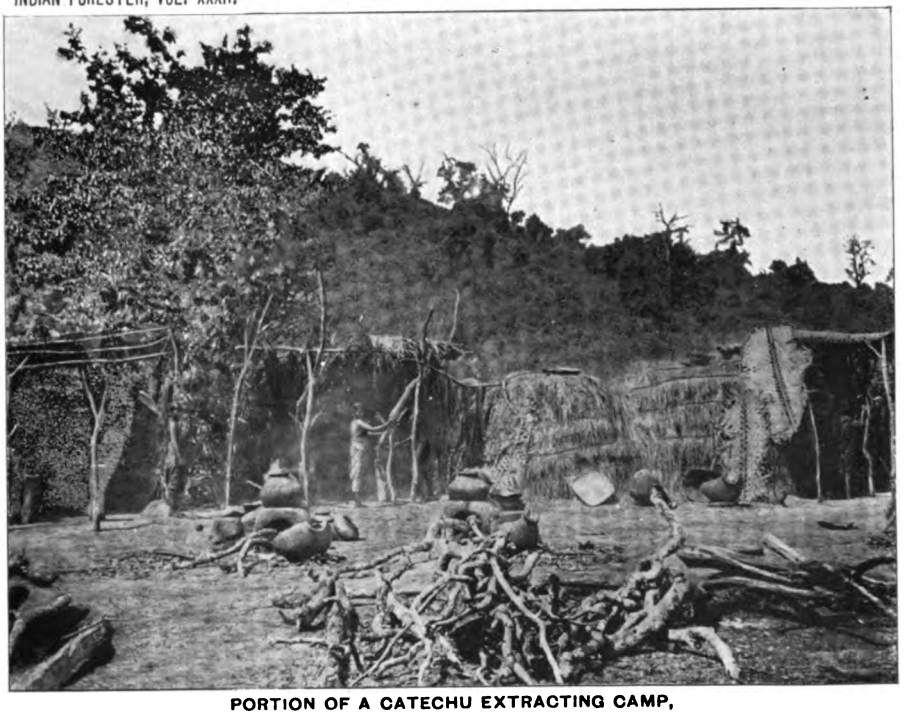
The tree is botanically known as *Acacia Catechu* (Willd.) and locally by the Canarese name *Kâchu-mara*, the first portion of the name being the vernacular variant of catechu.

The catechu is a "reserved" tree. It is armed and belongs to the natural order *Leguminosae*; it reaches a girth of about 4½ feet and a height of 20 to 25 feet (*vide* Plate XVIII). The tree is confined to the laterite plateaux in the Coondapur taluk, situated as a rule within 15 miles of the sea and gradually dies out as we proceed southwards until near Coondapur itself the tree will hardly grow. It appears again to a small extent in the Kasaragod taluk 80 miles further south, but no extraction is done there now. It yields a good firewood and the wood is heavy and durable but cannot be obtained of any large size.

The extract is astringent and besides the other uses it is put to it appears to be a remedy for diarrhœa, dysentery and diabetes; it is, however, chiefly used for chewing with *pan supari*; locally, it is used pure in small pieces, the size of a pea, and rolled up with the other ingredients in the betel leaf to form a chew. In Mysore, the catechu bought by the merchants from us is dissolved in water and the areca nut is, after being boiled and sliced, steeped in the solution and then put out in the sun on mats to dry, this operation being repeated until sufficient catechu has been taken up to form a red, shining, semi-transparent film through which the ruminated albumen of the areca nut is just visible; the brighter the red colour so obtained the better the quality of the nut.

As we sell it the catechu is in the shape of hard round balls covered with a whitish dust, the ashes with which the balls are covered to prevent them adhering to one another; on breaking, the interior of the balls should show a vitreous conchoidal fracture similar to quartz and be of a warm reddish brown colour.

The manufacture of catechu which I will now attempt to describe is carried out under departmental supervision by a



PORTION OF A CATECHU EXTRACTING CAMP,
Hosur, Coondapur Range, S. Canara.

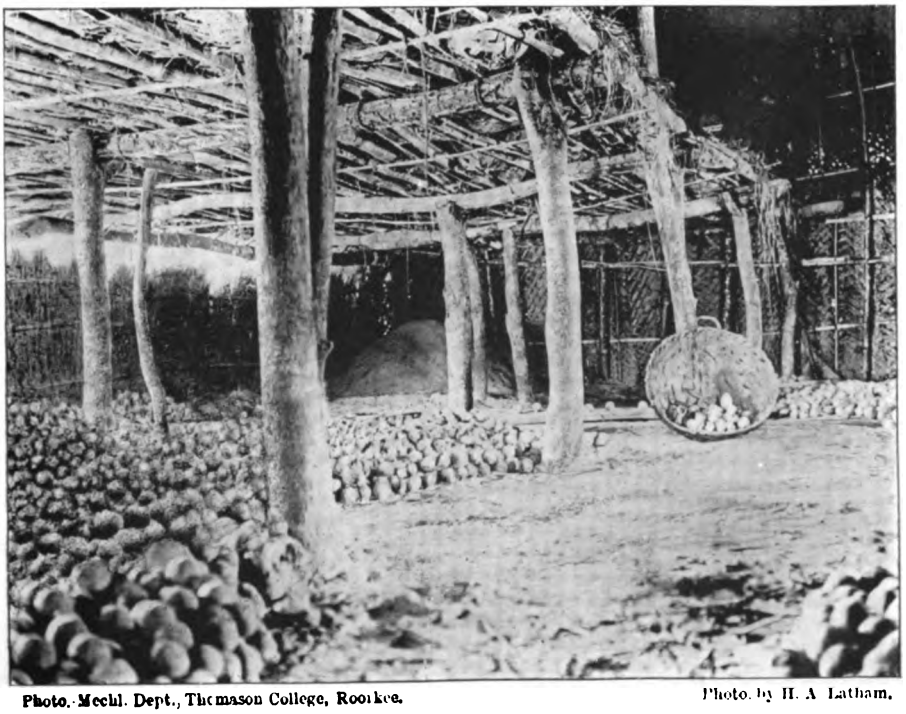


Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by H. A. Latham.

INTERIOR OF A CATECHU STORE SHED.

contractor who is paid on the outturn and is bound, for the actual boiling, to employ only Kudubies, a local tribe of aboriginals.

So far as the department is concerned, a locality where there are plenty of catechu trees is selected and all trees over 6 inches in diameter are allowed to be cut ; the contractor has to engage the Kudubies and select the site for the ovens, conveniently situated both for water and firewood, and also as close to the majority of catechu trees as he can get it. The site usually selected is a rice field for which the contractor may have to pay a small rent. Generally, however, no rent is charged as the owner is only too glad to have the ashes, obtained in extracting, to plough into his field. On this field the encampment is made, consisting of rows of thatched huts made of grass and bamboos ; the huts are about 6 feet high by 5 feet by 10 feet and about 15 feet apart, the rows being about 60 yards apart.

The first thing to do is to erect the ovens, known as "*Wolle ;*" these are made by a party of men a fortnight or so before the main body come, the ordinary soil of the field is used and the ovens built to a height of 18 inches and placed about 5 yards in front of the huts at irregular distances, 1 or 2 to each hut.

The oven is an oblong, about 2 feet wide by 3 feet long with two openings above about 1 foot in diameter on which the boilers, common ovoid earthenware pots (*madike*) are placed ; these pots are about 18 inches high with a diameter of 15 inches in the body and a mouth 8 inches across. The opening for the fire is placed on the windward side and extends to the far side of the second opening in the top of the oven, the smoke, &c., escaping through the spaces between the boilers and the oven ; the earth forms the hearth.

Plate XIX depicts a corner of a catechu extracting camp and an interior of a catechu store shed.

To proceed to the details of the working the guard and the watcher go out the first thing in the morning and mark trees for the Kudubies to cut noting the name of the man, the girth and the length of the workable stem and branches. The Kudubi then cuts

the tree and chips off the sap wood, a ring about 1 inch wide, with his axe and brings it into the camp where a Forester is stationed who measures the length and girth of the pieces and takes the weight of wood brought in. (The largest tree cut in 1904-05 was 3 feet 8 inches in girth and yielded 26 maunds* 7 lbs. of heart wood). The Kudubi then carries it off to his shelter and proceeds to chip it. In the afternoon he may have to go and get firewood, but generally he can get enough firewood in a day to serve for several days' boiling. So much for the men's work.

Mrs. Kudubi puts the chips (*chakkai*) into the pot nearest the mouth of the oven and fills it up with water putting a large flat wooden spoon on the top partly to keep the chips down, and lighting her fire allows it to boil. As soon as this occurs the pot is tipped into a wooden trough (*marige*) placed alongside the oven and the pot with the chips is refilled ; this process is repeated six times. The contents of the trough are put into the second pot which is used purely for evaporating. The contents of this pot are replenished from the trough with a cocoanut bailer (*chippu*) until all the extract obtained from the chips has been evaporated to a nearly solid residue ; the contents are then poured into a broken half pot and allowed to dry naturally, being stirred at intervals to enable the drying to proceed evenly. The extract (*rasa*) is of a yellowish brown colour when stirred, the surface being of rich redbrown. This stirring is done with a one-sided spoon (*satuga*).

To make the balls the woman covers her hands with a little wood ash to prevent the extract adhering to them and takes up as much catechu as she can close her hands on and presses it into shape. These balls are paid for at Re. 1-2-0 per 100 and are counted before the Forester next morning, and delivered to the contractor. This ends the work done by the Kudubies. When the balls have been counted in, they are rolled by special men engaged for the purpose on a board sprinkled with a little wood ash and this is repeated daily for 3 or 4 days to consolidate them. These rollers are paid from 5 to 8 rupees per mensem ; 3 men and 4 boys were employed in 1904-05 and could roll 4,000 balls in a day.

* One maund equals 28 lbs.

Their pay aggregated Rs. 40 per mensem and they were supplied with food as well probably costing another Rs. 20.

After this daily rolling the balls are spread out in the receiving shed to dry in a single layer for the first day or two and after that they may be in two layers.

After the fourth or fifth days' rolling they are put in a pit and covered over with wood ashes on which a little water is poured and on being taken out the next day are gone over and all balls which are soft or broken are then rejected, the good ones being put on the upper story of the stone shed to get quite hard and dry.

As far as I have been able to work out the cost of manufacture, the details are as follows per candy of 5 cwt. :—

	Rs.	a.	p.
Extraction	31	8	0
Rolling	2	12	0
Shed and ovens	1	0	0
Shelter for Kudubies	1	0	0
Sundries	1	0	0
Total ...	37	4	0

This is the maximum cost to the contractor.

The total quantity of heartwood chipped in 1904-05 was 11,527 maunds and yielded 63 candies and 9 maunds or about 11 per cent of extract. (20 maunds = 1 candy).

The contractor is paid Rs. 42 per candy (for 1904-05 and 1905-06) and this price has gradually come down.

Sales are by tender and realized in 1903-04 Rs. 200 per candy and in 1904-05 Rs. 175 per candy. The lowest rate received since operations commenced in 1889 is Rs 126 per candy in 1892, when also the amount paid for the manufacture (Rs. 60) was at its maximum. The rates, however, have varied considerably.

An extract, of which specimens have been sent to England for valuation, has been prepared from the wood of Xylia dolabriformis by treating it in the same way as catechu, but is very difficult to get solid.

CORRESPONDENCE.

TO THE HONORARY EDITOR OF THE INDIAN FORESTER.

A FOREST SERVICE FOR QUEENSLAND.

SIR,—I do myself the honour to advise you that I have been appointed Director of Forests for this State.

The forest wealth of Queensland is very vast. It is computed that there are 40,000,000 acres of land in the State bearing commercial timbers. These range from the finest softwoods, such as Hoop Pine as strong as British Oak, and weighing, when seasoned, about 32 lbs. to the cubic foot, to timbers like ironbark, half as strong as the finest cast iron, and weighing about 70 lbs. to the cubic foot, with all grades of hardwoods and softwoods between. The most exquisite furniture woods are also present in quantity and variety.

It is my duty, amongst other things, to afford information relative to these timbers, and I shall be glad at all times to be favoured by your enquiries in this connection.

I beg to ask that you will kindly place my name on your mailing list for the despatch of your publications or other information relating to timber, scientific, technological or commercial; the world's timber markets, forestry or cognate sciences, forest botany, etc.

A large hall 55 by 80 feet, splendidly lighted and occupying a prominent position in the newly erected Executive Buildings, has been placed at my disposal for the exhibition of timbers and objects relating to Forestry. I shall be very glad to receive any maps, plans, or other objects relating to Forestry in any part of the world, as well as samples of commercial timbers.

I have the honour to be,
Sir,
Your obedient servant,
PHILIP MACMAHON,
Director of Forests.

BRISBANE:
12th April 1906.

BRUSHWOOD BURNING.

SIR,—There is an interesting note on the Brushwood Burning in Changa-Manga plantation in the February number of the *Indian Forester* and a final decision on the question will be an interesting one. Lala Atma Ram may throw more light on the question by comparing the results of burning the brushwood with those where the brushwood is sold, instead of burning, and removed by the people in Shahdera plantation of the same Forest Division. One drawback in the comparison may be that while the Changa-Manga plantation is an irrigated one, the Shahdera is not, but there are compartments in the latter, which owing to their situation on the bank of the river, are not in very much less favourable conditions.

As to the objections against burning the brushwood :—

1. (*a*) Although burning brushwood deprives the soil of a good deal of its natural manure, still it leaves something in the ashes, and is not this something better than nothing?

(*b*) Can this not be avoided by collecting the brushwood on the compartment lines and burning it there in lots. This can be done daily along with the work of taking out the Kandi, thin fuel. Of course this will hinder the stacking of fuel along the compartment lines, but some parts may be allotted for burning. This may mean a higher expenditure, but the ultimate good should be kept in view as burning in the compartment damages the stools, standards and soil as well.

2. (*a*) The narrow "bands" are liable to be broken at various places and there are chances of the water getting out of the compartment for which the canal authorities may ask an extra fee.

(*b*) If the root-suckers appear on account of the burnt stools an equal and perhaps greater number of coppice shoots never appears on this account, and thus I do not think the root-suckers increase the density more than the coppice shoots which would have come up had the stool remained sound.

3. The twigs of Sissu do not decay so very soon, and before their decay the shoots must have been sufficiently damaged.

4. The blanks will show themselves no doubt, but when cleared for planting the brushwood will have to be thrown on to the

adjacent areas which may break the shoots on that area, and if burnt so much the better.

5. If it is advantageous to grow the trees at convenient distances for the production of thick wood, then burning of the brushwood in the compartment helps it a good deal by burning many stools and rendering them unfit for giving out too many coppice shoots to increase the density of the forest.

6. It is not only the burning which gives growth to various species of fungi, but there seem to be other factors as well; and if such fungi are not found on the areas where burning is not carried on, then burning may be the sole cause.

7. In the absence of burning the expenditure under improvement work would have to be doubled as stated in (5), and will this not counterbalance the cost of burning?

8. Same as above.

JAGAT SINGH SHIHN,
Forest Ranger (Punjab).

12th March 1906.

CHICKRASSIA TABULARIS.

SIR,—I have collected about a maund of the fruits of Chickrassia tabularis with the object of sowing the seed in the Mal Forest. Almost all the capsules are 3-celled, with the exception of a very few, say about 2 per cent., which are 4-celled. I have not yet found any 5-celled capsules. The fruits have been collected from 2 or 3 different trees.

The tree is rather common in the Mal forest. But I have not yet found any tree more than eight or nine feet in girth. It grows very straight, and trees with clean straight boles of 40 ft. to 60 ft. are not uncommon.

RAI MOHAN CHAKRAVARTY,
Forest Ranger.

GORUBHATHAN:
29th March 1906.

REVIEWS AND TRANSLATIONS.

FOREST ADMINISTRATION IN BURMA, 1904-05.

The reports of the four circles are preceded for the first time by a review written by the recently-appointed Chief Conservator. The creation of this new post is an important administrative step which will doubtless have a widely beneficial effect in the future. The area of reserves was increased during the year from 20,038 to 20,411 square miles, the addition of 808 square miles being to some extent counterbalanced by the disforestment of 375 square miles in the Chin Hills. This disforestment has been rendered necessary owing to errors in procedure, presumably at the time of settlement. The urgent need for extending reservation in these hill tracts is recognised by the Local Government, and further reservation may be looked for in the Chin Hills. Lack of officers is put down as the cause of the delay up to date. It is satisfactory to note that proposals for the extensive reservation of forests of the dry zone of Upper Burma are now receiving the attention of government. In this zone of scanty rainfall and frequent drought, the maintenance of forest growth is a matter of vital importance.

The compilation of working-plans was carried out as far as the limited staff permitted, new plans for 122 square miles being sanctioned and plans for an area of 2,739 square miles being under preparation at the end of the year. The rate at which working-plans operations are proceeding is, however, far from commensurate with the large area yet to be dealt with, considering the further fact that some of the older working-plans will come up for revision before many years are over. Want of officers must again be put down as the cause of the backwardness in this respect.

Altogether 398 miles of roads were constructed at a cost of Rs. 24,308, the sum of Rs. 59,774 being spent on new buildings. The need for export roads is a pressing one, there being vast areas of marketable timber which cannot at present be worked, and which could with the construction of cart roads be opened

out to the advantage of Government from a revenue point of view, while the forests themselves would benefit silviculturally by judicious fellings.

Protection from fire was attempted over 5,291,712 acres, of which area 92·4 per cent was successfully protected. The various circle reports record observations showing that natural reproduction of teak is generally scanty or entirely absent in fire-protected forests, while in forests not protected it is as a rule good. Divisional officers supply striking figures in support of these observations, and it is interesting to note that one Divisional Officer recently transferred from India, and therefore fully cognisant of the beneficial effects of fire-protection in general, notes with regard to the teak forests in his charge "that (1) in the unprotected hills of the Môn valley the reproduction is good; (2) in the Môn west reserve protected for eight years, teak seedlings of less than eight years age are very scarce; (3) in a small plot marked off on a fire-trace and burnt annually, seedlings of the year to the number of 1,000 per acre were counted; in the adjacent protected area only 20 or 30 to the acre could with difficulty be found."

Similar observations are recorded from all parts of the Province. Numerous experiments are now in progress with a view to ascertaining the best means of remedying this unsatisfactory state of things, but it will no doubt take time to arrive at the proper solution of the difficulty. In the meantime it appears highly inadvisable to push on the extension of fire-protection in natural teak forest regardless of consequences.

Taungya plantations were extended by 2,982 acres, bringing the total area now under *taungya* plantations to 69,673 acres or nearly 109 square miles, an area which the present staff finds it practically impossible to properly look after. The Conservator of the Pegu Circle rightly condemns the practice, too often permitted in the past, of forming small scattered plantations of a few acres each in clearings in natural forest. The money spent in keeping the surrounding forest from encroaching is out of all proportion to the value of the plantations. In our opinion no *taungya* plantation should under ordinary conditions be less than 50 acres

in extent, in one continuous block, though this area may take more than one year to plant up.

The Mergui rubber plantation was extended by 819 acres at a cost of Rs. 11,460. The success of this plantation is not yet assured. The original estimates of cost have proved too low, and fresh estimates are now to be prepared, further planting being carried out on a smaller scale than hitherto. During the year 793 lbs. of dry rubber was sent to London, the sale price averaging Rs. 3-12-8 per lb.

The financial results of the year show a total revenue of Rs. 1,09,61,494, an expenditure of Rs. 35,14,997, leaving a net surplus of Rs. 74,46,497, the proportion of surplus to gross revenue being 68 per cent. Of this revenue some 16 lakhs is abnormal, being due to the local sale of teak timber which, but for the closure of the Rangoon depôt, owing to an outbreak of anthrax among the depôt elephants, would have been delivered in Rangoon and sold after the close of the year. Owing in some measure to these exceptional circumstances the financial figures are abnormal in one or two Divisions of the Pegu Circle, the Tharrawaddy Division alone having a gross revenue of Rs. 25,28,560, and a net surplus of Rs. 20,97,598, after deducting an expenditure of Rs. 4,30,962. This large surplus is, we think, a record for any one Division. The great bulk of it is produced by the system of teak extraction by Government agency, the superiority of which, from a revenue point of view as compared with the lease system, is well demonstrated by comparing the figures of this Division with those of any Division where the teak extraction is mainly carried out by lessees.

All circle reports again comment on the hopelessness of properly carrying out work of any kind owing to the lack of sufficient controlling officers and the frequent incapacity and dishonesty of the subordinate staff. Thus we find that such important operations as Improvement Fellings can be carried out only over an infinitessimal proportion of the area over which they ought to be undertaken, while in many cases even important working-plans prescriptions have to remain in abeyance. It is satisfactory to

note that the Lieutenant Governor is keenly alive to the urgent need for strengthening the controlling staff and improving the calibre of the subordinate staff, and we trust that the day is not far distant when the forest work of this important Province will have a chance of being carried out in a much more efficient manner than is at present possible. The way in which the Officers of the Department have endeavoured to carry on their work in the face of the difficulties mentioned speaks highly of their devotion to duty.

RESEARCHES ON THE REGENERATION OF SILVER FIR.

In the *Bulletin Trimestrial* (December 1905) of the Forest Society of Franche Comté and Belfort there is an analysis or abstract by M. Cardot of a paper by M. Gerdil on the above subject. Parts of this article may perhaps be advantageously translated roughly, as follows :—

In all complete forests of pure silver fir, at whatever stage of growth, the germination of seeds may take place, but to a very small relative extent when the enormous quantity of the seed which falls is considered ; moreover this germination generally has no result ; the young plants disappear or remain feeble. Shortly, in these conditions and even when the cover is very high regeneration cannot instal and maintain itself definitely on the ground.

If we open out these pure forests by felling we see the soil cover itself, to start with, with a vegetation of brambles, ferns, raspberries and certain other plants which appear to have similar requirements. To this vegetation succeeds, after a few years, a shrub vegetation of honeysuckle, nut, roses, gooseberry, holly, privet elder, thorn, &c., and occasionally broad-leaved forest species, as the beech, hornbeam, elm, lime, ash, etc.

What results from observation made in these new conditions ? On the soil covered with bramble, fern, &c., even when all this vegetation is cut back to the root the regeneration (of silver fir) is found to be completely lacking.

The same negative results are found at the beginning of the riod of shrub growth, but as this shrub growth develops the

regeneration (of silver fir) begins, timidly at first, to instal itself; then the early plants persisting, and being vigorous and well constituted the regeneration gradually completes itself, and enumerations made in the young thickets show a regular gradation of ages.*

There is, thus, before successful regeneration always a *sterile* or *transitory* period of variable length, normally effective regeneration only commencing at the moment when the brush growth begins to decline, say at the end of 15 to 20 years.

Such is the usual course of regeneration in a pure silver fir forest. But there are numerous special cases which tend to complicate and obscure the phenomenon of natural regeneration.

It frequently happens that in woods which have become too open, the blanks cover themselves with grasses and *Cyperaceæ*. This especially occurs on moist or completely dry soils. Germination takes place with difficulty on such grassy soils and the young plants mostly die the first or second year. But those which do pass this critical stage develop vigorously, and the regeneration ends by installing itself, sometimes even fairly quickly.

If the soil is stony, or pebbly, or consists of large grained loose sand, it becomes altogether suitable for regeneration, even under the complete cover of a high forest, even under a carpet of brambles.† This influence of the physical constitution of the soil on the regeneration has been noticed already by M. Guinier.

Carbonised or burnt soils are also very favourable to the natural regeneration of the silver fir. This species instals itself easily at places where refuse has been burnt.‡

If among the patches of seedlings in a silver fir forest we dig about a little it will be found that the soil is full of saphrophytic

* In the Bhinga forest of the Bahraich Division of Oudh there is a very interesting example of a heavy shrub growth (in an old and sparse 'sal forest), beneath which is creeping in the sal regeneration. This example, however, may perhaps be only partially *a propos*.

† Compare the profuse regeneration of sal so often found on a stony hill side, as, for example, in the Kumia Block, Kumaun Division, U.P.

‡ By the side of a road in the Thano forest, Dehra Dun, are two or three thick patches of Haldu (*Adina cordifolia*) which have come up on the sites of old charcoal kilns. The regeneration of Haldu is, as a rule, very difficult

organisms : "*mucorinées*", yeast, "*bacteriacèes*", fungi—very variable and numerous. It is practically full of them. Examined in the light this earth appears sometimes like snow. A mycelium, brilliantly white and velvety, inglobes the minutest particles of the soil, and gives off an odour of soap.

The regeneration of silver fir appears to be closely connected with this white and soapy-smelling mycelium. Where it is found the seeds germinate in greater abundance, the young plants persist and develop, even under a very dense cover.

On soil broken up by works, where the lower layers have been brought to the surface, when trees have fallen restocking is easily carried out. So also in the rotten soil of old roots.

But the special case which is the most interesting is that which concerns a mixed forest of silver fir and other species. Here the young growth of silver fir occurs in great abundance and *without passing through the transitory sterile period ;* nevertheless the results of the seeding differ greatly according to the relative proportion of the mixed species. Should there be only a few sparse beech in the midst of an old silver fir forest the seed crop of the latter will be compromised by the excessive seed crop of the beech. On the other hand, it will suffice for there to be only a few silver fir in the midst of a beech forest, even when the latter is very dense, for the floor of the forest to be invaded by silver fir seedlings, to the complete exclusion of the beech seedlings.

In mixed silver fir and spruce forest the same thing happens under the spruce, even if the silver fir seed-bearers are very far apart, the seedlings of the latter establish themselves with great ease, while those of the former will be almost completely wanting. In forests where the silver fir largely predominates, the results of enumerations, though standing out less clearly, are not less conclusive. The soil there seems far more suitable to the seedlings of the spruce than to those of the silver fir. The first develop *vigorously* and the second remain feeble. Further, the spruce seedlings seem to *seek* the cover or the neighbourhood of the silver fir, which often seem propagation spots for the rival species.

Besides his own personal observations, M. Gerdil quotes much documentary evidence from other writers, all tending in the same direction, and dealing with a variety of forest species.

* * * * *

What are we to conclude from these numerous and concordant facts? Hitherto, all theories upon natural regeneration have been almost exclusively based on the action of the cover and the temperament of the young plants. In seed fellings we occupy ourselves with the amount of light and of cover to accord with reference to this temperament. But one sees young seedlings persist or disappear under conditions which are entirely identical. How are we to explain the almost absolute resistance of certain crops to direct or immediate regeneration and the necessity for a transitory period and a secondary vegetation or change of species in order to re-establish the conditions requisite for regeneration? This resistance has been definitely established by Gerdil's observations so far as pure crops of silver fir are concerned. The work of M. Thomas on the artificial restocking of the forest of Chinon has done the same for the oak. The Danish forester Muller in his remarkable researches on the natural forms of humus has shown how, in Denmark and Germany, splendid beech forests, with trees 75 feet high, were replaced by moors while neither nature nor art could manage to produce a second growth of the same species on the same soil. Finally, the same difficulties have been noticed in the regeneration of pure crops of scots pine, of spruce and of larch.

Is it not logical to think that the soil intervenes in great part in the phenomenon of regeneration and that the lot of the young plant which germinates on the forest floor is not connected only with the exercise of the function of chlorophyll, but that it depends also on the normal action of its root apparatus?

But how are we to explain the action sometimes harmful, sometimes favourable, of the soil on the development of natural seedlings? Robert Hartig, in his treatise on the diseases of trees, has said that the unsuccess of beech regeneration should very often be attributed to insufficient aeration of the soil. Under the cover

of the incompletely decomposed dead leaves an accumulation of carbonic acid is produced which causes asphyxia and the rotting of the roots. This explanation is noteworthy; nevertheless it does not take account of the constant prosperity of regeneration in mixed forests.

We know the theories of Dr. P. E. Muller and of Volley on the formation of peat in the forert. A special transformation of vegetable debris which is produced under the influence of insufficient aeration, of an excess or a default of water, or a particular state of the soil, leads to the production of an imperfect leaf-mould or peat with an acid reaction, unsuitable to forest vegetation and to natural regeneration.

This peat is frequently met with in beech forests, and its formation explains the sterility of the soil and its powerlessness to produce a new vegetation. By a comparison between the "kind" (*doux*) or peaty leaf-mould of a beech forest and the vegetable soil that we find in an old silver fir forest, M. Gerdil demonstrates that it is not in a formation like the peat of beech that we must look for the cause of the unsuccess of regeneration in pure silver fir forest.

Now may the cause not be especially attributable to the *biological* composition of the soil? The great savant Berthelot has said that the earth was *living*. Is that not specially true, as M. Gerdil remarks, of the forest soil? The number and variety of the living organisms in it are extraordinary! Among these organisms, and particularly among the fungi (*champignons*), there are many which are special to the silver fir forest. A close network of mycelian filaments spreads at the surface of the soil, envelops the seeds and the young plants and nourishes itself on their substance. The more the fir forest ages the more parasites of all kinds multiply not only in the trees, but in the soil itself, and it is not until after the disappearance of the trees which assure the renewal of the morbid germs, and after the installation of a new vegetation which completely modifies the conditions of existence of the parasitic organisms, that the cycle of the regeneration in silver fir can commence.

There may also perhaps be room to attribute a certain influence to root secretions. "Absorbtion by the roots is a special osmosis which necessarily connotes an exchange." Thus, we may well admit that the soil, which for a century or two has nourished an old silver fir forest, "should be saturated with products rejected (*désassimilés*) by this plant, and that it thus becomes unable to grow a new generation of the same species.

Finally, the silver fir is one of those forest trees upon the roots of which Franck has found mychorhizas. If the fungus which lives in symbiosis with the silver fir is an indispensable intermediary between the nutritive matter of the soil and the rootlets, it is necessary that it should itself find in this soil the conditions which it requires, and it may well be thought that it cannot live in a *milieu* contaminated with the vegetable debris of the silver fir and by the living organisms of which such debris is the seat.*

* * * * *

A. G. H. H.

FOREST ADMINISTRATION IN CEYLON, 1904.

Taking the area of the island of Ceylon as 25,481·22 square miles, the proportion of reserved forests is 2·73 per cent., of proposed reserves 2·88 per cent.; selected for proposal as reserved forest, 7·13 per cent., and other crown forests 28·01 per cent.

Working plans do not apparently seem to have made much headway at present. Mr. T. J. Campbell, the writer of the year's review, says: "The Conical Hill reserve is the one area in Ceylon for which a systematic working plan was framed, and this has been

* In the Kanjatra Block of the Jaunsar Division, U. P., of which the upper stage is mostly spruce though there is also some silver fir efforts have for years been unsuccessfully made to plant spruce. Silver fir plants, however, have succeeded. Practically no natural young growth of either fir is to be found. It has been thought that the leaf-mould was so deep that before the radicle of the germinated seed could reach the mineral soil beneath it became dried up. Yet the altitude of the block is considerable and the aspect North. Moreover this explanation would not account for the failure of *planted* spruce. Have we in this article found the true explanation?

anything but successful. The plan has been modified more than once, and made adaptable to circumstances, but its inherent defects are insurmountable. The prescriptions, even so modified, have not been adhered to, and no 'control form' is maintained or has been, so that scrutiny is valueless. The planting up of strips has terminated in failure.

"A twenty years' rotation scheme for timber required for salt manufacture in Puttalam, is being systematically worked.

"Mr. Broun introduced some healthy elementary prescriptions as to fellings and the method of selecting them, and established a rough 40 years' rotation for general adoption. Certain silvicultural principles have been adopted in practice, but the mere pursuit of revenue and a surplus have only too frequently relegated sound principles to limbo. The dual system of control by Government Agents and Assistant Conservators contributed to this vicious practice. The result is forest composed of over-mature dead and dying trees, no age classes defined, sterility or immaturity of seed, and a heterogeneous mass of sotf, inferior woods and ligneous undergrowth, obstructing light and positively forbidding any effort of reproduction. The simplest form of climber-cutting, clearing and fire-protection have practically never been attempted and improvement fellings, in the proper sense of the term, are unknown."

That most pernicious of all forms of so-called cultivation termed "chena" in Ceylon (jhuming, &c., in India) flourishes in the Island to the detriment of its forests. A trial is to be made of the system of "taungya" cultivation in use in Burma, the trees to be raised being the better class of indigenous ones instead of further experimenting with exotics. Much money and time have apparently been wasted over the attempted introduction of outside trees when plenty of good indigenous species exist.

Fire protection we read has not made much headway at present. As Mr. Campbell remarks: "This question of fire-protection is one of paramount importance, and once forests are properly constituted and a scheme for their management is introduced, protection from fire must be one of the first measures of conservancy. The sum spent in India on this work is enormous, and every experienced

observer admits that Government is amply repaid for the outlay by the increased intrinsic value of the forest and the spread of reproduction without the necessity of planting." We note that the Department do their best to supply the other Public Departments with the timber they require, the value so supplied during the year amounting to Rs. 84,913.

Exploitations from the forests are carried out either by departmental agency or private purchasers the latter taking out the greater amount of produce.

Excluding the value of free grants of timber standing on land sold by the Crown, the total revenue of the year amounted to Rs. 3,70,462 as against Rs. 3,46,537 of the preceding year. The expenditure was Rs. 3,08,537 as compared with Rs. 2,73,363, the surplus being Rs. 61,925 as against Rs. 72,520.

The organization of the department has still many difficulties to cope with apparently in the Island, but from the Report it is obvious that progress is being made.

CURRENT LITERATURE.

FORESTRY AND IRRIGATION for February 1906 contains a review of an important work on a history of the Lumber Industry in America by Mr. J. E. Defebaugh, the first volume of which has just made its appearance. After dealing with the discovery and settlement of the country and the forest geography of North America, etc., the author takes up the question of the Forest Resources of the United States and the opening paragraphs, coming as they do from a lumberman and not a professional forester, are full of significance. "The beginning of the twentieth century marked with approximate accuracy an epochal period in the timber and lumber history of the United States of America. Until that time the country, in its use of forest products, had been drawing upon a surplus, but thereafter a continuance of production on the former scale, without care for the perpetuation or reproduction of the forests, necessarily would draw upon the capital fund, so to speak, with the inevitable result of a growing scarcity of forest

products, or, to be more exact, of an increasing and manifest deficiency in the supply of standing timber for which the product must be secured."

The rest of the number is mainly devoted to a consideration of the Minnesota Reserve. These forests have a considerable importance since they are situated at and around the source of the great Mississippi River.

The first ANNUAL REPORT of the Department of Agriculture has been recently issued by the Government Press, Calcutta. The Report commences with a general review of the progress of agricultural research during past years subsequently dealing with the present position. The position of the Pusa Research Institute is described and the present staff enumerated. Proposals for the future research work to be taken up are considered, the entertainment of several additional experts in cotton, wheat, sugar, tobacco, fruit, etc., having been sanctioned. We note that the Government of India are behaving with great generosity to the new Department, an additional grant of 24 lakhs having been granted to it. Following the Inspector-General's report are the reports of the Pusa Staff. This report is issued in octavo form, the new *Indian Forester* size having been taken, it would seem, as a guide. It is a most convenient one for Reports of this nature and we are glad to see this departure from the old inconvenient Government Report size.

The JOURNAL OF THE SOCIETY OF ARTS for 26th January 1906 contains the text of a paper read before the Society by Dr. John Nisbet, late of the Indian Forest Service. Taking as his text "The Planting of Waste Land for Profit" Dr. Nisbet considered the scope for planting on waste lands in the United Kingdom; the encouragement given by the State to such planting; the lessons to be gained by what has been done in this respect in foreign countries; the lines upon which Government could be asked to give encouragement to the work; how to plant for profit; the probable cost of planting and prospective returns and finally the national-economic effect of such plantations. A discussion followed in which Mr. E. Stafford Howard, C.B., Sir Dietrich Brandis, Dr. W. Sommerville and others took part.

The BOTANICAL GAZETTE for February 1906 contains a paper on Chemotropism of Fungi by Harry R. Fulton. In his experiments Fulton made use to a greater or less extent of fourteen species of fungi. The embryology and development of Riccia lutescens and Riccia crystallina form the subjects of the following paper by Charles E. Lewis. The paper is beautifully illustrated with plates.

The AGRICULTURAL BULLETIN of the States and Federated Malay States for December 1905 contains a further note on Rubber pests destructive to seedlings a few days old The enemies in question are a brown slug which appears at dusk and gnaws off the epidermis of the stem and green parenchyma of the leaves. It conceals itself in herbage during the day. It is also said to attack young plants up to six feet or more in height nibbling the bark and biting away the buds as they appear, thus seriously checking the growth of the young tree. Collection and keeping down weeds are suggested as remedies. The second enemy is a large cricket (probably a Gryllacris). This insect gnaws the seedlings right through leaving a stump of 1—3 inches and carrying off the tender shoot. They live in burrows in the nursery beds. This insect evidently works in a manner identical with that of Brachytrupes achœtinus, mentioned in Departmental Notes on insects that affect Forestry No. 1, p. 1, as attacking Ficus elastica seedlings in the Chittagong Hill Tracts.

SHIKAR, TRAVEL, AND NATURAL HISTORY NOTES.

A SWARM OF LOCUSTS.

Swarms of locusts are pretty common to most of us, but as this one has what I take to be somewhat of a peculiar history, I venture to put as much as came to my notice on paper.

This swarm was noticed first in the east of the Kumaon Division at the end of October last, travelling westwards. It arrived in the Ballia valley (along which the cart road winds to Naini Tal)

on the 3rd of November. It remained in this valley until the end of January 1906, eating up the entire rabi crop of the villages and doing a certain amount of damage to the forest. The locusts seemed to travel up and down, being apparently stopped by the frosts, between the elevations of 1,400′ and 5,000′. I saw them myself at the higher elevations, having withstood a night of pretty severe frost, rising under the morning sun's rays and flying at once down hill without leaving a dead one behind them.

At the end of January a branch of the family forced the hills and took a line over Bhimtal, Bhawali, down the Ninglat valley, thence, spreading out, swept round the Chaubattia Ranikhet hill and passed on to the wheat fields of the upper Ramganga valley—in all, in a bee line, a flight of some 50 to 60 miles over hills and through some pretty severe frosts. Many were left behind as the main body advanced, but the damage they did was of little importance. The remainder soon started after the first lot, but scattered tremendously, visiting many small valleys on the southern slopes, crossing an 8,000′ ridge and disappeared to the north-east of Almora.

I have known a swarm go to the snows and return in fair numbers, but this swarm was finished off in the middle of February by a three days' snowstorm. Even after this storm I saw a few still alive but in a very weak condition and unable to fly any distance. I have seen none alive since the 12th of March.

The damage done to the crops was heavy when they stayed any length of time. Wheat, barley, and rape eaten down more thar twice is practically a failure and 60 days' rice is being put in instead. The same eaten down once and even twice has recovered. Of course these crops were not higher than 9″ when first attacked.

The flora of the Ballia valley was also severely treated, but as many of the trees had dropped, or were dropping, their leaves, and as the summers' growth was complete, the damage was not so much as might have been expected. Of the principal trees the Chir (Pinus longifolia) suffered most, the locusts eating at the base of the needles and dropping the longer parts on the ground. The oak (Q. incana) was hardly attacked at all, neither was the sal.

The following is an alphabetically arranged list of the trees attacked, some of course worse than others, and where deciduous trees are mentioned the leaves before falling are referred to.

Albizzia Lebbek, Bauhinia Vahlii, Berberis asiatica, Bœhmeria rugulosa, Bridelia retusa, Cassia Fistula, Celtis australis, Cocculus laurifolius (to a limited extent only), Debregeasia bicolor, Eugenia Jambolana, Ficus religiosa, Ficus Roxburghii, Grewia laevigata and tiliæfolia, Heptapleurum venulosum, Mallotus philippinensis, Murraya Konigii, The nettle, Olea glandulifera, Pinus longifolia, Rosa moschata, Rubus ellipticus, Zanthoxylum alatum.

Those practically rejected were :—

Bassia butyracea, Bombax malabaricum, Casearia graveolens, Ficus Cunia, Musa, Quercus incana, Shorea robusta, Terminalia belerica and tomentosa.

NANI TAL : W. H. LOVEGROVE.
24th March 1906.

EXTRACTS FROM OFFICIAL PAPERS

IMPROVEMENT IN THE PAY OF THE ADMINISTRATIVE POSTS OF THE IMPERIAL BRANCH OF THE FOREST SERVICE.

We publish below for information a Resolution of the Government of India on the subject of an improvement in the emoluments drawn by the Inspector-General of Forests and Conservators of Forest. We regret that the Secretary of State was unable to accept *in toto* hte recommendations of the Government of India in this matter. It will be noted that the improvement in the allowances drawn no longer includes exchange compensation allowance or acting promotion for privilege leave vacancies.

Resolution of the Government of India, R. and A. Department, Circular No. 4F., dated Calcutta, the 28th March 1906.

The Government of India have for some time had under consideration the question of the grading and emoluments of the Imperial Branch of the Forest Service, and have arrived at the

conclusion that, in order to maintain its efficiency, it is necessary to take steps to improve the conditions of the service. With this object in view they have obtained the sanction of the Secretary of State to the following enhanced rates of pay of the administrative posts :--

(*a*) The pay of the Inspector-General of Forests will be Rs. 2,500 and that of the Chief Conservator, Burma, Rs. 2,150.

(*b*) The pay of the three grades in the class of Conservator will be :—

	Rs.
First grade	1,900
Second „	1,700
Third „	1,500

The distribution of the total number of Conservators' posts among the grades will be equal, an excess of one falling in the second grade and an excess of two in the second and third grades.

(*c*) Present and future holders of the appointments of Inspector-General of Forests, Chief Conservator and Conservator will not be entitled to receive exchange compensation allowance ; and in the case of Conservators no acting promotion from grade to grade will be allowed for privilege leave vacancies.

2. These rates of pay will have effect from the 11th February 1906.

J. WILSON,
Secretary to the Government of India.

MISCELLANEA.

THE SAW MILL OF THE FUTURE.

It is always more satisfactory to record established facts than to indulge in prophecy, but when the march of science and invention shows that existing conditions are entirely unsuited to meet requirements which it is clearly evident must arise in the near future, it becomes the duty of any journal devoted to the interests of any branch of industry to warn its readers of the changes which must inevitably take place, and to draw their attention to the steps which should be taken to meet them. It is with this object in view that we devote in this our special number a short space to the consideration of the modifications which will doubtless have to be made in the present design and equipment of saw mills, which, although well suited for the requirements of the trade in the past, are not by any means the best that could be adopted in the immediate future.

When a timber merchant has decided that he must start a saw mill, he generally consults with some friend who has a mill of his own and whose experience may therefore be deemed to qualify him to give good practical advice on the subject. If he requires a mill of average capacity to convert logs into boards, planks and scantlings of all sizes, his practical adviser will almost certainly recommend him to furnish his mill with the following machines:—

Two Vertical Log Frames, one to take logs up to 4 feet and the other for logs of smaller sizes.
One 4-ft. Horizontal Board Cutting Frame.
One Large Rack Circular Saw Bench.
Two Self-Acting Circular Saw Benches.
Two Plain Saw Benches, and
One Crosscut Saw Bench.

He will further be advised that the most suitable building for the convenient working of this plant will be a mill of sufficient

width to allow of the two Vertical Log Frames, the Board Cutting Frame, and the Rack Bench being fixed in a line at the end of the mill, nearest to the timber depôt, so that the logs can be brought direct to either of those machines at which they can be converted most advantageously ; the smaller saw benches being placed in a second line beyond the timber sawing machines, to edge the planks and boards, after leaving the latter, or to saw up the slabs and planks into smaller boards or useful scantlings of various sizes.

For the convenient working of such an assortment of machines as we have suggested, the mill would require to be about 80 feet wide and some 100 feet long, with a vault under the mill floor in which the lower part of the Vertical Frames would be fixed and which would also contain the shafting, belting and driving gear, which if placed above the mill floor would interfere with the free movement of the material. This vault would also serve as storage room for the sawdust made by the machines, until it could be fetched away in sacks or barrows.

For driving the plant an engine would be recommended capable of developing ample power for working all the machines to their full capacity, and the boiler should be specially constructed to burn the sawdust and waste wood made by the machines, instead of coal.

Such a mill as we have described fairly represent the best type of those which have been erected in this country during the last 25 years, and for the hitherto prevailing system of timber conversion, it could probably not be improved; but three main causes have recently come into operation which cannot fail to bring about material changes in the selection of machines and the mode of driving them which will necessitate considerable modifications in size and structure of the mill. These causes are :—

1st : The now thoroughly established superiority of the Log Band Saw over every other type of Log Sawing Machine.

2nd : The growing preference for electrical driving.

3rd : The general adoption of the Pneumatic Conductor for removing the refuse from the machines.

As regards the first of these causes, we have so often advocated in our columns the advantages of the Log Band Saw, that it is only necessary to say here that a Horizontal Log Band Saw of the best type will do the work of two Vertical Log Frames and a Horizontal Reciprocating Frame, and hence by substituting a Band Saw for these three machines, the width of the mill can be reduced from 80 to 40 feet, or, in other words, it would only require to be half as large as would be necessary to accommodate the four log sawing machines referred to above, as now generally deemed to be essential.

The objections to electrical driving have hitherto been the heavy cost of the Dynamos and Motors, and the prevailing belief that a special electrician would be required to attend to them, but owing to the keen competition among the many firms of electrical engineers, and to improvements in the machinery for producing electrical plant, the cost of both Motors and Dynamos has lately been enormously reduced, and the management of them is now so well understood that there is no difficulty in obtaining an engine driver who is also qualified to look after the electrical plant. The advantages of electrical driving both as regards saving of power and cost of maintaining the heavy shafting and belting at present almost universally employed for the purpose, are so evident that there can be no doubt that it will be generally adopted in the saw mills of the future.

The removal of the sawdust by the Pneumatic Couductor is not by any means new, and it would undoubtedly have come into general use long since, but for the unfortunate experience of several mill owners who with the view of saving expense have purchased a fan and cyclone, and have fitted up the piping themselves, and having no knowledge of the many points which have to be observed to make these installations a success, have generally ended in a lamentable failure. It is now, however, generally recognised that the Pneumatic Conductor is an essential item in any new saw mill plant, and we therefore assume that it also will be a feature in the saw mills of the future.

It is therefore safe to predict that the standard plant for a saw mill of moderate capacity will generally consist of :—

One Horizontal Log Band Saw.
One Rack Circular Saw Bench.
Two Self-Acting Saw Benches.
Two Plain Saw Benches.
One Crosscut Saw.

Of the two first machines the Band Saw would be used for breaking down the logs, and, when required, would also saw them into boards of any thickness, while the Rack Bench would be used for edging and cutting to width the heavier flitches from logs which have been broken down at the Band Saw, or for sawing out piles or scantlings from square logs.

As all of the machines in the modern mill we are describing would be fixed on the floor level, and the electric motors for driving them would either be coupled direct, or by cut gear wheels to the driving shafts of the machines, while the sawdust would be caught up by the draft created by the fan, as it falls from the saws, no vault would be required under the mill floor, and as each of the machines would be fixed on a bed of concrete, the cost of foundations for the entire plant would be very small.

To save labour and economize the time of the Log Band Saw and Rack Bench an electric crane to carry 6 or 8 tons would be added. This crane would span the entire width of the mill, and would cover the whole area of that part of the mill floor to which the Band Saw and Rack Bench extend, so that it could lift logs from the mill floor, or from a truck running on a narrow gauge railway passing between the Band Saw and Rack Bench, the line being continued through to the opposite end of the mill for removing the finished material after it leaves the smaller sawing machines.

The advantages which the saw mill of the future offers over the mill of the present day are both numerous and important, among the chief being the following :—

1st : A great economy in labour, as the Band Saw requires three men to work it, as against the six men (two at each

of the Vertical Frames and two at the Board Cutting Frame). Two more men would be saved, by the electric traveller in fixing and adjusting the heavy timber, on the two Log Sawing Machines and transferring the sawn flitches to the Rack Bench, and small Saw Benches. One man would also be saved by the Pneumatic Conductor, as there would be no sawdust to be collected by hand.

2nd : A great economy of timber, as the waste in the saw cut of the Band Saw is only 1/16 of an inch, or about half as much as that made by each blade in a Timber Frame or horizontal Board Cutting Frame. This, although inconsiderable when only a few cuts are required in a log, becomes of very great importance when the Band Saw is used for sawing thin boards from the log; and when sawing ¼-in. panels the saving of timber in saw cuts alone, amounts to no less than 20 per cent of the log. A further great advantage of Band Saw over a Vertical Log Frame is that as the former removes one board at a time, the sawyer can see how his log is developing, and by thus avoiding any defects which may appear in it can obtain the maximum amount of sound boards from it, which of course cannot be done with a Vertical Log Frame.

3rd : A saving of fully 25 per cent in the power required to drive the machines, as when driving by electricity the amount of power used is automatically regulated to the amount taken at the moment by the machine it is driving, and the great waste of power required to maintain a system of heavy main shafting and belting running at a high speed is avoided.

4th : The danger from fire is enormously decreased by the automatic removal of the sawdust, and as the refuse is carried away immediately to the boiler, and there is no underground cellar in which it can accumulate, all the inflammable material which is the chief cause of fires will be absent in the saw mill of the future.

But we can imagine some of our readers saying, yes, this is all very nice, but how much more shall we have to pay for all these advantages? Strange as it may at first sight appear the saw mill we have last described can be built and equipped with all the most modern machinery, including an electrically driven travelling crane, the Pneumatic Conductor, and the whole of the electric plant, for considerably less than the more old-fashioned mill in which the machines are driven by shafting; as the saving in the first cost of the timber converting machines, and in building the much smaller mill required for the more modern plant, besides doing away with the vault under the mill floor and the costly masonry foundations required for the Vertical Log Frames, would more than suffice to pay for the electric plant, overhead travelling crane and Pneumatic Conductor, while a further saving would be effected in the smaller engine and boiler required for the more modern plant.—*The Timber Trade Journal.*

A HISTORY OF THE LUMBER TRADE OF AMERICA.

During the past few years numerous prophets have arisen warning the world of a rapidly approaching famine in wood. As the utterances of seers in former ages were disregarded by their contemporaries, so the lumbermen and merchants of the present day, who can see enough raw material for their own and some succeeding generation, deride the idea of a dearth in the land. The man who foretells misfortune is rarely popular with his fellows, but because his forecasts do not accord with generally accepted ideas, it does not follow that they are untrue.

It has been pointed out that the districts of the world, which were densely populated in ancient times, are now arid wastes. From the early histories of the human race we learn that the first peopled districts of Asia were well wooded in the days of their prosperity, but are now wildernesses, the increase of population and the destruction of woodlands being the cause. From this it is inferred that similar changes are now slowly at work in various parts of the world, and it cannot be denied that at many of the

sources of our supply of softwoods the rate of cutting far exceeds the natural reproduction of the forests.

This gradual contraction of the available supply has been recognised by Sweden, Denmark, Germany, and other countries, and replanting and forest conservation have been taken seriously in hand. The vast woodland wealth of Russia, too, is being exploited under restrictions.

We in the United Kingdom, being more dependent on a foreign timber supply than any other people, this question of the world's timber reserve is to us one of greatest importance. The surface of the globe has now been so well explored, that every available area of supply is known, and those who have carefully studied the question tells us that we shall not enjoy even the present abundance of wood for many generations longer.

As we said above, timber merchants are not disposed to give any credence to "croakers" who prophesy famine and statistics are produced of available millions and billions of feet in various countries to prove that there is, and there always has been, and always will be, enough wood for every purpose.

For upwards of two centuries we have been drawing supplies of coniferous and deciduous woods from the North American Continent, where the forests have always been described as inexhaustible; but the enormous exportation from Canada and the United States during the second half of last century, and the phenomenal growth of population in the great Republic have so depleted the Continent that steps are being taken to conserve the present forests in order to avert a crisis in the not distant future. Alarmist reports are now and again put in circulation concerning the export from America, which appear justified to some extent by the falling off in the abundancy of the supplies of one wood after another. Indeed, it has more than once been asserted that the United States will cease to be a timber exporting country in less than twenty years. Such statements are not without their effect on our timber market; and in order that a well-balanced opinion may be formed of the possibilities of the New World to continue to supply us and the rest of Europe with wood,

we welcome the appearance of "The History of the Lumber Trade of America," by Mr. James Elliott Defebaugh, the editor of the *American Lumberman*, published in Chicago. We have read the first volume of this work with much pleasure, and we look forward to the appearance of the succeeding ones.

This production takes rank with the standard literature of the timber trade, and the thoroughness with which the subject is dealt with, show that much valuable information passes through the mind of the editor of a weekly trade paper, which he cannot find place for in his ephemeral productions.

The following extract gives an idea of the scope of the work :—

"The beginning of the twentieth century marked, with approximate accuracy, an epochal period in the timber and lumber history of the United States of America. Until that time the country, in its use of forest products, had been drawing upon a surplus, but thereafter a continuance of production on the former scale, without adequate care for the perpetuation or reproduction of the forests, necessarily would draw upon the capital fund, so to speak with the inevitable result of a growing scarcity of forest products, or, to be more exact, of an increasing and manifest deficiency in the supply of standing timber from which the product must be secured.

"Not only were the forest in surplus supply ; that is to say, occupying a greater territory and in larger quantity than were necessary, provided their natural growth should be maintained to supply in perpetuity the national requirements, but they were, especially during the period of development up to about 1850, in many instances a positive detriment. Forests stood on millions of acres of fertile lands which were needed by the settler and the would-be farmer, and a slow-growing crop of timber was occupying land that might more profitably be devoted to the annual production of grain or other products of agriculture.

Unfortunately there has never been a timber census of the United Sates, nor even any very trustworthy estimate either of acreage or volume ; but the best informed students of the subject

believe, after as careful investigations as they have been able to make, that the forests yet remaining, if operated along conservative lines, would annually produce in perpetuity an amount of forest products little, if any, more than the present annual output. If that be true, the United States has come to the point where it can no longer be lavish in its use of its wonderful timber resources, but most rigorously conserve them. It no longer will be consuming a surplus ; but, except for the adoption of forestry methods, will be drawing upon its capital.

"It seems fitting, therefore, that, at such a turning point in the life of this great and fundamental industry, a study should be made of its history in order that those concerned—and every one is directly or indirectly concerned in this subject—may look forward from the vantage point of knowledge and recorded experience. To afford such a vantage ground is one of the objects of this work, which must be a record not merely of men and of events, but also of conditions.

The author does not confine himself to the United States, but deals with the whole of the North American Continent, several interesting chapters on the history and *personnel* of the Canadian trade being included in the volume before us.

FOREST REFORM.

We have received a communication under this title from a Dehra Dun Ranger. Alluding to the article entitled "The Police Commissioner's Report and the Forest Service" published under the initials F. A. L. in the *Indian Forester* last year, * our correspondent points out that he is of opinion that the subordinate branches of the Department require reform, in order that the status of the staff may be raised to that of their compeers in the Police Department. He states that from the point of view of the subordinate ranks the Forest Department is the poorest paid in spite of the highly technical work the men are now called upon to assist in. Our correspondent calls attention to the fact that the

* July Number, p. 389.

upper subordinate ranks are now required to spend two years at a training school learning their profession, whereas the Police Officer goes straight into his Department. Whilst this is, of course, true in some cases, our correspondent does not, however, mention that many of the men trained at Dehra Dun are educated there entirely or partially at Government expense, and provided they do well are promoted to grades which they would spend many years in reaching or fail ever to reach without going through the course.

There is, however, a good deal to be said in favour of the argument that the subordinate officers, indeed all officers of the Department, are entitled to consideration owing to the fact that they have to spend much of their service in unhealthy climates and often in a state of solitariness which in itself amounts to great hardship. The Forest Ranger and Police Inspector are practically synonymous appointments in the two Departments, but under the new rules the Inspector will occupy a higher position, because of the fact that he draws the higher pay, in the eyes of the people amongst whom both serve. As the two officers often have to work together the position is rather an anomalous one for the Ranger.

MYSORE FORESTS AND THE CAUVERY RIVER.—The announcement that the water in the Cauvery has fallen so low that the works at Shivasamundrum are unable to get enough to generate the full supply of power for Kolar and Bangalore is a notable sign of the extent and intensity of the drought from which the country is suffering. The water for the works is taken off above the Falls by a canal some three or four miles long which leads to the pipes down which it is carried in a shoot to the generating engines below, and on the most cautious estimate it was never apprehended, however little might be going over the Falls that there would be insufficient in the river to keep this channel full. Another indication of the abnormal dryness was manifest in Mysore itself even at the time of the Royal visit, when the large tank, or rather lake, which lies at the foot of the city, and is fed

by the whole drainage of the hill of Chamundi, was so nearly dry that waders and paddy birds might be seen picking up their living in its centre. And this at the end of January. That the Cauvery River should fall below the lowest estimate upon which Major de Lobinière planned his canals, for there are two parallel ones running from above the Falls to the pipes, is a serious matter and it behoves the Mysore Forest Department to make careful enquiries into any cutting that may be taking place in the forests on the Cauvery Catchment areas. Reckless destruction of forest, even for the sake of obtaining extra revenue, will result in terrible disaster if so important and, to the gold fields, so valuable a river as the Cauvery shows any sign of permanently diminishing its supply.

DEVELOPMENT OF FOREST RESOURCES IN COCHIN.—The Board of Trade Journal says that the German Consul-General at Calcutta reports an undertaking of considerable importance in the development of the forest resources of Cochin. The difficulties of transporting the timber from the interior have been overcome by the construction of a light railway in sections, at three different levels, of 20½, 4½ and 19 miles long respectively, connected by shoots, and joining the main railway line to Cochin. It is expected that this line will bring down yearly 500,000 cubic feet of teak wood, ebony, &c., a supply which should be of no little importance.

A BIG TIMBER STAGE.—When Charing Cross Station was reopened for traffic, the chief feature of interest was the huge timber staging, by means of which the old roof is being dismantled. This big staging is a fine example of this kind of work. Its weight is 450 tons, there are 25,000 cubic feet of timber in it, bolt holes to a total length of one and a half miles have been bored, the time taken for erection was six weeks, and its value is probably nearer £7,000 than £6,000. Huge as the structure is, it is movable, and for this purpose is supported on 56 double-flanged wheels, which run on three sets of rails laid on

longitudinal balks of timber on the platforms. It has been built in two distinct portions to facilitate the process of shifting it, which is accomplished by means of steam winches, steel ropes, and anchored pulley blocks.

LAND PRESERVATION IN THE PUNJAB.—It is satisfactory to learn, remarks the *Civil and Military Gazette*, that improvements are considered to be resulting from the working of the new Punjab Land Preservation (chos) Act, a measure which aims at protecting the forest-clad slopes of the lower Himalayas from denudation by graziers.

Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by F. A. Leete.

FOREST HOUSE, ABDULLAGANG,
Bahraich Division, Oudh.

VOLUME XXXII NUMBER 6

INDIAN FORESTER

JUNE, 1906.

THE INDIAN FOREST RESEARCH INSTITUTE.

Date tempore prosunt.

We publish elsewhere a recent Resolution of the Government of India constituting an Indian Forest Research Institute. The idea of forming a central bureau or research station at which the numerous scientific and economic problems which constantly present themselves to the executive officers of the service could be investigated is no new one to our readers and has been under the consideration of the Government of India for some time past. It will be remembered that the formation of such an institute was suggested in these columns in January 1905. From the correspondence subsequently received on the subject, it became abundantly evident that the time was not only ripe for such a departure but that the members of the Department from the Inspector-General downwards had fully realised that without some such research institution it would be impossible to make that economic and material progress towards efficiency which they had so much

at heart. The unanimity on this point was as pleasing as it was satisfactory, and to the lasting credit of a rapidly developing branch of the Government service.

Our previous article will have made our readers acquainted with the general aims and objects of the research bureaux attached to the Forest Services of other States and with the general lines upon which the research work is carried out. In India whilst the aims and objects of the newly created research institute will be analogous to those of other similar institutions, the lines upon which the work will be carried out will require to embrace a much wider field and to be carried on on a much broader basis owing to the immense diversity in the character and conditions of the forests existing in the vast continent. We are ready to fully acknowledge the great value of the researches carried out, of the experiments attempted with success, and of the deductions recorded therefrom by the scientific forest research bureaux of other countries, but, whilst giving to an acquaintance with these the full measure of importance it deserves, for no officer of a research institute should be without a thorough knowledge of the work going on in his own particular branch throughout the world, we would strongly emphasise the fact that we must not rest on the deductions recorded from experiments made in countries outside India as applicable in their entirety to this country. In some instances they are so, or can be so modified as to be applicable, but in the vast majority of cases they are not. It is of little use glossing over the fact that this point has not been sufficiently recognised in the past either in or out of the Department. We have been content to rest upon the facts taught us when students about German and French forests, facts based upon researches in those countries, and with endeavouring to apply these to the Indian forests, even in cases where their application has not only been absolutely futile in practice but has rather tended to harm, and certainly to stagnation, than otherwise. Can we say that there has been any advance at all commensurate with the period during which the Department has had charge of the forests of the country, in our knowledge of the sylviculture of even the best

known and most valuable of our Indian trees? Most will agree as to the answer. Methods of sylviculture in Europe as a rule are not applicable to India, although we are far from saying that valuable hints may not be gleaned by their study. We read a remark the other day in an American periodical anent the total absence of Indian forest literature. What has been the reason? If we go no further than the columns of this Magazine volume after volume will show us that our very education has been the stumbling block and that, following other precedents in India, we have spent the years that are past in theorising and in futile efforts to apply the practices of Europe to the widely varying conditions of our vast forest areas in India.

In this ever-recurring tread in the footsteps of instructors who either had never been in an Indian forest or who had received their education from the hands of such the Department cannot divest itself of all the stigma which attaches to the man content to blindly follow in the footsteps of his predecessor without attempting some advance for the better. The extenuating circumstances of heavy executive work and shorthandedness cannot be dealt with here nor is it now necessary since we are about to turn a new leaf. But whilst in such directions as the study of sylviculture and the methods of growing our tree crops best adaptable to the conditions of the country, we have not, owing to the blind following of the precepts of Europe, made that advance which could have been looked for after half a century of work; there are other directions in which it has been quite impossible for the Department, through its executive officers, to make any progress even of the smallest. The study of the injurious pests, both animal and vegetable, the chemistry of the widely varying soils and of the extremely numerous minor products of the forests and finally a knowledge of these minor products themselves have been quite beyond the power of the heavily worked executive officer to grapple with. No one but the specialist, the Forest Officer who having followed the ordinary educational course of his brother officers, has subsequently made a speciality of a particular branch of these forest sciences, can hope to obtain, after perhaps years

of patient observation, investigation and experiments, such an acquaintance with his subject as to make his researches available from a practical and economic point of view to the Executive Officer. Owing to the recent enlightened action of the Government of India the Department will now have four officers each devoting himself to one of these special branches, and we foresee in the near future, and it may be written without hesitation or fear that the conviction will be found unjustifiable, that such an advance will be made in our knowledge of these subjects both in economic and scientific directions as will justify to the hilt the action of Government and the previous convictions of the Department as to the necessity of the present departure.

The position of the Department with reference to the work in connection with the preparation of Working-Plans has of course differed from its attitude to the other branches. It was impossible on the one hand to frame Working-Plans for areas of forests of which neither the boundaries nor the contents were known, nor on the other, was it necessary to do so for areas from which, owing to inaccessibility or for other reasons, no extraction of the produce could be undertaken. Nearly a quarter of a century ago Dr. Schlich, when Inspector-General of Forests, obtained the Government of India's sanction to the formation of the post of an Imperial Superintendent of Working-Plans, the post being held by the Assistant Inspector-General of Forests. The creation of this post has until within quite recent years proved sufficient to cope with the Working-Plans work, the increase in the number of plans framed being necessarily slow at first. The work has now, however, increased to such a degree that the arrangement introduced in 1884 has become quite inadequate to cope with it. Also it has become essential that the Superintendent of Working-Plans should be able to travel about the country and study the forests for which plans are being made. The Imperial Superintendent of Forest Working-Plans has now accordingly been made into a separate post and attached to the Research Institute. In the words of the Government Resolution the holder of the post "will collect and collate statistics of the

results of forest management throughout India, which are provided by the control forms annually submitted to the Government of India, so that the valuable information required in the different provinces will be made available to the whole Department. In addition to this he will assist the Inspector-General of Forests in the control at present exercised by the Government of India in the preparation of Working-Plans, performing in this matter the functions at present exercised by the Assistant Inspector-General of Forests. In order to render this assistance more effective and to remove a serious defect in the present system, he will visit the forests in which the Working-Plans are being prepared, and will record a note upon the local conditions of the forest for the information of the Inspector-General of Forests. A copy of this note will also be sent through the Conservator to the Local Government for information, and for any action they may care to take upon it."

In this brief review of the aims and objects of the new departure we have endeavoured to put before the Department the work which lies before it and through it before the members of the Research Institute. We feel sure that we are but voicing the sentiments of the Service when we tender to the Government of India our sincere acknowledgements for one of the most important, economic and scientific departures which has been made since the creation of the Forest Department, and we have every confidence that the results achieved will fully justify the far-seeing statesmanship which has inaugurated the new policy.

Crabbe's lines would seem to be peculiarly appropriate to the present departure.

'Tis good, 'tis pleasant through th' advancing year,
To see unnumbered growing forms appear;
What leafy-life from earth's broad bosom rise!
What insect myriads seek the summer skies!
What scaly tribes in every streamlet move;
What plumy people sing in every grove!
All with the year awaked to life, delight and love.

Then names are good ; for how without their aid,
Is knowledge, gained by man, to man conveyed ?
But from that source shall all our pleasure flow ?
Shall all our knowledge be those names to know ?
No ! let us rather seek, in grove or field,
What food for wonder, what for use they yield ;
Some just remark from Nature's people bring,
And some new source of homage for her King.

SCIENTIFIC PAPERS.

ON SOME BAMBOOS IN MARTABAN SOUTH OF TOUNGOO BETWEEN THE SALWIN AND SITANG RIVERS.

BY SIR DIETRICH BRANDIS, K C.I.E., F.R.S.

III.

From pp. 151—155 of my report of 1881 it appears that *Tinwa*, *Cephalostachyum pergracile* is associated with teak in the Sinswè forests and in the Upper Salwin forests, on moist and not rocky ground.

The most remarkable species in this part of Martaban is a large single-stemmed bamboo (*Wabgai*, Kar., *Tabindaing*, Burm. Manson No. 2) which is fully described on p. 151 of my Burma report of 1881. I found it (leaves only) covering extensive areas on the hills at the head waters of the Metharauk stream, ascending in places to near the crest of the Buthiko range, as well as in the Sinswè forest of the Yunzalin valley. Manson found it in flower on the hills above Papun commonly growing in sheltered side-valleys, and he also reports it from the head waters of the Bilin chaung, as far down as Hlagunbyo village. The culms are 40—60 ft. long, the lower half naked, without branches, with white or pale yellow stripes. The internodes are 22—29 in. long, 2½—3 in. diam., walls ⅓—½ in. thick. The sheaths are firm with black hairs outside, 8—13 in. long, gradually narrowing to an apex 2—3 in. broad, blade often as long as sheath, with a broad undulating band at the base on both sides.

The flowers received are all male and not in good condition, the tender parts being mouldy and mostly eaten by insects. The

spikelets are polished, lanceolate, sharply pointed 1—1½ in. long, solitary or in lateral fascicles of 2—8 spikelets, supported by coriaceous, truncate sheaths 1—2 in. long. Two basal glumes are empty, then follow 4—5 flowering glumes with 21—25 longitudinal

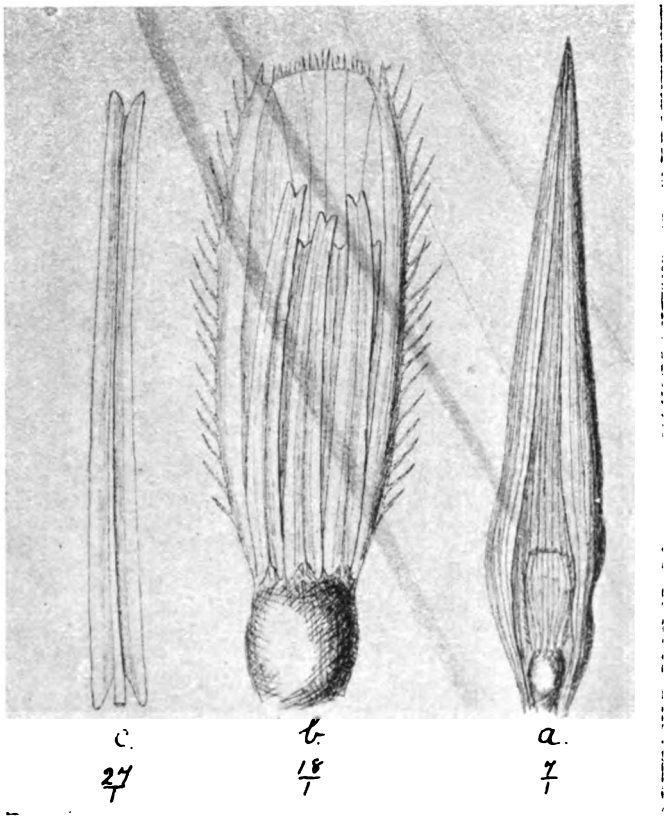


FIG. 8.—WABGAI, KAR.—*a* (× 7) Front view of flowering glume with the very short blunt transparent palea through which are faintly visible the anthers, seated on a fleshy torus. *b* (× 18) Palea with the anthers on a fleshy torus. *c* (× 27) Anther, bidentate at apex.

nerves and few transverse veins. The glumes are naked, not ciliate along the edges, the flowering glume is $\frac{6}{5}$, the palea $\frac{1}{8}$ in. long. The palea is transparent, ciliate along the keels, with a

broad truncate top and ciliate apex. Anthers 6, bidentate at the tip, nearly sessile on a fleshy torus, no trace of lodicules. (Fig.

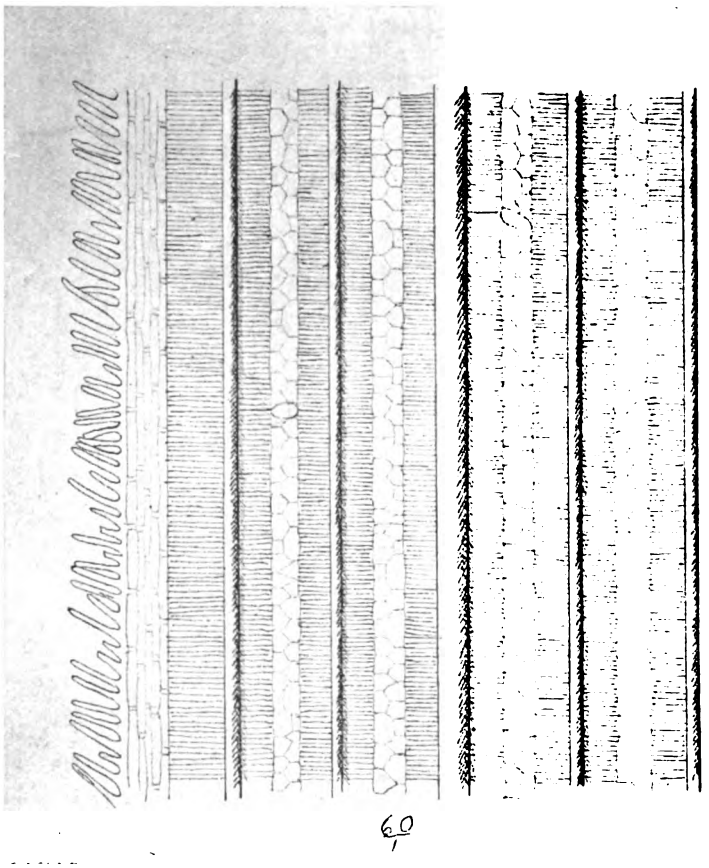


FIG. 9 —MELOCANNA BAMBUSIOIDES, TRIN.—(× 60) Piece of leaf on the inner edge, showing on the edge a broad colourless band thickly set with fine hairs. One stout and 4 fine nerves with the bright bands of silica cells between. Very faintly visible 2 transverse veins where they cross the band of silica cells (24 n on 1/4 inch)

8*a*, glume, palea and anthers. *b*. palea and anthers. *c*. anther.) The leaves are 8—9 by 1—1¼ in., underside glaucous, with

very minute hairs, teeth (hairs) on both edges small n 30 on ¼ in.

Until fruit and female flowers are obtained, the genus of this remarkable *Tabindaing* must remain uncertain. Unisexual flowers are known in several genera, this character therefore gives no indication. All species of *Gigantochloa* and *Oxytenanthera* known to me have pointed anthers. Of *Melocanna bambusoides* the culm sheaths leaves and flowers are quite different. For the present therefore it must continue to be known by the Karen name *Wabgai*. In "Indian Trees," p. 672, it is mentioned under *Gigantochloa*, to which genus Mr. Gamble had referred it in his monograph.

Melocanna bambusoides (*Muli*, Beng.; *Kayin wa*, Burm.) the remarkable single-stemmed bamboo, with large pear-shaped, fleshy fruit, seeds without endosperm, forms large forests in the Lushai and Chittagong hills, in Arakan and on the Upper Chindwin. It is not impossible that it may be found in Martaban, and hence I think it useful to draw attention to some remarkable characters in the leaf, to which C. B Smales first drew my attention. The end of the leaf is drawn out into a long point which below the tip has a bunch of long, fine hairs (Fig. 10*a*). The inner edge is closely set with fine hairs on a broad colourless band (Fig. 9), while the outer edge has a few short teeth (thick-walled hairs) (Fig. 10 *b*).

The figures here given of the leaves of some bamboos may serve to illustrate a character which in many cases will be found useful, in order to identify bamboos of which leaves only are known. In some species the longitudinal nerves are close together, in others they are distant. Of the leaves here figured *Teinostachyum Helferi* has the nerves most distant, the specimen figured, 18 on ¼ in. *Pseudostachyum polymorphous* has 21 on ¼ in., *Melocanna bambusoides* 24 and *Phyllostachys* sp. 33. It may be objected that broad leaves must necessarily have the longitudinal nerves more distant than narrow leaves, and this view is apparently supported by the fact that the leaf here represented of *Teinostachyum* was 2 in. and that of *Phyllostachys* only ¾ in. wide. In broad

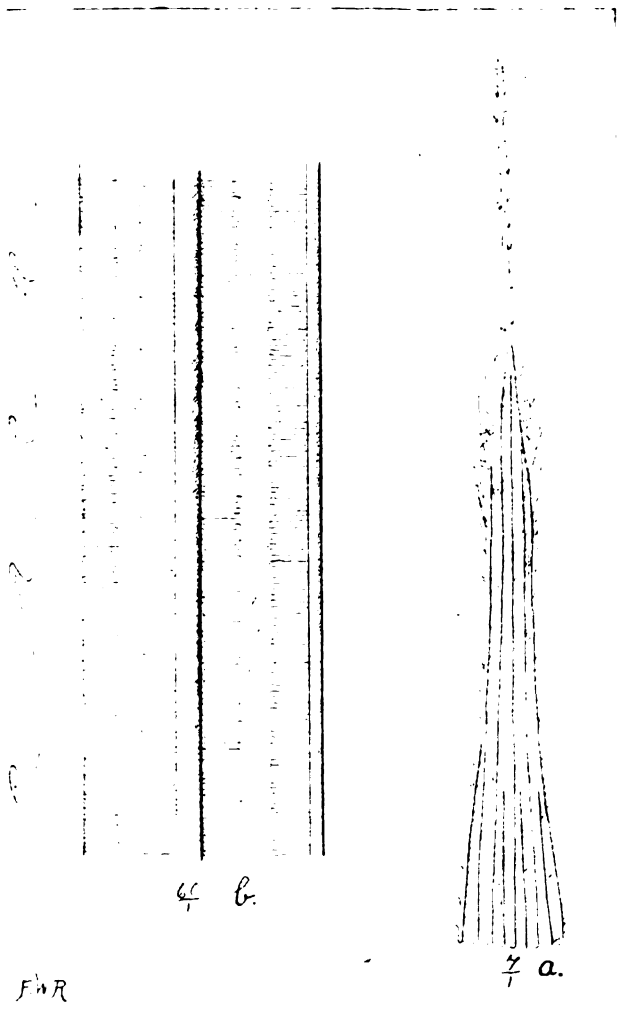


FIG. 10.—MELOCANNA BAMBUSOIDES, TRIN.—*a* (× 7) Tip of leaf, showing the long linear hairy apex with a brush of long fine hairs. At the base 8 longitudinal nerves, of which 3 only extend to the apex. *b* (× 60) Piece on the outer edge, a few teeth (broad thick-walled hairs) on a colourless band. One stout and one fine nerve with two bright bands of silica cells.

leaves undoubtedly the longitudinal nerves are more often distant than in narrow leaves, but this by no means is the general rule. Leaves of *Arundinaria falcata* ½ in. wide have 36—45 nerves on ¼ in., while those of *A. Falconeri* of the same width have 21—27 and those of *A. Hookeriana* 21—24 nerves on ¼ in. Leaves of *Bambusa Tulda* 1 in. wide have 30—43 nerves on ¼ in., while leaves of *B. khasiana* of the same width have only 18—21.

Attention to the nerves and transverse veins in the leaves will in many cases facilitate the study of bamboos in India.

Returning from this digression to the single-stemmed bamboos of Martaban I wish to mention a species, which as regards culm-sheaths and structure of leaf much resembles *Oxytenanthera macrostachya* of the hills east of Shwegyin. This species I found on the 25th February 1880, covering large areas on the hills south of the Thauk-ye-ghat river near the Tepu chaung, a feeder of the Yaukthawa stream. On the culm-sheath, which is exactly like that figured on Gamble's tab. 54 is entered by me: *Tabin daing Wa*, Karen hills, February 1880. This species is therefore truly single-stemmed and not loosely tufted. On p 141 of my report of 1881 this bamboo is mentioned with the remark that "the Taungya clearings had mostly grown up in bamboos and that the period allowed for the bamboo forest to grow up before it was cut again varies here from 7—15 years." Specimens collected by Kurz Burma, without locality (156) are exactly like those collected on the Karen hills in 1880.

To these two large single-stemmed bamboos in this part of Martaban should be added a third, found by me in the Upper Salwin forests in March 1859 and described on p. 683 of "Indian Trees" with simple, stiff, leafless branches on the lower nodes and small leaves. In 1859 the Karens called it *Wami*. Manson gives *Wame* or *Wamay* as the Karen name of *Oxytenanthera nigrociliata*.

Finally I wish to draw attention in connection with these to the single-stemmed bamboo of the Attaran forests, a full description of which will be found on p. 683 of "Indian Trees." This like the single-stemmed bamboo of the Yunzalin, I found in 1858

associated with teak (Attaran report, p. 165. Selections from the Records of the Government of India, XXXII, 1861). These four large single-stemmed bamboos of Tenasserim and Martaban must await further specimens, before they can receive systematic names.

One of the bamboos kindly collected for me by Mr. Manson I am entirely unable to identify. It was collected on the east side of the Sinswè reserve and the Karen name is given as *Kanyaw*. It is described (Manson No. 7—) as a dark-green, more or less glaucous bamboo, internodes 24—30 in. long, and sometimes longer, diam. 2—2¼ in., walls thin, ¼ in., nodes not prominent, undeveloped buds flat, oblique, pointed, with a crustaceous, fragile margin and a pair of smaller buds at the base. The culm-sheaths are firm, 9 in. long, top convex with elegantly plicate and fringed auricles on both sides of the broad blade, which is nearly as long as the sheath. The leaves are 12 by 1–1¾ in. glaucous beneath, at the top of sheath the remains of long bristles, nerves 33 on ¼ in. Regarding the mode of growth nothing is said. The leaves resemble *Oxytenanthera macrostachya*, but the internodes of this species are only 18 in. long and the blade of culm-sheath is represented as short, triangular. The species of *Bambusa* which have large auricles on the culm-sheaths as far as known to me have a short triangular blade.

I do not apologise for having entered into such lengthy detail regarding the bamboos of Martaban. Teak in Burma is associated with bamboos and the correct treatment of teak to a great extent must be governed by a correct knowledge of the mode of growth and the requirements of the bamboos associated with it. The undergrowth of bamboos (*Kyathaung* and *Tin*) in fire-protected forests of the Kadin bilin working circle, to which (*Ind. For.* XXXI, 140, 505) Mr. Troup, if I understand him correctly, ascribes the absence of teak seedlings in fire-protected areas, is a striking case in point. Troup states that they are not seedlings, hence the only explanation possible seems to be that the rhizome of these two densely tufted species, if protected against fire, throws out long underground branches, which produce this remarkable undergrowth.

It may be objected that of the 32 species mentioned here, only 13 are found associated with teak, *viz.*, *Bambusa Tulda*, *polymorpha*; *Thyrsostachys siamensis*; the four *Oxytenantheras*; *Dendrocalamus strictus*, *membranaceus*, *longispathus*; *Cephalostachyum pergracile*; *Wabgai* and the Attaran *Tabin daing*. The study of the others, it may be said, is of no interest to foresters and may safely be left to Botanists. My reply to this objection is that the life-history of all bamboos must be studied, in order correctly to understand the mode of growth and requirements of those species, which are habitually associated with teak. Hence I think I was justified in giving an account, as far as I was able, of all species known to me from Martaban. A knowledge of species is indispensable before the study of their life-history can be attempted.

The drawings, which illustrate this paper, are by Mr. F. W. Rolfe, youngest son of the distinguished Botanist, R. A. Rolfe, Assistant at the Royal Botanic Gardens, Kew.

KEW. *February* 1905.

ORIGINAL ARTICLES.

THE AMERICAN FOREST RESERVES.

BY CHARLES H. SHINN, FOREST SUPERVISOR, UNITED STATES FOREST SERVICE.

Some time ago (in August, 1903) I wrote to the *Indian Forester* giving a glimpse of the life of a Head Ranger in the Sierra Nevada Mountains. To those who were able to read between the lines, I suspect that even this brief glimpse raised many doubts as to whether we Americans had yet learned how to handle our forestal resources. But since that time a great many things have happened, all interesting to fellow workers and full of promise for the future.

A year ago last January I was in Washington to attend a Forest Convention, and witnessed the transfer of the Forest Reserves of the United States from the control of the Department

of the Interior to that of the Department of Agriculture. This transfer has already proved to be one of the most successful pieces of constructive forest legislation ever passed by the American Congress. It put Mr. Gifford Pinchot, with his trained body of foresters and a well-equipped central office, in entire control. The immediate result was that in the shortest possible time the whole thing was reorganized from bottom to top, the "weaklings" were weeded out, new blood came in, and actual forestry, for the first time, had its opportunity. In fact as well as in name, the Bureau of Forestry became the Forest Service of the United States.

The date when the actual transfer was made was February 1st, 1905, only fourteen months ago. Since then all of the old reserves have been reorganized (they numbered fifty-four in 1902, comprising about 60,000,000 acres); many new ones have been created; additions of considerable size have been made to old reserves; competent inspectors are examining large areas with a view to securing yet more reserves in the near future; comprehensive new legislation is now before Congress, and the work is everywhere taking strong hold upon public affairs.

The growth of the forest idea in America has been extremely slow, as might have been expected where such vast areas of seemingly inexhaustible coniferous and hardwood forests existed. Public interest was with difficulty stirred, and soon settled back. Many capable men tried to arouse the nation to the importance of forestry, but all that came of it was a mass of reports, memorials, resolutions and a few fragmentary laws. Between 1817 and 1858, Congress reserved certain tracts, in all 244,452 acres, in Alabama, Louisiana and Mississippi, in order to secure liveoak and cedar for naval construction. Then came the war between the States, and the age of ironclads, and hardwood reserves were abandoned. The Commissioner of Agriculture, however, continued to compile reports upon forestry. In 1877, for instance, Dr. Franklin B. Hough made a special report of 650 pages. In 1882 a Division of Forestry was established, and under successive administrations this report-making system necessarily continued. In 1882 also the American Forestry Congress was organized, and from this

developed the American Forest Association which has been one of the most important factors in shaping public opinion. In 1882 also, the American Journal of Forestry was established.

Thus matters moved on slowly, steadily, after the manner of republics, while a few workers, such as Hough and Fernow were hammering away at the thick shell of indifference. By 1898 the forest work of the United States was still mere report work and still a "Division"; it employed eleven persons, six of whom were clerks and subordinates and only two professional foresters. It was still an office without any field work worth mention.

This carries us over eighty-one years since Congress attempted to create Forest Reserves among the oaks of the south, and yet American forestry had not taken hold of the task. But by that time the leaders were in the service, or ready for it, and the next seven years witnessed a marvellous change. In July 1904 the "Division" of 1898, with its eleven men, had become a "Bureau" with 821 employés, 153 of whom were professional foresters. Field work of excellent quality was being carried on in twenty-seven States and Territories. Nearly a million acres of private woodlands and forests were being managed under the advice of the Bureau, and the demands for more of this kind of work were immense. A Forest School had been established at Yale; a science and a literature of American forestry had been created and had interested the public, so that graziers, lumbermen, railroad owners, clubs, conventions and all kinds of associations were being enlightened in a thousand ways in regard to the meaning of forestry. The whole field of action, by the leadership of a few capable men, was transferred from the desks to the forests. Better than all else, the Bureau of Forestry had fitted itself in these creative years to take administrative charge of the forest reserves, which had meanwhile grown up in the Land Office.

Secretary Wilson, in his report for 1905, estimates the present value of the forest reserves at $250,000,000, and says that they are being administered at a cost of less than one-third of one per cent per annum. It is evident from a careful and conservative survey of the American field that the fifty-four reserves containing sixty-two

million acres of land which the Land Office formerly controlled will eventually develop into a perfected system including many Appalachian forests from Georgia to New Hampshire and hundreds of areas chiefly designed to protect the sources of water supply and to prevent grazing lands from being overstocked, in addition to pure forest reserves. If the management of the reserves continues to display the admirable qualities of energy, foresight and "plain horse sense" hitherto manifested, the time may come when the "American system" includes five or six hundred reserves covering three or four hundred million acres, while a Secretary of Forests and Waters sits in the President's Cabinet. The sixty-two million reserve acres of July 1904, grew by July 1905 to more than 85,000,000 acres, a gain of over thirty-seven per cent, and although future reserves will often be small, the field force is constantly discovering useful territory.

The bulk of the additions since February 1905 have been made in California, and the latest Reserve map shows to what a great extent forestry is certain to shape the social and industrial future of this immensely rich state whose area is about 99,800,000 acres, including lowlands, uplands, deserts, alpine peaks, rich valleys and varied climates from Norwegian to Italian. In Parks and Reserves California now contains about twenty million acres thus set apart for forestry, for game preserves, for tourists, and, in brief, for public uses. The "Use Book" tells the men of the service to administer their areas for the "greatest good to the greatest number," and that is a high ideal to follow.

Timber sales are under way in nearly all the California reserves, under trained inspectors and technical assistants, with students from the forest schools and forest rangers to do the surveying, scaling, marking, etc. Many of the seasoned rangers have been promoted "for excellent work" and some of them are now in charge of reserves of their own. The whole American forest force has been put under the Civil Service system and examinations are held at stated periods for rangers and supervisors.

The special need of California at present is for some kind of a Forest High School where forest guards and rangers of fair

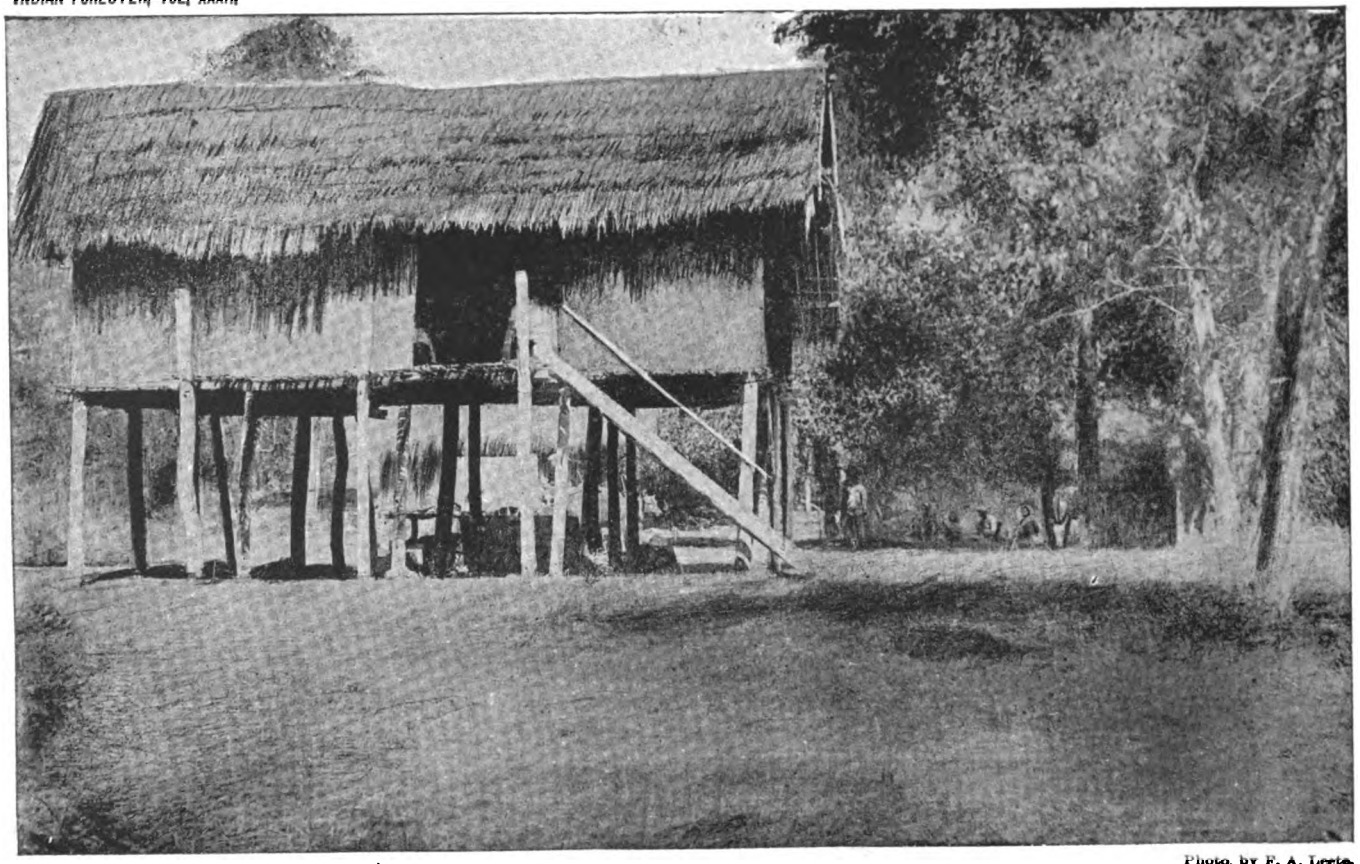


Photo.-Mechl Dept., Thomason College, Roorkee. Photo. by F. A. Leete.

FOREST HOUSE, BAW,
Minbu Division, Upper Burma.

common school education can profitably spend successive winters, fitting themselves for promotion. Without this, some of our most capable mountaineers, quiet, unselfish, unconquerable men, are woefully handicapped for the growing requirements of the service whose demand for men far outruns the supply from the forest courses of our universities.

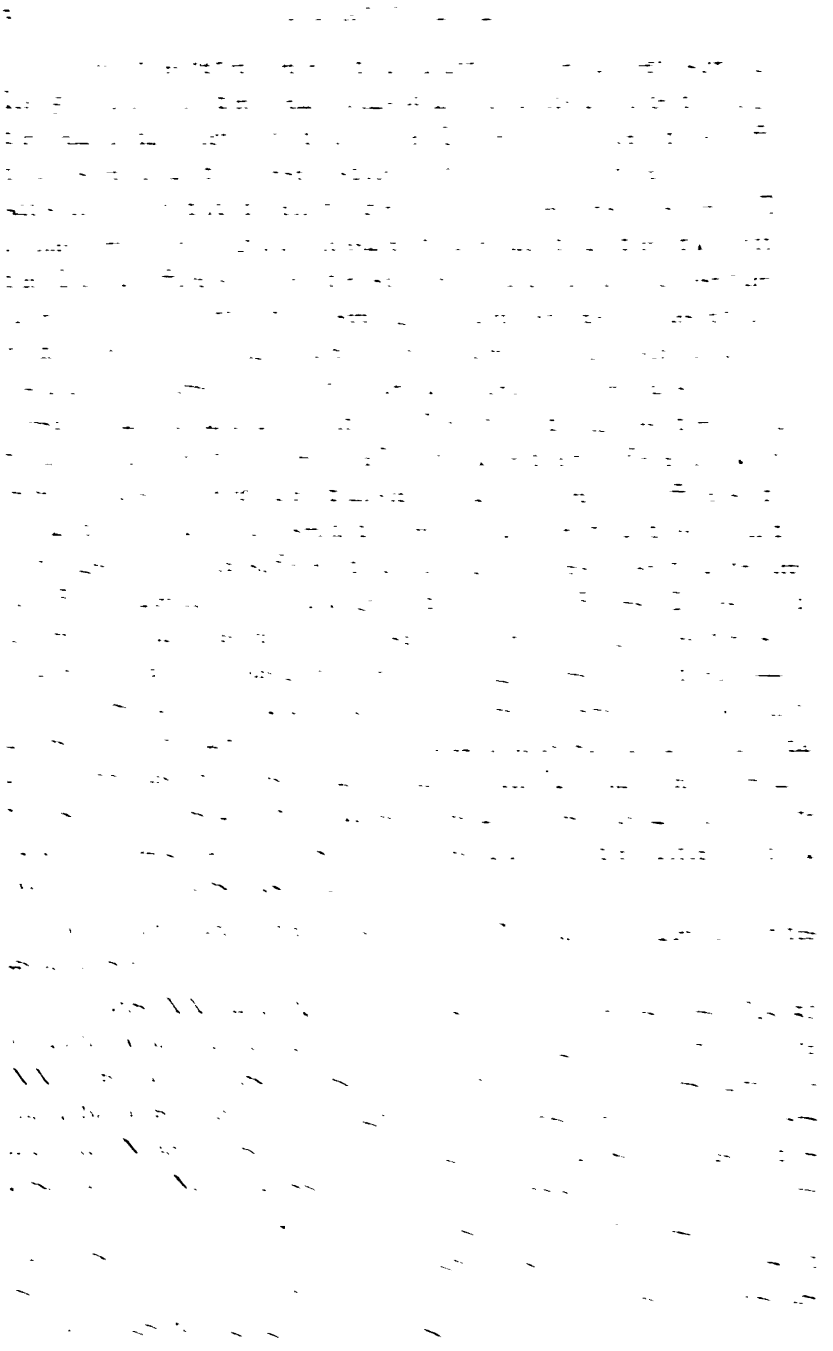
In our work, distant though we are from India, we often gather inspiration and a multitude of administrative suggestions from your own great forest service. As we climb our Sierras we only get glimpses of pumas or wolverenes instead of your noble *felidiæ*; we deal only with Basque sheep-trespassers, with isolated half-crazed hermits of the wilderness, with Mono and Chowchilla American Indians, with wandering trappers, hunters and prospectors—instead of with your picturesque and multitudinous primitive peoples. But still we feel that there is a true fellowship, somewhat more, somewhat deeper than that which generally unites foresters, for Californians have gathered much from the Indian Forest Service, and as years pass will doubtless gather more than ever before.

TYPES OF FOREST REST-HOUSES IN INDIA.

II.—BURMA AND THE UNITED PROVINCES.

BY THE HONORARY EDITOR.

In the February issue of the *Indian Forester* we commented on the great disparity in comfort and healthiness of the rest-houses built by the Forest Department in different parts of India. In that number we showed pictorial representations of three rest-houses of the type to be found in the Naini Tal, Dehra Dun and Kheri Divisions of the United Provinces. We here reproduce, through the kindness of Mr. F. A. Leete, examples of two rest-houses of the Bahraich Division of these Provinces and two of the type to be found in the Minbu Division of Upper Burma. The startling difference between what is considered essential to ensure the comfort and health of the Controlling Staff whilst on tour in the one province when contrasted with that provided in the other speaks for itself.



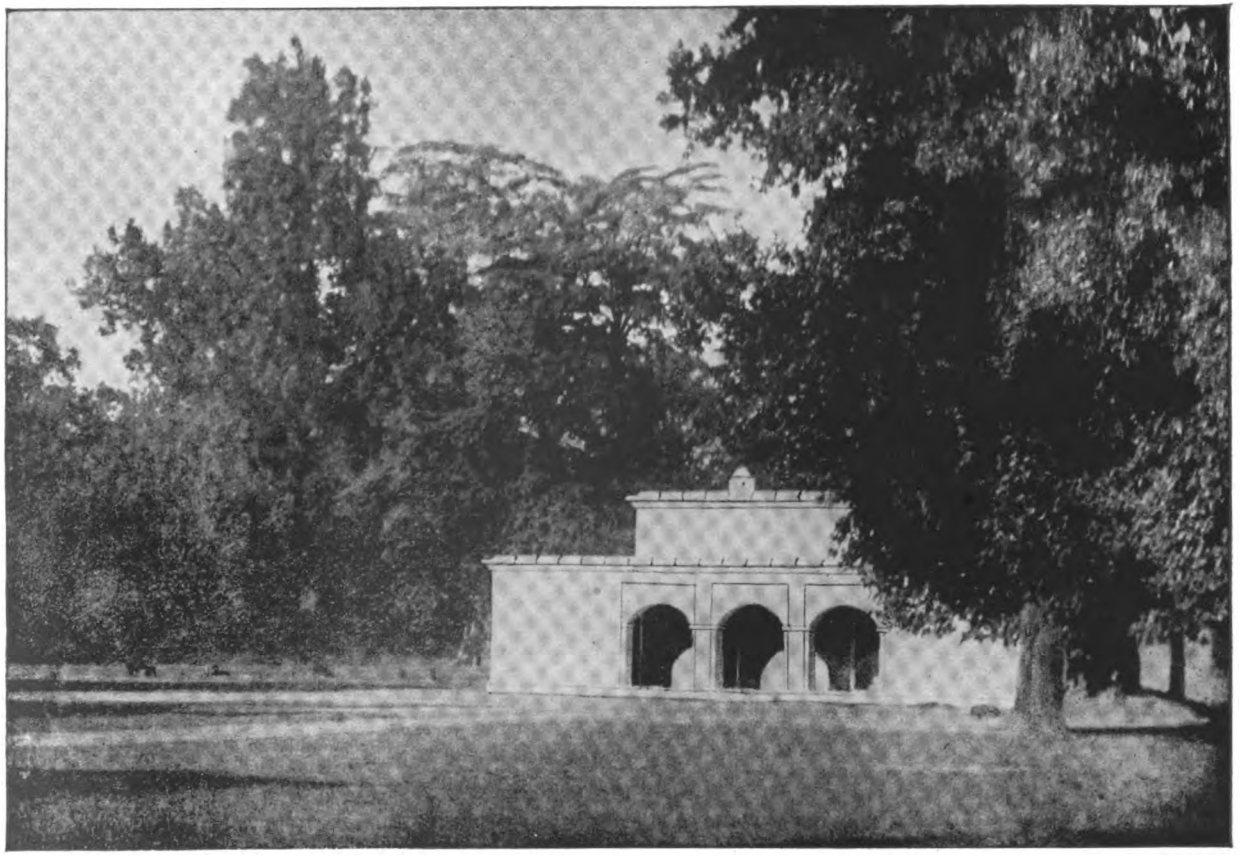


Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by F. A. Leete.

FOREST HOUSE, KAKADARI.
Bahraich Division, Oudh.

When it is remembered that Burma gave a net surplus of Rs. 55,13,000 for the year 1904-05 and that its climate throughout the year is far inferior to that of the United Provinces, it is difficult to consider that the present state of affairs in the former Province is satisfactory, or that it reflects credit upon those responsible. That it has been due in great measure to the fact that the majority of the Burma officers joined the service in Burma and consequently have had no opportunity of seeing for themselves or ascertaining from others how things were done in the more go-a-head and up-to-date Provinces of India may be adduced as one reason for the present want to accommodation. Men took things as they found them and apparently made no effort to have them different. Within recent years, however, the transfer of a number of officers from India to Burma would seem to open out a hope that this condition of things will not be suffered to continue. In response to a request Mr. F. A. Leete, now in charge of the Minbu Forest Division in Upper Burma, has very kindly sent us the photographs we show in this number and has given the following notes about them :—

Plates XX and XXII exhibit two rest-houses in the Bahraich Division. They are both built of pucca bricks set in mud mortar and lime-plastered inside and out. Plate XX has one large and two small rooms and two bath-rooms and cost Rs. 2,000. Plate XXII two large and two small rooms, each of the latter with a bath-room. It cost Rs. 2,600.

With reference to the huts, both in Minbu, Mr. Leete writes as follows :—

"Plates XXI and XXIII may speak for themselves; Rs. 50 for either would leave a contractor a fair margin of profit. Plate XXIII is not a 'forest' house, *i.e.*, not built by the Forest Department, but it is a very fair average of what Forest Department houses are like. Nine-tenths of the camping in Minbu is in huts of this description. Nevertheless when my predecessor drew up a preliminary report in 1904 for a working plan for the Magwe half of the division he remarked : 'Buildings are sufficient for the present as there are many Bombay-Burma Corporation huts (*tés*), besides the buildings belonging to the Forest Department.'

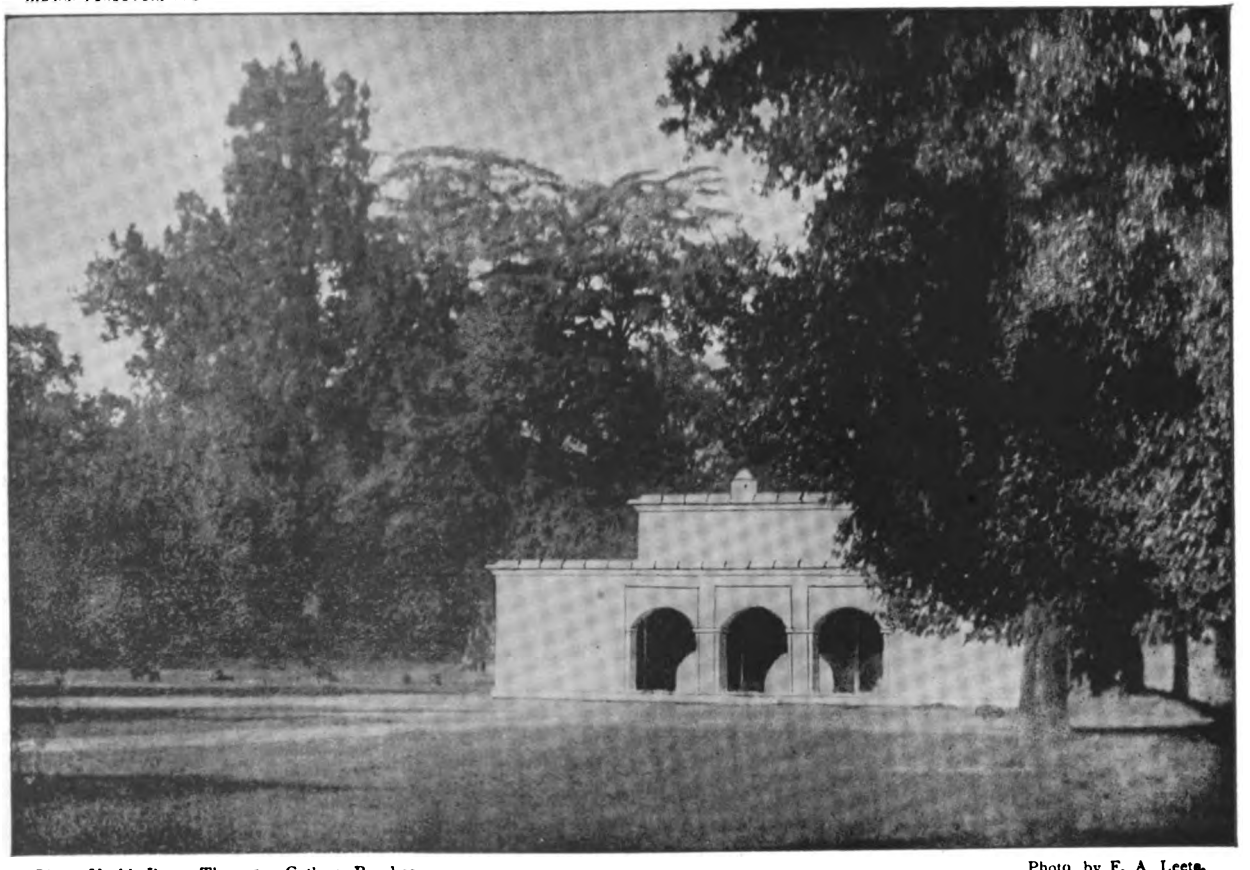


Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by F. A. Leete.

FOREST HOUSE, KAKADARI.
Bahraich Division, Oudh.

"The buildings referred to are nearly all of the style shown in the photographs (both Forest Department and Bombay-Burma).

"In the whole division there is one house that cost Rs. 1,000, one of Rs. 800 and three of Rs. 400. All the rest are of the Rs. 50 type.

"Needless to state my predecessor had had no service in India. Fortunately there was time to change the preliminary working plan report and so it was done.

"The building of more houses of the Rs. 1,000 to Rs. 1,300 type was started, and it is hoped that the present rate of two to three new houses a year will continue for a long time to come."

We have ourselves, during a tour in Burma, occupied huts of the type shown by Mr. Leete both in the Katha, Tharrawaddy and Ataran Divisions. It is often advisable to wear a *topi* during the hotter portion of the day in these "rest-houses" so sparing has the contractor found it necessary to be, with the munificent funds at his disposal, with the materials of which the apology for a roof is composed.

It is perhaps needless to remark that with such accommodation in which to pass the greater part of the year the health of the Burma Forest Officers is far from good, nor can it be a matter for surprise if enthusiasm and energy are sapped and undermined by such unnecessary hardships and exposure.

CORRESPONDENCE.

TO THE HONORARY EDITOR OF THE INDIAN FORESTER.

THE TREATMENT OF ELEPHANTS' HEADS BY INDIAN MAHOUTS.

SIR,—In the January (1906) number of the *Indian Forester* Mr. Bruce asks whether there is any real use in applying oil to elephants' heads. I had hoped that some one better qualified than myself would have replied to this enquiry and settled the question once and for all. I shall, however, quote my own experience.

I have had charge of a number of elephants practically throughout my service and have endeavoured to learn as much as possible regarding their treatment. In Bengal and Assam, it was, and probably still is, the practice to anoint elephants' heads daily with mustard oil. I noticed that wherever the goad or spear had penetrated the skin and mustard oil was applied there resulted almost invariably a small abscess or sore, from which matter would spurt forth where the head was struck near the wound with the driving hook or stick. I then observed that the Kheddah elephants and those belonging to private owners whose heads were never oiled, were free from festering sores. It was then decided to abolish the use of oil on the timber elephants and to continue it on the baggage animals. This experiment confirmed my observations. The heads of the timber elephants, which are subjected to far more punishment than those of baggage animals, were comparatively free from sores. Before finally abolishing the use of oil, I tested its effect in the sun and noticed that although there may be some virtue in the use of oil by keeping the head cool immediately after its application, in a few hours an oiled head was perceptibly warmer to the hand than an unoiled one. This seems quite reasonable considering that the natural colour of an elephant's skin when dry is much lighter and therefore absorbs less heat than when oiled when it turns practically jet black.

I abolished oil some three years ago, and have had no trouble whatever in consequence; on the other hand, the relief from the constant trouble with mahouts for pilfering or for not using the oil supplied, has produced some peace of mind to all concerned, and I feel certain no discomfort to the elephants.

DHUBRI: W. F. PERREE.
5th May 1906.

A NEW METHOD OF FIRE-PROTECTION.

SIR,—In the March issue of the *Indian Forester* Mr. Hodgson accepts "F. G.'s" invitation to express an opinion on the above question. I should like to add a few words as I am in entire

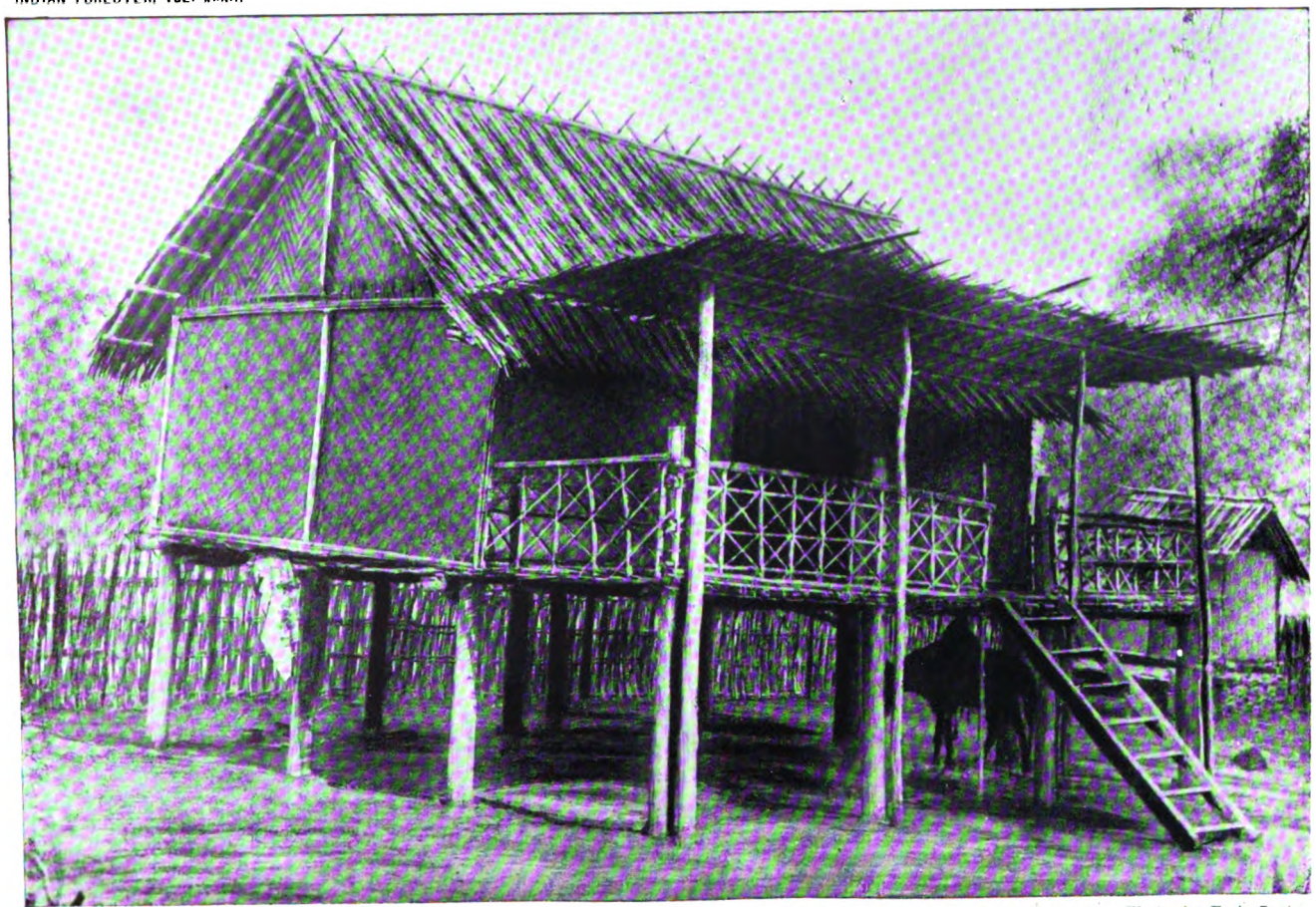


Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by F. A. Leete.

DISTRICT HOUSE, PA-AING.
Minbu Division, Upper Burma.

agreement with Mr. Hodgson in his views as to the injurious effect on the local population if the Forest Department purposely burns the forests.

This system has actually been proposed and is in fact carried out in certain forests of at least one district. In reporting on the proposal it was exactly Mr. Hodgson's objection that I raised in opposition.

The first step in combating forest fires is obviously to ascertain their origin. I have no experience of forests outside the Madras Presidency, but I presume the circumstances in other Provinces cannot be entirely different, and that it may be said that elsewhere as well as in Madras the number of fires arising other-wise than by the agency of man is so small as to be negligible.

From time immemorial the people of India living in and near forests have been in the habit of burning them whenever they wished and moreover have not thought it in any way incumbent on them to prevent the burning or refrain from any act which might cause fire, the burning being generally beneficial from their standpoint. Forests are burnt to obtain new grass, to facilitate the collection of fruit, honey, horns, roots, etc.; to facilitate shikar and even to render passage through the jungle easier and less dangerous.

It may therefore be accepted that practically all fires are caused by man, either wilfully or through carelessness and apathy.* If we wish to put a stop to the mischief we can only do so by removing the desire to burn the forests from the minds of the people by education. I am convinced that efforts to protect selected areas and direct appeal to the people have had some result. They see that we are really in earnest in our efforts, and this coupled with punishment in proven cases has had and is having its effect.

* 5,448 fires occurred in the fire-protected forests in British India during 1903-04. Of these 237 originated during departmental fire conservancy operations, 568 owing to external fires crossing the fire traces, 4,085 were due to carelessness of outsiders and the remaining 558 originated from intention or malice. Of the total number of 5,448 fires, 4,390 occurred in the Madras and Bombay Presidencies, 1,058 only originating in the whole of the Bengal Presidency.—Hon. Ed.

I have nothing to say against the plea that an early light fire is preferable to a late severe one, always providing that an early fire is a guarantee against further fires in the same season. That there is not always such a guarantee and that more than one fire can burn over a given area in one season has already been shown by Mr. Hodgson and may well be believed when the fire season extends, as it did in 1904-05, in the North Coimbatore Division from the end of November of one year to the end of September of the next.

It seems to me, however, a great retrograde step in our "education" of the people to ourselves set fire to the forests. Jungle tribes and even more civilised castes are not likely to differentiate and will not see the force of not burning where and when they wish to when the Department is burning elsewhere.

Fires being almost entirely due to man are preventible, but they are preventible only by banishing the wish to burn. No amount of protection that we can undertake will save the forests if the hill tribes and others are determined on setting them on fire. We must therefore teach them by the force of example as well as by precept assisted by deterrent punishment meted out to detected incendiarists.

COIMBATORE :
2nd May 1906.

C. E C. FISCHER,
Deputy Conservator.

REVIEWS AND TRANSLATIONS.

THE FORESTER.

BY JOHN NISBET, D. Œc.

III.

PART V.—THE MANAGEMENT AND VALUATION OF WOODLANDS.

The management of a forest varies with the object it is desired to attain. Dr. Nisbet's work is primarily intended for the use of land owners and land agents who will ordinarily desire to obtain

the largest return on the capital invested, and the working of the forest with due regard to its continued maintenance will generally be arranged to this end. In the case of State forests, such as our Indian forests, however, the sole object with which these are administered is usually the public benefit, the legitimate demands for forest produce of the people, more specially those in the vicinity of the State forests, have to be fully provided for, the public as a whole benefiting by whatever surplus revenue may be obtained.

After dealing at length with the theoretical principles of woodland management, Dr. Nisbet treats of the measurement of timber crops, and then proceeds to explain the formation of working-plans, or the practical application of the theoretical principles which he has previously discussed.

As he justly remarks :—" It is hardly possible for any large tract of woodland to be managed economically, and for the productivity of the soil to be fully utilised, unless the management is regulated according to a working-plan." It is to be hoped that the publication of Dr. Nisbet's work will lead to the more systematic management, by means of carefully prepared working-plans, of many of the larger woodlands in Great Britain. A useful chapter on book-keeping on woodland estates and a chapter dealing with the valuation of woodlands, with appendices, giving amongst other things, average yield tables for scots pine, spruce, beech and oak in Germany which should prove very useful, conclude Part V.

PART VI.—THE UTILISATION OF WOODLAND PRODUCE.

This part deals with the technical properties, practical uses and market value of timber, the harvesting and sale of woodland produce, the transport of timber by land and water, the preservation of timber, various industries such as the manufacture of wood pulp, charcoal burning, resin tapping, and saw mills are described and a note on grazing in woodlands and on leaf fodder is given.

For various reasons, the chief of which is perhaps the want of sufficiently skilled and intelligent labour, European methods for the harvesting of timber are, in most cases, impracticable of adoption in India, and it is generally found necessary very largely

to utilise, whilst improving as far as possible, the native methods of felling timber, etc. So also in the matter of transport local methods have to be mostly adhered to, and in some cases, *e.g.*, the use of elephants for the extraction of timber from the forests in Burma, the methods in force could hardly, in any circumstances, be replaced by European appliances.

The preservation of timber by various processes is discussed at length; so far, in India, the various experiments that have been made in this direction have not yielded very satisfactory results, but the information that is brought together in the chapter on this subject should prove of considerable use for reference. In discussing the outturn of the saw mills belonging to the Sierra Flume and Lumber Company (page 526) it is stated that the mills "have an annual output of 16 million metres of boards (575 millions of cubic feet) which represents exactly half of the annual outturn from the State of Oregon (1888)."

What is exactly meant by the expression "metres of boards" is not clear. The standard unit of lumber measurement in America is the "board foot," a "board foot" being the contents of a board 1 foot square and 1 inch thick; the term metre board perhaps means the contents of a board 1 metre square and 1 inch thick the cubic contents of which is something less than a cubic foot; the outturn would therefore be between 14 and 15 million cubic feet instead of 575 millions. Moreover this latter figure, if correct, would mean an outturn of nearly 2 million cubic feet a working day, which seems incredible.

Dr. Nisbet is to be congratulated on having produced a work that cannot fail to be of the greatest use to all who are interested in forestry, more especially those who wish to introduce more systematic methods of management into the working of their forests and woodlands; and it should serve further to stimulate the interest in forestry that has in recent years been evinced in Great Britain.

M. HILL.

FREMLÄNDISCHE WALD- UND PARKBAUME FÜR EUROPA.

EXOTIC FOREST AND PARK TREES FOR EUROPE.

Fremländische Wald- und Parkbäume für Europa. By Heinrich Mayr. Berlin: Verlag von Paul Parey, 1906.

The introduction of exotic trees for economic as well as for ornamental purposes has for many years occupied the attention of the Forester and the arboriculturalist: there need, therefore, be no excuse for the production of an exhaustive work on the subject such as that which has just been brought out by Dr. Heinrich Mayr of the University of Munich. This book, of which the letterpress extends over 622 pages, is no mere theoretical discourse, but is the result of years of practical experience, the author having had exceptional opportunities, in the course of his travels, of observing the various species in their natural habitat. His first journey was undertaken in 1885, when he went to America, and then to Japan, China, Java, and India, returning in 1887. He then went almost at once to Japan as Professor at the University of Tokio, where he remained more than three years, returning *viâ* China and Ceylon. While in Japan he saw much of the natural forests of that country and the adjacent islands. In 1894 he undertook the charge of an experimental forest garden of about 40 hectares near Munich, at the same time gaining considerable experience of the planting of exotics in the State forests of Bavaria. In 1902 another journey was undertaken, the countries visited being East Java, North China, Korea, Japan, and the Sierra Nevada region of North America.

In the opening chapter the various geographical regions, in their relation to tree vegetation, are described more or less in detail in three main continental tracts,—(1) North America representing the new world, (2) Europe, and (3) Asia, the two last-named representing the old world. The Asiatic countries and regions dealt with are Japan, Korea, China, the Himalayas, Siberia, the Caucasus, and Asia Minor. Chapter II contains a series of six comparative tables of climatic zones, the object of which is to indicate what species with a habitat in one part of the world may with reasonable prospect of success be introduced into another

country whose climate is somewhat similar. These tables are conveniently arranged for ready reference.

Chapters III and IV contain much instructive reading, treating as they do respectively with the acclimatisation of exotics in Europe and their value as forest trees, not only from an aesthetic but also from an economic point of view. Chapter V is a short chapter on the nomenclature of trees, and is especially interesting to the systematic botanist, while Chapter VI describes the conditions, based on actual experiment in various parts of Europe, under which the various exotics can best be grown, as regards locality, soil, etc.

Chapter VII contains a more or less detailed description of each of the exotics which are suitable for planting in Europe. These are divided into three main groups, (*a*) conifers, (*b*) monocotyledons, and (*c*) dicotyledons. The genera are arranged in alphabetical, not in botanical, order; this fulfils the purpose of the book in being one of ready reference for the practical Forester or arboriculturalist rather than a strictly botanical treatise. Among conifers we naturally find the large bulk hailing from North America, China and Japan. The various Himalayan conifers are described. On page 375, however, the vernacular name of *Pinus excelsa* is wrongly given as *Chir* instead of *Kail* or *Chil*, while on the same page the photograph of what is undoubtedly a *Pinus longifolia* forest is marked *P. excelsa*. The monocotyledons are represented by three species only, two being doubtful species of Japanese bamboos (the *Mosotaké* and the *Mataké*), and the third the Japanese *Shiro-palm*, *Trachycarpus excelsa*, Wendl. (Syn *Chamaerops excelsa*, Thunb.) Among the dicotyledons we find many exotic representatives of well-known European genera (species of *Acer*, *Betula*, *Carpinus*, *Castanea*, *Fagus*, *Fraxinus*, *Populus*, *Quercus*, *Tilia*, *Ulmus*, etc.), as well as other genera not typical of Europe, such as *Careya*, *Diospyros*, *Eucalyptus*, *Magnolia*, etc. This chapter is admirably illustrated by photographs and diagrams.

Chapters VIII to XI contain much information that is of practical value in connection with the cultivation, tending, and protection of exotic trees for ornamental as well as for economic

purposes, Chapter IX containing a useful table of species arranged according to the localities and soils most suitable for them. The concluding chapter, No. XII, deals with the propagation of trees other than by seed. Of particular interest is the Japanese method of grafting buds of ornamental exotic conifers on the tips of the leading shoots of indigenous conifers, an operation in which the author has achieved a fair amount of success. Thus on the European Silver Fir (*Abies pectinata*), the following species have been successfully grafted by this method—*A. amabilis*, *cephalonica*, *concolor*, *lasiocarpa*, *nobilis*, *Pindrau*, *sibirica*, and *Webbiana*. Budding in the case of the spruces, on the other hand, has not proved successful.

The book concludes with a series of diagrams principally of leaves, fruits, seeds, and woods, the wood diagrams being coloured. There is also appended a list of seed firms in various parts of the world, to whom intending purchasers of seeds and plants may apply for such species as they require. India, we notice, is not represented.

The book is copiously illustrated by means of photographs as well as by sketches and diagrams. There are altogether upwards of 600 illustrations, of which some 550 have been drawn from nature by the author himself. The work should prove of great value to all who are interested in forestry and arboriculture, containing as it does an immense amount of valuable information which has hitherto not been brought to light. For the benefit of those who do not possess a sufficient knowledge of German, we should welcome an English translation of Dr. Mayr's admirable book.

ECONOMIE FORESTIERE.

Economie Forestière, by M. Huffel. Lucien Laveur, 13, Rue des Saints, Paris, 1905.

M. Huffel has lately brought out this second volume of his "Économie Forestière," which treats of the measurement of timber, forest production and the mathematics of forestry—what we should

call "forest economy proper." To many this part of forestry must seem rather a dry-as-dust study, yet all must admit its superlative importance. The subject is treated with the most admirable patience and research, and though the author is a Frenchman he is not above accepting the importance of German as well as Austrian and Swiss research in these matters. But all the major continental countries, as well as America, now see the necessity for forest research; it is only English, or rather Indian Foresters who, as yet, have done little in the line of direct research, and this in a country like no other in the world, and for the working of which we have consequently no one else's brains and labour to draw upon. For Indian forests we absolutely need research stations, experiments and patient collection of data. We think M. Huffel deserves well of his country for the careful way in which he has collated the information required for his subject of forest economy—information so much of which is to be drawn only from the investigations made at forest research stations. Being a Frenchman the author has of course put the whole thing in the most lucid way—and this is fortunate, for the subject is a very stiff one.

CURRENT LITERATURE.

The FOREST QUARTERLY for March 1906 opens with a short article by A. B. Recknagel on "Efficient Fire Protection." In this a scheme of fire protection evolved by the Laquin Lumber Company, a progressive firm operating near Laquin in North-Eastern Pennsylvania. The tract protected consists of 14,000 acres of first growth hemlock—hardwoods type. Annually 1,700 to 1,800 acres are cut clean over, so that it is estimated the operation will be concluded in another five years. Every spring as soon as the snow disappears all the brushwood and tops around the skidways is burnt 25—100 ft. back from the track. This operation costs the Company $3,000 a year. During the dangerous season a body of men patrol the railroad tracks and the boundaries of the forest These are mostly foreigners—Hungarians and Italians—and are paid an average of $1·49 per day and find their own board. Twelve

miles of the railroad (Susquehanna and New York) run through the forest. The patrols are in contact with one another and extinguish all incipient fires. All logging train crews are also instructed in fire-extinguishing methods. Firemen of engines and log loaders are required to dump all ashes in a safe place, *i.e.*, in a creek or to wet them with a hose which all engines carry. All the engines operating in or through the tract are fitted with double spark arresters, the ordinary one in front of the engine, and a cone-shaped, fine-meshed wire cap which fits over the top of the stack and efficiently prevents almost all dangerous sparks. The cap is made from 12 gauge ¼ inch mesh (same mesh for inside arrester), wire screen 18 inch in diameter at the base and 24 inch in height. The bottom is an iron ring hinged to another ring around the stack and closing over the stack when in use with a simple latch. The wire is fastened on the sides and at the bottom with bolts. The whole device is simple and efficient and may be recommended for use in India.* They cost the Company $3 apiece. Engineers say that these spark arresters do not interfere with the draft. K. W. Woodward has an interesting article on Forestry in Nova Scotia. We read that the hardwoods play a very unimportant part in the Nova Scotia forests, the soft wooded White Spruce and Balsam Fir being the chief trees, nearly all the Tamarac, *Larix laricina*, having been killed off by insects fifteen years ago, so that there are now no living large trees. Birch, Maple, Ash and Red Oak are also present. An interesting article follows on "The Beginning of Lumbering in the New World," by John E. Hobbs.

The second part of THE AGRICULTURAL JOURNAL OF INDIA Quarterly has reached us. Amongst the interesting articles of which it consists are—The Renovation of Deteriorated Tea by H. H. Mann, the Moth-borer in Sugarcane, Maize and Sorghum

* Whilst on the way up to Simla recently by the Simla-Kalka Railway we saw a large spark from the engine fall on to a sloping bank above a cutting covered with dry grass and young deodar saplings. A fire started at once and had spread to a considerable extent before the spot was shut out from view owing to the track curving round a shoulder of a mountain. We are of opinion that spark catchers should be fitted to all engines passing through forest areas during the hot weather.—HON. ED.

in Western India by H. Maxwell Lefroy, Education in Indian Rural Schools by the Inspector-General of Agriculture, Orange Cultivation in Coorg by G. Haller, and an Experiment in the Eradication of the Kans Weed in the Central Provinces by E. Batchelor, I.C.S.

The CANADIAN FORESTRY JOURNAL for February 1906 contains a full description of the first Canadian Forestry Convention held under the auspices of the Canadian Forestry Association to which allusion has been already made in these columns. This is followed by articles on Forestry on Dominion Lands and a Canadian Forest Policy. In this latter article the writer points out that to properly manage a forest estate specially trained officers are necessary and with her vast interest in forests and forest products the time has arrived for Canada to establish a Canadian School of Forestry to supply the men to fill the posts in her coming forest service.

FORESTRY and IRRIGATION contains an article (still incomplete) on How Shall Forests be Taxed by Alfred Gaskell and a second on the Summer Session of the Yale Forest School by C. S. Judd. Some of the illustrations accompanying this article would seem to be identical with those which we published in the *Indian Forester* last year. There is also an interesting article on Land Reclamation by Drainage by G. E. Mitchell.

FOREST MENSURATION is the title of a pamphlet issued by C. A. Schenck, Ph. D. of the Biltmore Forest School, who will be personally known to many of our readers. The little work covers briefly the whole field of forest mensuration and contains, in addition to the chapters on volume, age and increment of trees and forests, a chapter on timber and another on stumpage values. The pamphlet shows signs of haste in its compilation, for it is a work of compilation rather than one of personal original investigation, but withal is a most useful handbook for the new forest service. Several pages are devoted to the old mathematical formulæ for determining volume of trees which we are up to date enough to consider should have been omitted. Dr. Schenck is practically the first in the field in America with this little work.

Also by the same author are two little handbooks describing the work done at the Biltmore Forest School and the working field of the same school. The first describes the courses of instruction at the school, examinations, &c., whilst the second consists entirely of a series of photographs with short descriptions beneath each showing scenes in the forests where the practical work of the school is carried out—a novel but most excellent idea.

The AGRICUTURAL BULLETINS of the STRAITS and FEDERATED MALAY STATES for January and February are chiefly devoted to rubber notes. In the latter number the Editor, H. M. Ridley, has a note on Rubber in Southern India. Rubber apparently is not a very encouraging industry at present in the Southern Presidency, the seed either not germinating at all or damping off. Mr. Ridley suggests that the seed tried may have been of bad quality. Mr. H. F. Strickland appears to think that attention must be confined in Mysore to the Ceara rather than to the Para variety.

In the third number of LE BAMBOU edited by J. H. de Lehaie an article discusses Japanese bamboos from a commercial point of view; the various methods of employing bamboos are described and allusions made to the flowering. A second paper deals with the durability and resisting power of bamboos during transport.

SHIKAR, TRAVEL, AND NATURAL HISTORY NOTES.

CAVE DEPOSITS IN KASHMIR.

During the year 1905 a cave, in a small valley locally known as Imselwara, was explored by the writer and Mr. Allen Campbell of the Kashmir State Railway Survey. This cave had been known to the writer for some years. Two explorations were made, but owing to the lack of proper instruments no real excavation was carried out. This year it is hoped that H. H. The Maharajah Sahib of Jammu and Kashmir will kindly provide funds to carry out systematic working, etc., under the management of the writer. As far as is known at present the

cave is formed by a ridge of calcareous sandstone blocking up the outlet of a small nalla. The formation appears to belong to the Zanskar system and consists of an intrusion of blue limestone, mingled with sandstone, in the Amygdaloidal Trap system of the Panjal Series. The cave is water worn and has been formed by the melting snow which collects in the basin above the cave. During the summer the latter is practically dry. The cave is situated about 800 feet above the level of the Woolar Lake.

There are two entrances to this cave. The main one is very large, but is blocked by a fall from the roof; until this has been cleared away nothing can be done here. The secondary cave is an offshoot from the main one, and although very much smaller is about five times the length. It was in this small cave that the bone deposits mentioned below were discovered. The cave consists of a long and tortuous passage with two chambers in it which have to be reached by actually crawling or rather worming oneself along. An outlet was discovered at the other end, but owing to the débris of wood, etc., which have been washed down a small crater-like depression, it was not possible to follow the cave further on. Various discoveries of bones have been made. At present these are confined to portions of the skeletons of:—

(1) Cervus aristotelis or the sambur;
(2) Sus scropha or the European pig;
(3) The teeth of an, at present, unknown antelope;
(4) A tush of a bear, at present not identified.

These bones were found in the wall of the cave from 4 to 6 feet above the present cave bed level, and they are but a very small quota of what will be discovered when proper excavations are made which will be done systematically. The remains are probably about the same age as those found at Billa Surgam in Karnall. It is hoped that a full report will be made this year in the autumn as the Director of the Geological Survey, Mr. Holland, F.R.S., has very kindly offered to have any remains identified.

E. RADCLIFFE,
Kashmir State Forest Dept.

April 20th, 1906.

EXTRACTS FROM OFFICIAL PAPERS.

CREATION OF AN IMPERIAL FOREST RESEARCH INSTITUTE AND COLLEGE AT DEHRA DUN.

Circular No. 11—166-2-*F.*

GOVERNMENT OF INDIA.

DEPARTMENT OF REVENUE AND AGRICULTURE.

FORESTS.

Simla, the 5th June 1906.

RESOLUTION.

The Government of India have had under consideration the desirability of making better provision for scientific research in connection with Indian forests. They cordially acknowledge that the work of the Forest Department has been characterised by marked and progressive development, which has resulted in an improved condition of the standing timber and in a satisfactory increase in the net revenue derived by the State from its forests, while due regard has been paid to the interests and needs of the population residing in their neighbourhood and to the requirements of the future. The energies of the Department have, however, hitherto been largely confined to the practical management of the forests under its charge, and comparatively little attention has been directed to the work of research, which has been pursued with such beneficial results in other countries. In order therefore to provide a staff of experts who will be in a position to devote a large proportion of their time to the prosecution of scientific research connected with forest produce, as well as to give the best available training to candidates for the Forest Services both of British India and of the Native States, they have, with the sanction of the Secretary of State, decided to raise the status of the existing

Imperial Forest School at Dehra Dun and to add to its staff. The School will now be known as the Imperial Forest Research Institute and College, and the staff will include six officers of the Imperial Service, holding the following posts :—

(*i*) An Imperial Sylviculturist, who will make sylviculture his special study.

(*ii*) An Imperial Superintendent of Forest Working-Plans who will collect and collate the statistics of the results of forest management throughout India, which are provided by the control forms annually submitted to the Government of India, so that the valuable information acquired in the different Provinces will be made available to the whole Department. In addition to this he will assist the Inspector-General of Forests in the control at present exercised by the Government of India in the preparation of Working-Plans, performing in this matter the functions at present exercised by the Assistant Inspector-General of Forests. In order to render this assistance more effective, and to remove a serious defect in the present system, he will visit forests in which Working-Plans are being prepared, and will record a note upon the local conditions of the forest for the information of the Inspector-General of Forests. A copy of this note will also be sent through the Conservator to the Local Government for information, and for any action that they may care to take upon it.

(*iii*) An Imperial Forest Zoologist, whose chief duty will be to investigate the damage caused by insects and other pests, and to suggest remedial measures.

(*iv*) An Imperial Forest Botanist, who will study the botany of forest plants, the diseases of trees, and the distribution of species.

(*v*) An Imperial Forest Chemist, who will investigate the chemical properties of the soils and of the produce of forest.

(*vi*) An Imperial Forest Economist, who will make a special study of the best methods of rendering forest produce of all kinds available at the smallest cost to consumers, and who will keep in touch with the commerce of India with the view of fostering and meeting the demand for forest products.

2. These officers, in addition to their research work, will each deliver a course of lectures on his special subject at the College, and take part in the training of the students ; but the educational work will be mainly carried on by the Assistant Instructors, who, besides their duties in the class-room, will be in personal charge of the students out of lecture-hours and during practical training in the forests. They will be four in number, and will usually be selected from the Provincial Forest Service.

3. One of the Imperial Officers, who will ordinarily be a Conservator of Forests, will, in addition to his other duties, hold the post of Principal. The members of the staff, who will be *seconded* on their respective lists, will draw the pay, substantive or officiating, to which they are entitled on those lists, together with the following local allowances :—

	Rs. Per mensem
The Principal	200
The other Imperial Officers	150
The Assistant Instructors	75

J. WILSON,
Secretary to the Government of India.

MISCELLANEA.

THE ST. LOUIS EXPOSITION.

THE FORESTRY REPORT.

Professor H. J. Elwes, F.R.S., who was appointed British juror for horticulture and forestry at the St. Louis Exposition, reports on the Forestry Section as follows:—

The very extensive collections of timber and wood specimens, the scientific collections and photographs illustrating the products of forestry, and the numerous appliances relating to hunting and fishing were shown in one building, and probably represented the largest and most complete collection of similar objects ever brought together. It is impossible for me to notice in detail any but the most important exhibits; but it may be said that the products of what is, I believe, the fourth industry in point of value in the United States, were shown on a most liberal scale by nearly all the State Commissions. Several foreign countries, of whom Germany, Japan and Brazil were the most important, also contributed largely to the success of this part of the Exhibition. In this department Great Britain could not be a large exhibitor, because, with the exception of high-class sporting-guns and a little fancy timber in the shape of brown oak, we export almost nothing to the United States.

By far the most interesting exhibit in the building was that of the United States Bureau of Forestry, which, though a comparatively new department of government, has under the administration of President Roosevelt and the energetic management of its chief, Mr. Gifford Pinchot, achieved an amount of work which must have an immense influence on the future of the timber industry in the United States.

The attention of the people and Government has been most forcibly directed to the fact that the immense forest resources of the country, which a generation ago seemed inexhaustible, were being wasted by fire, axe and grazing at a rate far greater than

natural reproduction could supply, by the writings of Professor C. S. Sargent, and by the admirable reports and bulletins published by the Forestry Bureau and the various State Commissions which have investigated the subject.

And though some of the most valuable timbers are being so rapidly exhausted that a continuance of the supplies exported to Europe, at a price with which British timber cannot compete cannot long be looked for; yet the endeavours which are being made by wise legislation to avert this waste have already produced good results, though these laws are not always enforced so strictly as could be wished, especially in the Western States

The United States exhibit, which was in charge of Mr. Gaskill, a most able, scientific, and practical forester, consisted of a large series of elaborate photographic transparencies, large coloured photographs, charts, relief maps, and specimens to show general and specific forest conditions throughout the United States, and the methods by which the timber resources of the country are utilised.

There were also specimens and charts showing the latest results of the testing of commercial timbers, and the value of wood preservatives; which, though until recently quite neglected in the United States, are becoming of great importance to railway companies and other large consumers.

Among the State exhibits the most beautiful and extensive was that of California, whose ornamental timber is well worth more attention than it has received from British manufacturers.

Immense planks of beautifully waved and figured redwood *(Sequoia sempervirens)*, Douglas fir *(Pseudotsuga Douglasii)*, myrtle or laurel *(Umbellularia californica)*, and other woods, surpassed everything of the kind in the exhibition in size and beauty. Oregon also made a fine show of similar timbers with the addition of Port Oxford cedar *(Cupressus lawsoniana)*, a common ornament of our English gardens, which on the coast of Oregon produces a clean, close-grained yellowish-white, fragrant, durable timber only second in its class to that produced by the Alaska or yellow cedar *(Cupressus nootkatensis)*. Both of these timbers are practically

unknown in this country, and would be valuable for fine inside work, though their commercial production is confined to somewhat limited areas. Professor Sheldon, of Portland, Oregon, has written a pamphlet on the forest wealth of Oregon, which contains much valuable information on the trees and timber of this great wood-producing state and gave me much valuabie help in my investigations

The State of Washington, which produces the largest commercial timbers in the world, showed in her State building square balks of Douglas fir of immense length and thickness. One tree, of which a butt length was sent to St. Louis by the McCormick Lumber Co., was stated to have contained 79,218 feet board measure, and to have been 340 feet high, though I never saw a tree myself of this species more than 300 feet in height.

Tennessee, Kentucky, and North Carolina also sent very fine exhibits of the hard woods for which these States were, and still are, celebrated, though the increasing demand has very nearly exhausted the best of them, namely, the black walnut, of which one log was shown valued at 800 dollars Yellow poplar *(Liriodendron tulipifera)*, known in England as whitewood and Canary wood and now largely used in the furniture trade, was shown in plain and figured specimens, some of which are very ornamental, and of which the supply does not seem to be so near exhaustion as supposed.

Arkansas, Missouri, and Mississippi, which are now the chief centres of production of the oak and of the red or sweet gum *(Liquidambar styraciflua)*, known in England by the trade name of satin walnut, showed large collections of woods in logs and planks, many of which were more or less injured by want of proper seasoning, for which sufficient time is rarely allowed by American lumbermen. I may say of the *Liquidambar* that although its wood has obtained a notorious reputation in this country for street paving blocks, it is a valuable wood for furniture and other purposes when properly treated.

Georgia, Louisiana, and Texas showed many fine timbers, amongst which the Florida or swamp-cypress *(Taxodium distichum)*

is most worthy of the attention of our consumers, as it is proved to be a most durable and valuable wood for many purposes, and is manufactured largely by some New England firms, among whom I may mention the Stearns Co., of Boston, Mass. The Savannah Board of Trade showed a large collection of the well-known products of the pitch or long-leaved pine, whose timber is so largely used in England. A wood shown in Louisiana and Texas exhibits, which seems unknown in England, is that of the Osage Orange or Bois d'Arc *(Maclura aurantiaca)*. Though not produced on a large scale this is one of the hardest, heaviest and most valuable woods for wagon wheels known in the United States (it has already been found of value in Europe for motor car wheels), and its young shoots, which were formerly made into bows by the Indians, are so tough that they seem likely to be valuable as handles for golf clubs and walking sticks. Another wood unknown out of the districts where it grows, in Montana, Idaho, and in Southern British Columbia east of the coast ranges, is that of the western larch or Tamarack *(Larix occidentalis)* which was well shown both in the log and in converted form by the Blackfoot Lumber Co., of Missoula, Montana. This timber, on account of its great size, hardness, strength and durability, seems likely to be one of the most valuable in the United States, for all purposes where those qualities are necessary, and, if the cost of transportation to the coast does not prove excessive, is worthy of attention. I have already distributed seed of this tree, which is hardly known in Europe, to some of the best foresters in Scotland.

In the Wisconsin State exhibit were some fine specimens of quartered white oak, curly red oak, figured black cherry *(Prunus, serotina)*, black walnut, curly birch, bird's eye maple and plane. These woods, however, are not now so much in fashion in the United States as formerly on account of their increasing scarcity, and at Grand Rapids, Michigan, the seat of the best furniture factories in the United States, mahogany and other imported hardwoods seem to be taking the place of native woods, except oak, for all the best furniture.

The Forest, Fish and Game Commission of New York State showed a fine exhibit of forestry products, specimens and photographs, including no less than eighty different native trees, and also a nursery containing the trees used to restore the denuded forest lands of this State. Another exhibit of interest was that of Mr. Brown, of Connersville, Indiana, who showed specimens of the western catalpa (*C. speciosa*) in various forms to show its rapid growth and extreme durability in the form of telegraph poles, railway sleepers and posts. But, however desirable the cultivation of this tree may be in the middle west and in the Mississippi Valley, it seems to require a much hotter climate than ours to bring it to perfection, and, as it is not to be found at present in large quantities, is of more importance to Americans than to us.

Among foreign countries the most remarkable exhibits were those of Germany, which, as might be expected, were thoroughly scientific. Of the immense number of different samples of wood and other forest products of Mexico, Brazil and Argentina, a large proportion were only named with local names, and therefore impossible to identify with certainty, though probably many of them would be valuable in this country if properly introduced.

Great Britain was practically unrepresented in this department, except by a small but interesting exhibit of publications, maps, photographs and working plans sent by the Indian Government Forest Department, which were awarded a gold medal, and by the large collection of photographs of trees growing in the British Islands shown by the Royal Scottish Arboricultural Society, Mr. C. Richardson, of Stamford, and myself.

In the Fish and Game Department, however, was an extremely well-prepared and well-arranged exhibit by the Marine Biological Association of the United Kingdom, illustrating the different stages in the growth and development of the principal food fishes of the British Islands. This exhibit received the highest possible award, and has, I am happy to say, since been purchased by Mr. James Horlick, of Cowley Manor, Cheltenham, and presented by him to the Fishery Commission of the United States.

CANADIAN WOODS AND THE ENGLISH TRADE.

Although we have in these columns so frequently pointed out how the people of the United States are competing against us for Canadian timbers, still to many on this side it is a matter for surprise that every season the shippers have been able to command advancing prices for their output. This has been concurrent with lower freight rates than those prevailing before the c. i. f. values were so seriously enhanced. If ocean freights had remained stationary, the c. i. f. value would have been proportionately greater.

Mr. Little said some twenty or thirty years ago that the supply of white pine would be exhausted in ten years; this prophecy has not come literally true, but there can be no doubt that this slow growing wood (150 to 200 years) is being cut down too rapidly. Eastern Quebec is cleared, and so is the State of Michigan. Year by year the lumberman has to go further afield, and to-day the nearest supplies can only be obtained hundreds of miles north of Ottawa, and in Western Ontario.

Six years ago we stated:

"The values of timber limits in Canada are annually increasing, and this, coupled with the high wages paid in logging camps and the extra cost of hauling, has steadily forced up the prices of all classes of this valuable material. The output is about 1,200 million feet per annum, possibly 50 to 60 per cent of the entire production going to the States, and unless the English market is willing to pay current prices, a still greater proportion will be diverted to the same quarter."

What is the position to-day? The Quebec men are here again with very firm upper lips, higher prices, and very little to offer. We learn from a very prominent shipper that the percentage of the Canadian timber now sold to the States is thought to exceed 80 per cent of the output, and the Americans, in their desire to secure their requirements, are outbidding one another. We heard of one specification which was required, but it has been impossible to get more than 10 per cent of it. We asked where intercolonial preference came in if the colony ship all the wood to the States, and were told that it did not apply. Naturally

Canadians must sell to the best market, so it is evident that if the English want preferential treatment they must be the highest bidders. Whether the conditions of the British market would justify such competition as to outbid the American market is a moot point, and one upon which we should hesitate to express any decided opinion.

This much, however, is proved, that the phenomenal prosperity of the States is operating somewhat to our disadvantage in running up the prices of what is to us an invaluable necessity in our manufacturing economy. We must confess that we do not think the present values are mere bubble prices; the advance has been so steady and persistent.

The restrictions of the Government as to the sale of timber limits are becoming more irksome to the buyers, and every winter the loggers have to go further north into wild and almost inaccessible territory. This, along with the general prosperity throughout the Dominion, enables the loggers to demand better food and higher wages for their work under the increasingly arduous conditions.

Another and a by no means unimportant factor in the situation is the enormous railroad development of the Dominion itself, calling for increased rolling stock. Then there is the new transcontinental railway from Quebec to the Pacific, which in construction and equipment must make a huge demand for timber of every class.

With all these facts before us, the growing American demand, the Government restrictions, the ever-increasing cost of lumbering, the greater distances it has to be hauled, and the improved economic conditions of Canada itself, we should not give a faithful reflect of the position if we held out an opinion that the values of Canadian lumber were at a bubble point.

Side by side with the advance of Canadian values, we must set forth that the values of the pitch pine of the Southern States are enormously inflated, and we venture to think that the probability is that this is not a mere rocket advance, especially if it is found that the construction of the Panama Canal is vigorously pursued. The amount of timber which this undertaking will absorb in the near future is simply incalculable, and for constructive and

engineering purposes there is no wood on the market so accessible as the pitch pine of the Southern States.

If we are correct in our premises, and the construction of the Panama Canal takes a large percentage of the pitch pine output, this in turn will stimulate the internal demand of the States for Canadian lumber ; it is therefore only a question of time when the United States and the Dominion of Canada will cease to be timber exporting centres.

Of course, with the completion of the Panama Canal, there is not only the possibility but the chance that new sources of timber supplies will be made available to this country, but that is not yet.

In the meantime, there are potential opportunities for the opening up and developing the timber areas of the Eastern Continent, which have not hitherto been recognised.—*Timber Trades Journal.*

THE LIBERAL GOVERNMENT AND AFFORESTATION.—An influential deputation, representing various societies, and in particular the Royal English and Royal Scottish Arboricultural Societies, waited upon the Chancellor of the Exchequer in his private room at the House of Commons on March 30th last to state their views on afforestation.

The deputation was introduced by Sir Herbert Maxwell, who drew attention to the enormous progress made by other countries in their treatment of this problem, in which England was far behind.

Mr. Munro Ferguson, M.P., who followed Sir H. Maxwell, said the main proposal of the deputation was that a strong central Board of Forestry should be appointed by the Government. He asked that £100,000 should be set aside for the purchase of land to this end, and £10,000 a year be spent on the business of planting, etc. That would enable them to begin planting at the rate of 3,000 acres a year, and the process would speedily grow as the results became apparent. They especially wanted a large demonstration area in Scotland.

Mr. J. H. Elwes, F.R.S., pleaded that taxation of timber-bearing land should only commence, at the full rate, as soon as the timber had matured and some return was coming in. Lord Lovat followed to the same effect. Mr. Fraser Storey, teacher of

forestry at Bangor University, insisted that trained experts were necessary for properly carrying out afforestation work. The Scotch County Councils were much better supported in the way of Government grants than were the English ones. In this matter of expert advice, Mr. Fotheringham, President of the Royal Scottish Society, agreed. Mr. W. R. Fisher, Professor of Forestry at the University of Oxford, pointed out that the Belgian Government had purchased large areas of waste land and were systematically planting them, and getting returns which promised to yield as much as £2 per acre. In England the Crown lands might be used for demonstration purposes, as well as any new lands that they might be able to acquire.

Mr. Asquith, in reply, said he did not agree that so little had been done as had been stated. He agreed that a central Board for dealing with afforestation was necessary, and should be formed as soon as the necessary funds could be found for its working. In Newcastle, Alice Holt Wood (near Farnham) and other places, schemes were being worked out. Oxford was giving higher instruction in forestry, and in other parts of the country attention was being directed to the subject.

The members of the deputation expressed themselves well pleased with its reception by the Chancellor of the Exchequer. Mr. Asquith was accompanied by Dr. Somerville, of the Board of Agriculture, Mr. Stafford Howard, Commissioner of Woods and Forests, and representatives of the Board of Trade and Local Government Board.

RUBBER IN RHODESIA.—Mr. E. R. Murphy, a Ceylon planter and now Native Commissioner in Rhodesia, writes to the *Ceylon Observer* from Dublin in reply to an inquiry as to rubber in Rhodesia :—"All the Rubber in N.-E. and N.-W. Rhodesia is the *Landolphia* creeper ; it is forbidden to collect or export it now, and that has hit all the traders in the country pretty hard as they used to make raids into the southern end of the Congo Free State adjoining our N. boundary and get out tons of rubber and export it through British territory ; there is a tremendous amount of *Landolphia* rubber in the south end of the Congo State."

Photo.-Mechl. Dept., Thomason College, Roorkee,

Photo. by W. F. Perree.

SHOVAIGHAR FOREST REST-HOUSE.

Goalpara Division, Assam.

VOLUME XXXII NUMBER 7

INDIAN FORESTER

JULY, 1906.

WORKING PLANS FOR CANTONMENT FORESTS.

In several parts of the country the boundaries of the Military Cantonments enclose an area of considerable extent. This land was originally taken up either to allow for a subsequent increase in the strength of the Garrison, to prevent the encroachment of bazars or to provide space for grazing, etc. In many cases the Military Cantonment included enforested areas which have since been entirely cut out, a process often followed by denudation and erosion which has at length the permanence of the Cantonment. A typical example of this is the Jelapahar and Katapahar Cantonment above Darjeeling, now being replanted by the Forest Department. Other Cantonments on the other hand still contain considerable and valuable areas of forest within their boundaries, but these are in many cases rapidly disappearing owing to the absence of any trained supervision for their conservation or professional knowledge on the part of those responsible for their protection. That the need of affording proper protection to such areas is an urgent one needs no insistence upon here. A knowledge of the real meaning of forest conservancy is becoming so

general that it is fully recognised that it is impossible for indiscriminate hacking or unlimited grazing to continue indefinitely in a forest without that forest entirely disappearing and in most cases leaving behind it a bare desert or at most a crop of useless scrub jungle or coarse unpalatable grasses. In the cases where heavy grazing by goats and camels is allowed to continue unchecked even these latter will disappear, leaving a desert where once a well-wooded countryside had been.

The question of protecting and properly looking after the Cantonment Forests in India has received the attention of the present indefatigable Commander-in-Chief in India, and we understand that Lord Kitchener has asked for Working Plans to be drawn up for such forests throughout the country.

This demand is an interesting one in view of the recent issue of a small pamphlet in America entitled "A Working Plan for the Forest Reservation of the United States Military Academy Army Post at West Point, New York." This plan was prepared on the recommendation of the Superintendent of the Military Academy that the lands of the reservation should be placed under systematic management. The plan drawn up, Mr. Pinchot writes, was adopted exactly in accordance with the text. This satisfactory state of affairs cannot be looked on otherwise than as most complimentary to the United States Forest Service, when it is remembered that in these cases there are inevitably so many interests, often somewhat antagonistic, involved. We propose here to briefly glance at this plan in the belief that the information may be of considerable use to those responsible for Cantonment Forests in India.

An examination of the land at West Point showed that the greater part of it would always be more valuable for the production of wood crops than for any other purpose.

The forest had suffered the usual mismanagement of all timber lands not under regular professional conservation. Most of the area had been cut in Revolutionary times. Until about 1875 cuttings in the second crop were made at irregular intervals. Since then no regular cutting had been allowed. An occasional

tree was cut for special uses, but the character of the forest had not been changed thereby. The more accessible parts were cut over first, and in consequence those areas nearer the Post are the oldest and best. Only a very few small areas have escaped cutting and these occur in the deep ravines, where the cost of getting out the timber was too great to make the operation profitable.

The first concern of the preparers of the plan was to ensure the future protection of the forest. It is absolutely necessary that all fires be kept out of this forest. Otherwise it will be useless to attempt an improvement of the present conditions. Ground fires are the direct cause of the scant, dry soil, the absence of seedling reproduction, the unhealthiness of the trees, and the deplorable sylvicultural condition of this reservation.

There is hardly 100 acres on the whole tract that has not been burned over within the last ten years. One-fourth of the area is burned over annually. They have been only ground fires, to be sure, which burn up the dead litter, but their recurrence year after year has made each season's fires more harmful than the last, inasmuch as the trees have gradually been debilitated and less able to resist injury. Large scars are burned into the trunks and roots, and each year grow larger, until finally the tree dies and adds fuel to the next fire's flames.

The loss of the trees actually burned, however, does not compare with the loss in productive capacity which the soil sustains. The loss is two-fold : first, directly, in the burning of the humus and the humus-making vegetable matter, and second, indirectly, in destroying the ground cover, underbrush, and leaves which protect the soil from the drying winds and the sun. Now humus has a great capacity for taking and holding water, thereby acting as a sponge-reservoir and lessening the total surface evaporation and waste of moisture. Further, the organic compounds of nitrogen formed by the decomposition of litter are the chief source of supply to the tree ; and when leaves and forest litter are burned, all the nitrogen (which is the most important factor as a food material) is volatilised and passes off in gaseous form. Another serious result is the loss of carbonic acid. While the atmosphere

itself contains enough carbonic acid to keep the trees alive, they must look to the soil for nearly half of the supply needed for their best development. With the supply of nitrogen and carbonic acid cut off, it is readily understood why a forest soon reaches the condition at present prevailing on much of the West Point tract. The humus also acts as a seedbed for the germination and growth of seed, and without it satisfactory seedling reproduction cannot be expected. These conclusions are all shown plainly by the difference in condition between forest areas which have been frequently burned over, and those which have not.

The prevention of these fires is one of the most difficult problems confronting the forest administration They occur in the spring before the trees have put out their leaves, and in the autumn when the ground litter and leaves of the fall before are thoroughly dry. Matches and lighted cigars thrown upon the ground, it is believed, start most of the fires. The inhabitants in and about West Point have no appreciation of the damage done, and are therefore very careless in this respect. Little notice is taken of small fires until they reach the uncontrollable stage, which, if there is any wind, occurs within an hour after starting.

It is almost incredible how rapidly a small fire, started perhaps by a cast-away cigar, match or hot ashes from a pipe, spreads, throwing out sparks, which are blown by the wind to exposed situations and give rise to fresh fires. Fifteen such fires were started in one afternoon in May 1903, at least half of which were in full swing before any organised fight was made against them. In view of these facts it is evident that a regular organised force from the Post must be established which, during the dangerous season, will be available for immediate duty under the direction of the woods-foreman, whenever occasion demands.

The effectiveness of fire lines, even when not previously cleaned out, was well shown in the fire mentioned. Back fires were started from the roads towards the approaching fires, and in this way two or three men were able to effectually check a fire that forty men could not have stamped out in the old way. Wherever the roads

were wide enough and clear of debris, one man to patrol the road and stamp out sparks jumping across was sufficient. The ordinary bran gunny-sack was found to be the most effective weapon for sparks and small fires. With proper precautions these small fires should never occur, but if they do, they should be extinguished at once.

This reservation is peculiarly fortunate in having always at hand a large body of able men, under splendid discipline, for occasional immediate service or for regular patrol. A protective service is possible here, which in a private forest would be out of the question.

The proposals for the present treatment are of considerable interest. It is laid down that improvement fellings will be adopted preliminary to the introduction of the regular system of regeneration by progressive fellings. For the first ten years all the fellings will be of the improvement order from which a large financial return cannot be expected. At the end of the ten years' period, however, the forest should be in such a condition that a well-defined and consecutive series of cuttings yielding a sure and definite income may be instituted.

The methods of treatment to be used are set forth in the description of the forest types. These methods may be classified under three heads: first and most important, improvement cutting; second, improvement cutting and underplanting; and third, reproduction cutting.

Improvement cutting consists in the removal of inferior and unlikely trees, which are crowding and impairing the growth of more valuable ones. The trees removed are usually those receiving little or no direct sunlight and are therefore inferior in development to the dominant trees. Their removal gives space for the crowns of the other trees to spread, admits more light to the lower parts of the crowns, and concentrates the soil nourishment upon the trees which are to compose the permanent crop. When the dominant tree is of a distinctly undesirable species or is straggling or crooked, and there is a promising tree of a more desirable species under it, the former should be removed. The amount to

be cut in improvement cuttings, including dead and unhealthy trees, will average from 10 to 30 per cent.

The second class of treatment, improvement cutting and underplanting, will be used on those portions where the removal of all diseased and unlikely trees would result in serious exposure of the soil. The dead and dying trees will be taken first, and the diseased and unlikely trees removed only as fast as is possible without injury to the soil conditions. Wherever these cuttings leave openings in the forest cover, it is proposed to sow broad leaved seed on the better soils of the lower situations, and to plant two year old conifer seedlings on the poorer soils of the higher and more exposed situations. The total amount removed will vary in accordance with the condition of the soil and the amount of diseased timber in the crops. It must be understood that on nearly all of this area the future welfare of the forest requires restocking by seedlings rather than by coppice. For this reason an attempt will be made to provide for and protect natural seedling reproduction in which respect the operation partakes of the nature of a reproduction cutting.

The third class, reproduction cuttings, will be begun on only a small part of the reservation during the period of this working plan. But after the improvement cuttings have been completed, reproduction cuttings will be made. The object of the reproduction cuttings is to gradually remove the mature trees in such a way that seedling reproduction of desirable species may be secured and protected. The first cutting is fairly heavy and aims to stimulate reproduction. Cuttings are made thereafter, at intervals of 10 to 20 years, according to the demands of the young crops for light and protection, until all the old crop has been removed. At the end of the cutting period the small areas which have not been seeded by the parent trees are restocked by planting.

In all three classes of treatment, it is absolutely necessary that all the trees to be removed should be selected and properly marked by the forester, since the success or failure of the work depends very largely on the proper selection of the trees to be taken out. It will be necessary to treat each situation as an

individual and distinct problem, and provide such treatment as its particular condition demands.

The following general principles will govern the cutting :—

1. Clear cutting will not be resorted to on any part of the reservation.

2. All dead and fallen timber, and all unhealthy trees shall be removed as soon as the operation is financially possible.

3. Preference in marking for cuttings shall be given to species which thrive best and promise to make the most valuable trees on the particular situation in which they are growing.

4. Trees over 12 inches in diameter shall be felled and cut up into lengths with a saw.

5. Particular care shall be used in felling to do no unnecessary damage to young growth.

6. Stumps shall be cut as low as possible.

7. Timber of a size and quality useful for lumber, poles, piles, posts and sleepers shall be saved for those purposes and cut into proper dimensions; and the remainder shall be cut into 4 foot lengths for cordwood.

8. Branches under one and one-half inches in diameter shall be piled and burned.

9. Cordwood shall be stacked in the woods when felled and hauled out on the snow.

10. All trees to be removed shall be marked distinctly with a marking hatchet on the stump and on the bole 3 or 4 feet up; and rigid inspection of the stumps shall be made after a cutting to ascertain if they all bear the forester's regular mark.

11. The amount of timber taken from each type in each compartment shall be recorded in a book provided for the purpose.

It has been for some time past the earnest desire of the Government of India that all reckless cutting in unprotected forests, the firing of such forests, over-grazing, etc., should be put an end to throughout the country, and we believe that most Officers Commanding cantonments are fully alive to the advantages which the prevention of such acts within the forests under their charge will confer. It should now be possible to frame suitable simple working

plans for cantonment forests and Commanding Officers will, we trust, soon be able to obtain thoroughly trained and efficient foresters, using the term in its usually accepted meaning, who will be capable of exercising, under their direct orders, that amount of professional supervision necessary to ensure that the fullest benefits are obtained from the forest areas within their jurisdiction.

The yield may not be high at the start, but proper supervision will ensure an annual monetary return, the revenue being necessarily dependent upon the value of the growth the area is capable of producing, as soon as professional supervision has brought the crop to a normal condition. The keenness of the majority of Officers of a garrison on sport and the presence in cantonments of large bodies of trained men are valuable assets towards ensuring efficient protection, once definite rules have been laid down on the subject. With efficient protection guaranteed will disappear the most serious of the dangers which these areas have had to face, *viz.*, illicit and indiscriminate cutting, fire, overgrazing and a general total absence of supervision over acts directly injurious to the well-being of the forest. Protection will also result, it may be noted, in an increase in the head of game on the area or, if shot out, in the possibility of restocking the forest with every prospect of success.

SCIENTIFIC PAPERS.

ON POLLARD-SHOOTS, STOOL-SHOOTS AND ROOT-SUCKERS.

BY R. S. HOLE, F. C. H., F. E. S.

PART I.

1. In the vegetable kingdom two modes of propagation commonly occur, known as the asexual or vegetative and sexual respectively. In both cases the new individual arises from a minute piece of protoplasm called a *protoplast*, but in the first case "this protoplast does not require the special

Two modes of reproduction, the vegetative and the sexual.

stimulus afforded by union with another protoplast, whereas, in the other, in order that a new individual organism may be produced, a pairing, *i.e.*, a union of the substances of two protoplasts, which have come into being at different spots, must take place."*

Yeast fungi.

2. As affording a good example of vegetative reproduction we may select a typical yeast fungus.

The yeast fungi are of great economic importance on account of their power of causing the alcoholic fermentation of sugar solution, a process which, for example, commences at once in the sweet juice extracted from sugarcane, if it is left exposed to the air instead of being quickly boiled, and which we also recognise in the preparation of spirit from the sweet-tasting mahua flowers and in the manufacture of wine from the sugar in grapes. We are not however here concerned with the economic importance of these interesting plants but with their mode of growth and reproduction.

Vegetative reproduction of yeast fungi.

3. Each yeast plant consists of a single minute, oval or spherical cell with a diameter of about $\frac{1}{2000}$ of an inch, which when placed in a suitable nutrient solution, under suitable external conditions of temperature, etc., begins to grow and multiply with great rapidity. The cell-wall bulges out and a protuberance is formed which gradually increases in size, the nich connecting it with the mother-cell remaining narrow. A cell-wall is then formed across the narrow nich at the point of union and the swollen protuberance separating from the mother-cell becomes a new and independent yeast plant, similar to its parent in all respects and endowed with the same power of reproduction or multiplication.

Vegetative reproduction of bacteria.

4. Again the great group of plants known collectively as the bacteria which, although exceedingly minute are almost always present in the air, soil and water, and are to be reckoned among the most successful plants in the struggle for existence, have no power of sexual reproduction, and multiply in a manner somewhat similar to that of the yeasts.

* Kerner. *Natural History of Plants*, II, p. 6.

So long as the external conditions are favourable, bacteria grow and multiply very rapidly. Each tiny bacterial cell, whether spherical, rod-shaped or curved, having grown to a certain size, becomes divided by a cell-wall into two equal portions and these segments, separating from one another, two distinct individuals are formed, each of which then continues to grow until it has attained the normal size, when it also divides into two, and so on.

The utility of vegetative and sexual reproduction respectively to plants, and the innate power of unlimited life possessed by embryonic cells.

5. In such simple organisms as the above all the cells remain *embryonic*, *i.e.*, they retain their power of growth and capacity to produce new individuals, and these plants possess in themselves the power of eternal life, death being eventually brought about by unfavourable external conditions, such as the exhaustion of the food supply, the accumulation of poisonous waste substances, extremes of temperature, etc.

Further, from a consideration of such plants we are compelled to accept the truth of the principle that vegetative reproduction may be fully and amply sufficient for the reproduction of the individual plant, *i.e.*, for the preservation of the species. We naturally then inquire why sexual reproduction exists at all. The answer appears to be that the offspring of sexual reproduction as a rule possess characteristics differing more or less from those of the mother plant and which may in consequence be better adapted to survive in the struggle for existence. Broadly speaking, then sexual reproduction may be said to generally favour the production of *new* species.

It is particularly important to note that there is no evidence to show that continued reproduction by asexual methods causes degeneration.

Differentiation of tissues necessary in higher plants.

6. Turning now our attention to the more highly organised plants, and considering the stresses and strains which must arise in the tissues of a large tree for example, it is obvious that these could not possibly be composed entirely of embryonic cells, seeing that such cells do not possess the necessary strength and rigidity. Still

we can recognise the presence of embryonic cells, for instance in the buds, at the various growing points, in the cambial layer and in the young callus tissue which is developed on the cut surface of a wound. However large the entire plant body may be, we know that it has been built up by the activity of its embryonic cells, and these must in consequence possess the power of producing any part of the plant body in which they occur. Thus we are not surprised to find that roots may develop from the callus cells at the base of a cutting and leafy shoots from similar cells on the upper cut surface.

Innate power of eternal life possessed by embryonic tissue and limited life of all differentiated tissue in higher plants.

Although then there is no reason to believe that, in so far as its innate power of eternal life and unlimited reproduction is concerned, there is any essential difference between the embryonic cell which forms part of the vegetative body of a highly organised flowering plant and the cell which constitutes a yeast plant or a bacterium, there is obviously an essential difference between them in the fact that the former is not a distinct individual living an independent existence of its own but a minute unit, forming part of a very complex organism in which the interests of the units must be subordinated to the interests of the organism as a whole.

This cannot be better expressed than in the following words of Pfeffer *:—

"In a well-ordered community every individual is of use and service to the whole, and under conditions which necessitate a rearrangement of the functions of the several members, any given official may be compelled to engage in unaccustomed work and perform duties from which he was previously free. Similarly, in the plant community the activity of every cell and of every organ is subservient to the common weal, and may, when necessary, be modified.....so as to fulfil the changed requirements of the whole."

Thus, in a tree, numerous cells are killed for the common good to form the rigid supporting heart-wood, the conducting water channels, the protecting bark and other parts indispensable to the existence of the tree as a whole.

* W. Pfeffer. *The Physiology of Plants* (Eng. Trans., 1900), Vol. I, p. 27.

Embryonic cells which thus undergo differentiation into organs or tissues with a definite function or work to perform have a limited life, often of very short duration, root-hairs for instance only live for a short time, leaves live for only a few years at longest, while sepals, petals and stamens have a very brief life. The continued existence of plant life therefore depends on the power of unlimited life possessed by cells which retain their embryonic character.

In annual plants the death of the structure we recognise as the plant ensues on the production of the seed. The seeds, however, contain embryonic cells, and the continued existence of the latter renders the maintenance of the species possible. Many trees, on the other hand, are capable of living for very long periods, instances having been recorded in which an age of over 1,000 years has been attained. In the great majority of such old trees, however, the actually living tissue which has risen from embryonic cells and become converted into special tissue or organs with a particular function to perform is at most but a few years old.

Why a tree eventually dies.

7. If, then, we recognise that the majority of trees are able to maintain a number of their cells in an embryonic condition, we are led to inquire why a tree should ever die. So far as is known at present every tree does eventually die.

It is also a well-known fact that after a certain time, varying with the species and localities, as a tree's age increases, its vigour decreases. This is seen for instance in a smalier power of producing fertile seeds or vigorous coppice shoots, in a smaller capacity for healing wounds and in the production of narrow annual rings.

This steadily diminishing vigour means an ever-diminishing power of resisting injurious external influences generally, and the longer a tree lives the more it becomes exposed to such influences which must in consequence sooner or later cause its death.

To take one point of view alone it is clear that the older a tree is the greater becomes the superficial area of living tissue to be protected and the greater become the number of wounds and injuries

it receives which, if not rapidly healed, expose an ever-increasing area to the attacks of injurious fungi.

The reason for this decrease in vigour is not clearly understood.

According to R. Hartig * this must be ascribed "in all probability, especially to the fact that the forces which conduct the water and nutritive materials to the highest bud of the tree are limited in their action, and that sooner or later, depending on the specific and individual nature of the plant, these no longer suffice to provide for the continuance of growth in height."

If we accept this as the primary cause it is not difficult to see how decreasing vigour and ultimately death may be brought about.

Taking the case of a tree, growing in the open which is able to develop its crown normally on all sides as it grows, it is clear that after the attainment of the limit of its height growth, further considerable expansion of the crown and addition to the total area of assimilating leaf tissue becomes a physical impossibility. The total amount of food manufactured by the leaves cannot in consequence be considerably increased after this period, and it is possible that the total amount which can be manufactured in any given period, say a year, may remain practically constant.

Now the essential absorptive organs in the majority of trees and shrubs are the root-hairs. These are formed near the growing tips of the roots and as a rule live only for a few days. In order, therefore, that the needful supplies of water and minerals may be obtained from the soil a continued growth in length of the roots is necessary and consequently there must be a continual addition to the total amount of cambium and living conducting tissue which has to be maintained and supplied with food. There is thus an ever-increasing demand for food, and, as we have seen above, any considerable increase in the total quantity of food manufactured is impossible. It is thus not difficult to realise that a time must come when there will be not only no food available for storage as reserves but also not even enough for the maintenance of the

* R. Hartig *The Diseases of Trees* (Eng. Trans. by Ward and Somerville), p. 7.

cambium in full vigour. The absence of reserves would be manifested by the diminished power of forming fertile seed or vigorous coppice shoots, while the more or less starved condition of the cambium would be evidenced in the less vigorous healing of wounds and in the diminished capacity for forming new tissue as shown by narrow annual rings.

In this connection it is interesting to note that the Banyan (*Ficus bengalensis*), which, by means of the supports provided for its branches by the aerial roots, is able to extend its crown in a horizontal direction to a practically indefinite extent, is probably the most long-lived Indian tree.

8. The above considerations, it is true, cannot be held to satisfactorily account for the ultimate death of a tree until the mechanism of water transport in trees has been thoroughly explained, which in the present state of our knowledge is impossible, but they do at all events indicate that in considering the power of continued life and reproduction possessed by the individual embryonic cells of a tree, the question of the reciprocal relations existing between such individual cells and their neighbours with which they are obliged to live in the plant body is one of paramount importance. It appears, moreover, that, both in the case of simple plants like a bacterium or yeast and highly-organized plants like a tree, embryonic cells eventually die if their growth and division is prevented for a long period and thus seeds ultimately lose their power of germination and dormant buds eventually die. The death of an embryonic cell in a tree is consequently assured if the neighbouring cells do no more than refuse to pass on to it the food necessary for its growth and development. The fact that some species of trees do not possess the power of developing either pollard-shoots, stool-shoots or root-suckers, that some readily produce pollard-shoots but neither stool-shoots nor root-suckers, that others mainly produce root-suckers and so on, do not therefore in any way prevent us from accepting the truth of the general principle that all

The influence exercised on embryonic cells in one of the higher plants by the cells and tissues in their neighbourhood may prevent the growth and development of the embryonic cells and may even cause their death.

embryonic tissue is capable of unlimited life and reproduction provided the external conditions are such as to allow of its continual growth, for in such cases the non-development of embryonic cells may be ascribed to the influence exerted upon them by neighbouring cells which, as we have seen, may not only prevent their development, but may be carried so far as to cause their death.

True vegetative reproduction does occur among the higher plants.

9. With regard to the question whether higher plants are capable of true vegetative reproduction we may note the following authoritative statements :—

"By vegetative multiplication higher plants can annually give rise to individuals which are strong and capable of flowering and fruiting." *

"Long experience has shown us that the propagation of plants is accomplished with much greater certainty by means of Brood-bodies (all reproductive bodies arising asexually ranging from a single cell to a completely formed plant) than by fertilisation and production of fruit." †

To illustrate how successful vegetative reproduction may enable a plant to be in the struggle for existence we cannot take a better example than that of the celebrated American water-weed, *Elodea canadensis*, well known for its obstruction to navigation in canals in Europe and which, according to Kerner, "seldom flowers and owes its very remarkable propagation and distribution, not to fruits, but to a quick and plentiful production of off-shoots." ‡

Again, none of us would be inclined to doubt that the plant developed from the tuber of a potato or from the "runner" of a strawberry is identical with the mother plant in regard to its power of growth and development and of forming flowers and fruit.

Very similar to the herbaceous strawberry is the case of the common European shrub known as the bramble or blackberry, the long arcuate branches of which often root at the tips.

* Strasburger. *Text-Book of Botany* (Eng. Trans 1903), p. 277.

† Kerner. *Natural History of Plants*, II, pp. 6 and 70.

‡ Do. *Do.* *Do.* II, p. 457.

The old branches forming the connecting links between the young plants and the mother eventually dying off, independent individuals arise similar to the mother from which they sprang. The same phenomenon may be noticed in the case of *Rubus lasiocarpus* common in the Dehra Dun in India.

(*To be continued.*)

ORIGINAL ARTICLES.

THE EFFECTS OF THE GREAT FROSTS OF 1905 ON THE FORESTS OF NORTHERN INDIA.

VII.—THE EFFECTS ON THE FOREST GROWTH OF THE HILL DIVISIONS OF BENGAL.

BY A. L. MCINTIRE CONSERVATOR OF FORESTS.

In the hill divisions of Bengal the amount of damage committed by the frosts of 1904-05 was moderate, only exposed seedlings or saplings being killed here and there. Pipli (Bucklandia populnea), Lepcha Kaula (Machilus edulis), and in a few places Tun (Cedrela sp. Gamble), or perhaps, in some cases, Cedrela Toona planted too high, were the chief sufferers.

In the Duars and Terai the only damage noticed was the cutting back of isolated "Mallata" (Macaranga pustulata) seedlings or saplings coming up in blanks. In other parts of Bengal damage was confined to the highlands 1,000 feet to 2,000 feet in elevation in the north of the Chota Nagpur division, *i.e.*, in the Palamau and Hazaribagh districts. In such localities sal in nearly all depressions has suffered to a greater or less extent, the damage varying from the killing of the outer twigs only, or of the lower or top branches only, to killing outright down to ground level of trees up to 50 feet or 60 feet high. In the Palamau reserved forests it is estimated that about 15,000 acres, or a quarter of the sal-bearing area, has suffered in this way to a greater or less extent. I have neither heard of nor seen any damage worth considering in Singhbhum or Orissa, though both contain sal-bearing valleys or depressions of which the bottoms are 1,200 feet to 1,600 feet in elevation; even teak was unscathed in Puri and Sambalpur.

CHARDUAR FOREST REST-HOUSE,
Darrang Division, Assam.

Photo.-Mechl. Dept., Thomason College, Roorkee. Photos. by S. Eardley-Wilmot.

CHIBUK INSPECTION HUT,
Garo Hills Assam.

TYPES OF FOREST REST-HOUSES IN INDIA.

III.—ASSAM.

BY THE HONORARY EDITOR.

In our last article upon this subject we compared some Burma rest-houses with those built for the accommodation of Forest Officers when on tour in the United Provinces. The comparison was not to the advantage of Burma and the illustrations we are able to give in this number through the kindness of Mr. Eardley-Wilmot, Inspector-General of Forests, and Messrs. Perrée and Doxat show that Assam is no better off than Burma in the question of house accommodation for touring Forest Officers. This will cause little surprise when it is noted that in spite of the remarks of the Government of India on the subject, an expenditure of the insignificant sum of Rs. 4,373 was considered sufficient in 1903-04 for new construction and repair work to buildings throughout the whole Province, whilst the amount fell to Rs. 3,572 the following year. In the interests of the forest work of the Province, let alone the health of the staff who have to contend with a particularly unpleasant and malarious climate, this short-sighted parsimony in the provision of adequate accommodation in the forests cannot be too strongly deprecated. To a Department which yields a handsome annual surplus from the forests especial care should be taken to ensure the continuance and increase of this source of revenue to the State. The saving of the few thousands of rupees which is all that is required for the provision of good houses in the forests has resulted in the past, and must result in the future, in the disablement of a large percentage of the staff through sickness and the consequent loss of their services when they have become most valuable to the Province whose policy is based upon such short-sighted methods. On this subject Mr. W. R. Doxat, a Deputy Conservator who has had considerable experience of the rest-houses of Assam, writes to us: "There is scarcely a single forest rest-house in Assam fit for a Divisional Officer to reside in for any time. There is not a province in India that has shown such a high mortality or such a number of officers who have been compelled to be trans-

ferred on the grounds of ill-health to other provinces. Moreover while the Assam Province is a healthy one for the planters, yet the ill-health among Forest Officers has been abnormal. The reason is not only their arduous and unhealthy work but rather the utterly inadequate provision of rest-houses and headquarters' bungalows."

"The photograph of the thatched huts at Chibuk in the Garo Hills occupied during the past cold weather by the Inspector-General of Forests whilst on tour, to whom we are indebted for the illustration, is typical of the accommodation of this nature provided for Forest Officers in this Province. Mr. Eardley-Wilmot informs us that the huts are in a small clearing in a forest of sal where bamboo is also well represented. They are situated half way between Damra and Dambu. Mr. Doxat has kindly sent us, amongst other photographs, the illustration of the forest rest-house at Damra. He writes, 'Damra is one of the most notoriously unhealthy range headquarters in Assam. The rest-house consists of two rooms with a mud plinth and bamboo matting on the floor; the windows and doors being plain wooden shutters without any glass. The range quarters are merely sheds'."

The rest-house at the Charduar Rubber Plantation, of which Mr. Eardley-Wilmot sent us a photograph, is amongst the best at present existing in the Province. It was erected by the Public Works Department in 1887—88. I have not been able to procure the cost price but the appearance of the bungalow proves it to have been greater than the sums allowed to the Divisional Forest Officer. It is a wooden house built on piles some 8—9 feet above the ground level and consists of three rooms, 17′ × 16′ and 12′ 8″ in height, with two bath-rooms, 8′ 6″ × 8′ 4″, and a godown, with plank floors, a thatch roof, bamboo matting walls and a front verandah 48′ 7″ × 7′. The wood used is all sal, the walls consisting of a wooden frame work filled in with *ekra* reeds), plastered over and whitewashed. The great defects of the bungalow are to be found in the windows and floors. The former are merely wooden gin mills which have to be shut in windy wet weather, the interior of the bungalow being then in darkness. The addition of glass

Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by W. F. Perrée.

HALTUGAON FOREST REST-HOUSE.
Goalpara Division, Assam.

windows would not, we believe, cost a large sum of money, and it would be then possible to read and write in the bungalow in bad weather. The second defect is the clumsiness exhibited by the carpenters who put down the flooring, broad spaces having been left between the planks through which the wind blows and damp gets in.

The remaining illustrations depict various rest-houses in the Goalpara Division. On these Mr. W. F. Perrée has kindly given us the following note :—

"The Jenali inspection hut is typical of the accommodation provided for Forest Officers up to a comparatively few years ago. It is situated on the Trunk Road and consists of a grass hut with two small rooms and two bath-rooms and a small verandah in front ; the floor is of earth raised a few inches above the general level. A mat of 'nal' covers the earth floor. The dilapidated state in the illustration is due to the attempts of wild elephants to pull down the hut. The Patgaon bungalow built in 1900-01 is typical of the newer type of inspection house. This was considered to meet all requirements and came within an ace of being made the standard plan for the whole Province. The floor is of earth raised about three feet above the general level. The walls are of ekra plastered with mud and whitewashed. The accommodation consists of two rooms each 16′ × 16′, two bath-rooms each 8′ × 8′ and two verandahs 8′ × 32′ and 8′ × 16′. The Haltugaon rest-house is also on an earth plinth raised 2 to 3 feet. The entire structure is of rough hewn timber, reeds and grass, the walls are mud plastered and roughly whitewashed. The materials are held together by means of cane and there is no nail or peg in its whole composition. There are three rooms each 10′ × 10′, two bath-rooms each 5′ × 10′ and verandahs each 5′ × 30′ and 5′ × 10′.

"The inspection bungalow at Shovaighar (*frontispiece*) is an example of the more luxurious type of building in use many years ago. The plinth is of earth raised 1′ or 2′ above the ground. The materials are fastened together with cane or jute string. The walls are mud plastered but not whitewashed. There are three rooms each 16′ × 16′, two bath-rooms 12′ × 8′ and verandahs each 48′ × 8′ and

24′×8′. Like the houses at Jenali and Haltugaon the doors and windows of this house are of bamboo mats which slide on a horizontal bamboo to which they are suspended. In the cold weather the cold penetrates through the numerous chinks and improperly closed doors and windows, while in the hot weather the absence of verandahs at the sides and the smallness of the rooms renders the heat intolerable.

"The inspection bungalow at Jam Duar is beautifully situated where the Sankos River debouches from the Bhutan Hills. It is one of the best in the district. The floor is planked, raised about 4½ ft. above the ground and there are two rooms each 12′×16′, with two bath-rooms 8′×6′ and two verandahs each 6′×16′ and 6′×32′. The addition of a third room at the outset and the erection of larger rooms would have made a fairly comfortable house.

"The buildings in Goalpara are, with a single exception, of the cheap and nasty type. Every consideration has always been subordinated to cheapness. There have been great difficulties in the past in procuring labour, but that was largely due to the petty nature of the works failing to attract skilled labour.

"Permanent roads are absent, so that transport of camp kit has always been by elephant. The Divisional Officer, limited generally to two elephants to carry his camp when on tour for a month or more, was unable to add tents to his impedimenta; consequently temporary grass huts were mainly used. A few inspection bungalows were constructed at central points, but the number of such houses was very small, while, as above stated, the money laid out was always insufficient to construct a comfortable house."

The writer can speak from recent personal experience of the great disadvantages and extreme inconvenience in the hot weather of several of the above described and other rest-houses in this province. A glance at the illustrations will make it evident that with such accommodation the touring officer must find it a difficult matter to cope with his official correspondence under conditions so entirely at variance with those to which a man of his training and

INSPECTION BUNGALOW (FOREST) AT PATGAON.
Goalpara Division, Assam.

Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by W. F. Perrée.

FOREST INSPECTION HUT AT JENALI.
Goalpara Division, Assam.

upbringing has been accustomed. A man cannot produce his best work in surroundings of absolute physical discomfort and which result in undermining his health.

Under the great impetus to efficiency all round which is resulting from the formation of the new Province, the Department in Assam may look forward, we feel sure, to a great amelioration in its touring facilities and we trust that that greed for revenue at the grave risk to health and real efficiency which has been a tendency of the past will no longer form a feature of the future forest policy of the Province.

CORRESPONDENCE.

TO THE HONORARY EDITOR OF THE INDIAN FORESTER.

PROVINCIAL TRAINING SCHOOLS.

SIR,—Every Forest Officer will admit that the suggestions set forth on the above subject in the March number of this Journal open up a question which is of vital importance at the present day. Many in fact may justly wonder that these institutions do not already exist in the more advanced provinces. The lower class at Dehra Dun, which will shortly be closed, has provided a means of educating men in considerable numbers for the United Provinces and Punjab, in fewer numbers for the Central Provinces, very few for Burma, one for Bengal and none for Assam. The reason for the disparity in numbers is not obvious except perhaps that the classes being conducted in Hindi did not therefore suit Burmans, Bengalis and Assamese.

The conditions and intensity of work vary enormously in different provinces, or even in parts of the same province. It may therefore be that the outlines of a scheme which will fulfil requirements in the United Provinces or the Punjab may be partly out of place in Bengal and Assam. For this reason, I have a few observations to make on the scheme sketched out in the article referred to, in its application to a Province like Assam.

The nature of the teaching must largely depend on the work expected from the establishment. In a backward province, where attempts at development are being made, a mass of important work suddenly falls on the staff, it is impossible that the trained Ranger should cope with it all, and the Forester or Deputy Ranger must therefore be able to relieve him of much of the less important part of his duties.

In Assam, and certainly too in parts of Bengal, the guard is quite illiterate, so that a course of tuition in different kinds of forest work is, as yet, not necessary. Moreover, guards are essentially a protective staff and to educate a few above the ordinary rank and file would probably only lead to jealousy and discontent. If a guard has qualifications for a Forestership, by all means promote him and then train him, but do not put ideas into his head which are out of place in a man of the lowest grade in the service. We all know how easily men in the lowest grades suddenly raised above their position suffer from "swollen head." Anyhow, for the present, the guard establishment is best left to do its protective work; we must depend on Foresters, Deputy Rangers and Rangers to do the actual work of which our forests are now in so great need.

I would suggest that the training be sufficiently exacting and prolonged to test the physical capabilities of the men as well as the degree of interest which they can maintain in their profession. A course of a few months is useless, as may be instanced by the present three months' training undergone by stipendiary students or scholars preparatory to proceeding to Dehra, which affords no test at all. The men should be long enough in the forests to feel the real conditions inseparable from the hardships of a forest life. No doubt, the suggestion made in the original article, to have a class at a hill station during the recess is an excellent one, but there are few hill stations so favourably placed as to afford typical training grounds for the students. The theoretical part of the course could, however, be best undergone in the hills.

I would suggest that, in the first place, a class of ten or twelve men be formed, half of the number to be new recruits and the rest

Photo.-Mechl. Dept., Thomason College Roorkee Photo. by W. F. Perrée.

JAM DUAR INSPECTION BUNGALOW,
Goalpara Division, Assam.

Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by W. H. Doxat.

FOREST INSPECTION BUNGALOW AT DAMRA,
Garo Hills, Assam.

promising men already in the service but not over 30 years of age. During the first season commencing in October, they would go through all the out-door work expected of them and would be made to actually perform the work themselves. In May, the entire class would proceed to the hills and there undergo a course in simple surveying, including the use of plane table and prismatic compass, road aligning, road making and levelling, simple lectures on the principles of Sylviculture, Forest Protection and Forest Law. Again in October the class would descend to the plains and be made to apply intelligently, in suitable localities, the principles taught in the forest and in the class-room. A course of enumeration or valuation work would be included in order to teach the men sufficient to do the mechanical part of a working plan. Throughout the period of training the men would be taught to recognise the principal species of trees, shrubs and climbers with which they have to deal. By the end of April, the probationer should be ready for a practical test of his qualifications and if successful would be drafted into the service. The complete course would, therefore, extend over 18 months and naturally be conducted in specially selected localities, not necessarily restricted to one division, but with strict regard to the best possible conditions for tuition.

It may be urged that the course is too comprehensive and too closely follows on the lines of Dehra Dun. Whatever may be argued for or against it, the fact remains that the distinction in any case can only be one of degree. No provincial school can expect to push the existing institution so hard as to give rise for alarm on this score, and if it did, it would simply indicate that the Imperial Forest School and probably also the Upper Executive Staff required still higher teaching and training.

Progress, or what we understand now by progress, in forestry—I do not refer to mere revenue collection—is only possible with the help of a competent staff. Provincial schools will do much to level up the establishment and also ensure greater uniformity of work in different divisions. Most of us are ready and eager to undertake those works of improvement which are necessary or desirable, but the feeling of abject helplessness under existing conditions is

entirely traceable to the lack of the proper establishment. We all want trained men!

The outline as presented above is in its roughest form and would require much elaboration in detail before being put into practice. As regards the teaching staff, it would be necessary to depute two Rangers or Extra Assistant Conservators to conduct the practical work, while the classes during recess could be directly handed to a couple of Divisional Officers or Assistants, as opportunities offered. The expense would of course be considerable, but the outlay should not be grudged if real efficiency is gained, especially at this juncture when conditions appear to be ripe for a move forward. I hope to have provoked a discussion of this all important subject.

W. F PERRÉE,
Deputy Conservator of Forests,
Goalpara Division.

SELECTION BY AREA.

I.

SIR,—Under this heading in the April number of the *Indian Forester* Mr. Hobart Hampden describes a new form of "Selection" on which, if Mr. Hobart Hampden will allow me, I should like to make a few remarks.

The article describes a deodar working plan he has come across, the prescriptions for which are generally as follows :—

(*a*) Exploitable trees are those of the I class and over, which are all to be removed during the felling cycle, the forest being worked over once in the felling period.

(*b*) The possibility to include all mature trees, *i.e.*, I class trees and over, and such as will reach maturity during the period taken, which in this case corresponds to the felling cycle.

(*c*) The allocation of the coupes according to the actual enumeration of mature trees (*i.e.*, I class and over) and II class trees. In doing this the year in which the felling is to occur is taken into consideration in

calculating the number of II class trees to be felled, *i.e.*, only the percentage of existing II class trees that would become I class between the year of enumeration and the year of felling is taken into the calculation.

(*d*) A readjustment of the coupes if necessary (empirically or by fresh enumerations) after a period of 10 years' working.

(*e*) Reproduction to be carried out principally by artificial means as it has been found that nature is not to be depended on.

The novel part of this is (*c*). Before going further I wish to explain that I understand that in the case in point, a felling cycle is the number of years in which the forest is to be worked over, in contradistinction with the "felling period" which is the number of years it will take an average tree to pass through the II class.

By allocating II class trees according to the number that will, by inference, be I class in the year of felling, a number of II class trees will be omitted that will be mature at the end of the felling cycle. Thus the total number of II class trees (less the small percentage that will not become I class), upon which the possibility was calculated, will not come into the outturn.

Therefore something must be wrong, and it is difficult to see how the coupes were practically allocated. According to my calculation the Working Plans Officer should be out by so many trees, II class at the time of enumeration, as do not become I class by the year in which the coupe is worked.

To explain this further.

Theoretically when applying the Selection method no coupes should be fixed by area, but the annual possibility should be removed, as uniformly as possible, from the whole of the forest. Practically, for reasons we all know, this is not possible and so our forests are divided into coupes with an area check, the coupes being arranged with a view to working over the forest once, twice, or more often, during the "felling periods."

Our possibility must include the percentage of II class trees that become I class during the "felling cycle," while II class trees

will be scattered all over the forest and cannot be distributed by sizes among the coupes so as to allow all those of, say, 5′ 11″ girth to be put into the first coupe, all those of 5′ 10″ girth to be put into the second coupe, etc., etc. Hence some II class trees must be left standing in the coupes first worked over, that have been included in the possibility calculations. This error will be largest when the forest is worked over only once during the felling period, and less and less the more often it is worked over during that period.

From a sylvicultural point of view there can be no harm in this, particularly where the removal of the unsound and worst II class trees is permitted, as then only the best would be left. But in all working plans based on this system it should be allowed for.

From an economic point of view, however, it cannot be right for not only are a certain number of I class trees left standing in the forest at the close of the period (*i.e.*, those II class trees that have become I class after the coupe in which they stand has been felled over), but the trees taken into the possibility have not all been utilised.

NAINI TAL: W. H. LOVEGROVE.
22nd May 1906.

II.

SIR,—Mr. Hobart Hampden's article on this subject in the April number of this Journal claims to exhibit a somewhat novel form of Selection that has recently appeared in a working plan. It seems, however, that in the instance quoted, the yield has actually been fixed by volume (number of stems), and that the question of area comes in only when it is necessary to balance, with more than ordinary accuracy, the year's outturn. The possibility is based on a complete enumeration of three higher classes, and beyond the usual provision to work over the whole forest in a certain period the plan is based practically on volume. It is immaterial whether our unit is a I class stem or cubic foot, the stem check actually defines a fixed quantity of material and therefore is a volume check.

Working plans in general have aimed at an approximately equal annual yield, and to procure this a calculation of the

number of mature stems per acre has usually been made, the coupe then being marked off on the ground or map, practically in the same way as described in the article referred to, so as to contain the number of stems representing the possibility. The difference here lies in the accuracy with which it is feasible to do this owing to the complete and detailed enumeration. Alluding to the particular coupe quoted as an example, it is almost certain that, in ordinary cases, the small difference of 163 stems out of a possibility of 2,200, (only 7·4 per cent) would have been neglected, the entire compartments yielding 2,037 stems alone being taken in hand.

We are told that the forest contains a fair distribution of age classes. In order to apply the system with an accuracy at least equal to the minuteness of calculation, the two higher age classes need to be absolutely evenly distributed on the ground, otherwise the small plot of 47 acres, forming part of a compartment of 157 acres, may contain more or less than the number of trees wanted when an error, a sylvicultural one perhaps, at once creeps in. Considering that the total number of exploitable stems is known, why not have stated that the deficit may be taken from an adjoining compartment regardless of its area? This method was adopted by the late Mr. Hatt in the working plan of the Buxa Division. A certain responsibility is placed on the Divisional Officer but he may surely be trusted to this extent if he is competent to do any sylviculture at all!

Mr. Hobart Hampden claims for the system which he describes, comparative freedom from sylvicultural error. This may actually be the case for the particular forest under consideration, but it is not clear why it should be so if universally applied. Its salvation appears to lie in the fact that artificial regeneration alone is depended on. He also remarked as a general axiom that "a selection forest worked on the basis of stems should have no area check." Why then have entered into a calculation whereby a part of the year's outturn is allocated to a portion of a compartment? Why not have adopted the simpler method, as done by the late Mr. Hatt?

The particular virtue of the system described is wholly dependent on the minuteness of the enumeration; the assessment

of yield by a simple method of proportion is surely not new, while the term "Selection by Area" does not appear to apply in any way to the general remarks contained in the article or to the particular example quoted.

W. F. PERRÉE.

REVIEWS AND TRANSLATIONS.

FOREST ADMINISTRATION IN THE PUNJAB, 1904-05.

During the year some disforestation was carried out in the Shahpur Division, a total of 107,196 acres being excluded from the reserve areas in connection with colonisation schemes on the Jhelum Canal. Forest Settlements were completed in the valleys of the Pabar, Rupin and Giri in the Bashahr Division and considerable progress in demarcation work was made in Rawalpindi and in the Pabar Range of the Bashahr Division.

Sanction was given during the year to the working plan for the Kangra Division and working plans were under preparation for the Sutlej and Pabar valleys of Bashahr. A working plan for Keonthal was completed and that for the Balsan forests accepted by the Chief of that State; the preparation of one for Kumbarsin will shortly be begun. It is satisfactory to note that in a short time working plans will be in force for all the Bashahr forests.

Considerable progress is being made in the direction of the improvement of communications. The expenditure on this head exceeded that of the previous year by Rs. 2,000, but was less than the budget provision due to the scarcity of labour in Kangra and Kulu after the earthquake. The Inspector-General's note on the improvements of communications in Bashahr has received the consideration of the Lieutenant-Governor, and the Government of India has been addressed with a view to obtaining their sanction to a comprehensive scheme of construction and maintenance of roads and paths. It is most satisfactory to see that this matter is being approached in such a liberal spirit, for it is only by opening them out that the forests can be either worked or properly tended and

conserved. It is feared that the damage done by the earthquake will prevent much advance in the construction of new buildings.

Breaches of forest rules increased during the year, Rawalpindi being as usual chiefly responsible for this state of affairs. It is satisfactory to read that the Courts of that Division are now treating forest offenders in an adequate manner. Here as in other parts of India the light sentences inflicted on offenders against the forest law have been one of the main causes for the large increase in forest crimes.

Out of 865 square miles protected from fire 862 square miles escaped, this being a most satisfactory state of affairs. The climatic conditions are reported to have been favourable in the hills, but the punitive closures imposed in the Murree Tahsil may be fairly claimed to have been largely responsible for this result.

Out of a total area of 9,111 square miles 641 square miles were entirely, and 1,146 square miles were partially, closed to grazing during the year a slight increase in the areas closed. The effects of the great frosts of February-March were very injurious in forest areas. Many trees and seedlings were killed by the frost and the damage done to the vegetation increased the risk of injury by fire and insect pests. In the Simla Division, however, the frost is reported to have done good by killing off noxious creepers. The earthquake also was not an unmixed evil since the demand for sawn timber gave an opportunity for clearing tracts in Kulu for deodar cultivation by extensive removals of blue pine. A certain amount of cultural operations were undertaken, inferior species being removed over 1,000 acres in the interests of the deodar.

The total quantity of timber removed from the forests, 3,842,700 cubic feet, shows a decrease on the previous year's figures of some 577,300 cubic feet. Of the amount removed about one-fourth was taken out by Government and twice that amount by private purchasers. Selection and improvement fellings took place in all the hill divisions, the chief being those conducted in Kangra and Kulu in order to give relief to the sufferers from the earthquake of 4th April 1905. That disaster demolished villages wholesale and Government gave much liberal assistance for reconstruction

purposes to villagers both in trees and sawn timber. In addition to this materials had also to be provided for the erection of temporary shelters for the people till the end of the rains, and large areas had to be thrown open for providing fodder and grazing of the cattle. It is in calamities of this nature that the full value for the forests and forest conservation to the people makes itself fully apparent, and it is on such occasions that the Forest Officer should, by his prompt and able efforts to aid the Government, endeavour to secure the people of the country on his side for the future by granting them to the full every advantage possible in their sufferings and loss. The interests of the forests, which are kept up for the good of the people, must in such cases be subordinated to their needs, and that such should not be fully realised by the Department in all cases is a matter for regret.

Experiments in the Kangra Valley have apparently led the Conservator to form the opinion that blazing the pine for the extraction of resin is injurious to the life of the tree. Tapping has been restricted in consequence pending further experiments, and this has led to the closure of the Nurpur Distillery.

The financial aspects of the year's working were eminently satisfactory, the revenue rising from 16½ to 19 lakhs of rupees, while the expenditure rose by *only* Rs. 18,000, a by no means so satisfactory aspect, the surplus being 9 lakhs. With such a surplus it is difficult to see why it should not be possible to carry on a large scheme of road and building construction in the immediate future.

Improvements in the reorganisation of both Imperial and Provincial Staffs have been receiving consideration. This Province like most others is undermanned. It is obvious that work cannot progress under such conditions. Progress cannot even mark time but retrogrades. We trust that the day is approaching when it will be considered essential that a circle should have a Deputy Conservator of Forests in charge of each important division, irrespective of officers on leave. We venture to think that the short handedness of local forest administrations is attributable more to the Local Government concerned and their forest advisers than to unwillingness on the part of the Government of India to sanction

the necessary increase In the interests of the service it is, we think, at this juncture of advantage to draw attention to this fact. Reorganisations and additions to the strength of Provincial Staffs can only come at intervals, and underestimating, with a view to large surpluses of revenue in the near future, the staff required to undertake the work of a rapidly developing department results in an *impasse* such as now confronts the Department. The forest advisers to Local Governments should remember that they are Imperial Officers as well as Provincial ones. We fear this has been too often overlooked in the past.

REVIEW OF FOREST ADMINISTRATION IN ASSAM, 1904-1905.

This is the last report which will deal with the original Assam Province. In future, the Circle will include three of the Divisions transferred with Eastern Bengal.

The total area of State Forests at the end of the year was 22,799 square miles, of which 3,797 square miles are Reserved and the rest, termed Unclassed State Forests, constitutes the whole of the waste land at the disposal of Government. There were no disforestations of any importance, the net increase under Reserves being 19 square miles. Excluding the State of Manipur and the Lushai Hills district, the proportion of Reserved Forest to the area of the province is only 8·3 per cent. There is clearly room for great activity in reservation considering that Assam is exceptionally well served by waterways which admit of cheap transport to the populous districts of Eastern Bengal. The Garo Hills which is probably the most favourably situated district as regards position and contiguity to markets, with a sparse population, contains a total area of 3,124 square miles of which only 136 square miles are Reserved Forests. Now that the needs of Eastern Bengal and Assam have come under the consideration of one Government, it is hoped that reservation will be dealt with from a wider point of view than hitherto.

A gratifying feature is the action taken to reserve 243 square miles for the protection of game. The settlement of this area is

in progress, and it is hoped that action has been taken in time to ensure a sufficient head of game to prevent extinction, by in-breeding, of interesting species peculiar to the province. The object and position of these game sanctuaries should be clearly laid down, to prevent their ultimate deterioration into special preserves for the wealthy globe-trotter or for those residents in the country, we are glad to note few in number, who disabuse the the power placed in their hands with other objects in view to the detriment of both sport and the preservation of game.

Forty-two square miles were undergoing settlement at the commencement of the year, of which 21 square miles were finally settled, leaving 264 square miles in hand at the close. The expenditure on settlement was only Rs. 202.

Survey operations were conducted in the Garo Hills, Kamrup, Darrang, Nowgong and Sibsagor Divisions: 145 square miles were topographically surveyed at a cost to the Department of Rs. 29,637 compared with 160 square miles for Rs. 16.431 in 1903-04. The Local Government again expresses a doubt as to the utility of costly surveys for Forests not yet under systematic management. The first essential to systematic management is a good map, and it is generally the want of it which has delayed the introduction of Working Plans throughout India. Progress in this respect in Assam need no longer be delayed.

The preparation of Working Plans appears to have made little advance during the year. A Working Plan was finally submitted for 64 square miles of the Nambor Forest. In the Dambu and Darugiri Forests, old plans for which the first felling cycle has already lapsed, are being worked upon by the carrying forward of arrears. Dambu appears to have been attacked on several occasions and the existing system does not appear to give the forest that period of rest which a Working Plan provides for. Considering the small areas of these forests, a complete re-enumeration before undertaking extensive departmental works would have been preferable. The Goalpara Working Plan was still under revision and the Forests are being worked on a provisional scheme for a period of two years. Complete enumeration was carried

out over 22,084 acres at a cost of Rs. 6,823. It is hoped that the results achieved will justify the expenditure and the delay involved.

The most important item of expenditure under communications was a sum of Rs. 10,845 on the extension of the Goalpara Forest Tramway by 3½ miles. The line was apparently used for removing only a part of the year's outturn. The earnings, taken as the difference between the estimated cost of carriage of materials by tram and by other means, are calculated at Rs. 1,156, which, on a total outlay of Rs. 49,273, is a small enough margin of profit. Probably, however, the other means were not at hand so that a share of the incidence of revenue may properly be allotted to the tramway. By the introduction of the tramway into Goalpara Mr. Perrée has solved the problem of exploiting the forests in this division. The unsuccessful attempts made through long years to exploit the forests by means of bullock cart transport were met by the annual recurring extinction of the cattle by anthrax. We trust the commencement made in the Western Range will be followed by an additional line in the Eastern Range A new cart road 7 miles in length was commenced between Dambu and Darugiri in the Garo Hills at a cost of Rs. 1,830; 254 miles of existing roads and paths were kept in repair at a total expenditure of Rs. 4,313. It is to be regretted that the new work on buildings fell to Rs. 3,572 against Rs. 4,373 in the previous year, repairs to buildings cost Rs. 6,364. None of the items are considered of sufficient importance to deserve special mention. It is clear that communications and buildings in Assam are not receiving their full share of attention and that the existing surplus is attained largely by withholding important Capital expenditure.

Assam appears to be very fortunate in respect of forest offences. The total number of cases of the year reached the comparatively small total of 421 against an average of 331 for the previous three years. The increase is attributed to greater activity in dealing with offences under the river rules.

Protection from fire in the areas where full measures were taken reached the high percentage of 99, the cost per square mile

being Rs. 8-13-8 against Rs. 7-12-11 in the previous year. In forests where full measures were not undertaken only 39 per. cent was actually saved, the cost per square mile of the area protected rising to Rs. 10-2-11.

Extensive climber cutting operations were carried out in Goalpara, the area dealt with being 19,531 acres at a cost of Ans. 12-9 per acre. Although this is extremely high it is probable that this much neglected operation, if further delayed, would lead to the eventual disappearance of the sal. It is interesting to note that the effect of fires on the growth of climbers is being studied by the annual burning of sample plots.

The severe frost of the season appears to have done much less damage than might have been expected in the low lying swampy portions of the forests ; sal seedlings are said to have been checked by it in Goalpara and in the Garo Hills.

Natural reproduction in Goalpara is said to be satisfactory on the high levels where the undergrowth is mainly grass. In the lower levels, however, fire protection has induced the appearance of a dense undergrowth of evergreen shrubs and weeds in which sal reproduction is absent. It is again satisfactory to note that the result of firing to get rid of this undergrowth and thus, it is hoped, enable the sal seed to germinate is being tested in sample plots.

Regular plantations are confined to rubber and a small plot of teak at Kulsi. Forty acres of rubber were added to the plantation at Charduar. The total cost of the Charduar plantation of 2,754 acres is stated to be Rs. 2,19,400, but it is not said what proportion of the Divisional Officer's salary has been included in this total. The year's outturn of rubber was 12,368 lbs. part of which realized a net profit of Rs. 2-11-3 per lb. The rest had not been disposed of at the end of the year. The yield showed variations between 2½ lbs. and 5 lbs. per acre. The figures of outturn, however, are not clear and the Local Government has asked that the financial result be clearly shown in the next report.

Departmental timber operations appear to have been mainly confined to sleeper works : 79,674 M. G. and 1,210 special sleepers were extracted against 70,401 M. G. and 1,982 special in the

previous year. The loss of material in conversion is said to have been as high as 70 per cent in Darrang due to the utilization of badly shaped and defective trees not saleable to purchasers. The loss in process of conversion can be very well overlooked if the forests are cleaned of their defective and over-mature stems. The total value of produce exploited departmentally during the year was Rs. 1,98,727 of which Rs. 57,277 was derived from minor produce, mainly rubber. It is noteworthy that no operations for the removal of unsaleable material to benefit the growing stock were undertaken in the Circle.

The system of unregulated fellings which prevails in parts of the Province appears to leave matters solely in the hands of the purchaser. Portions of the forests are untouched and the more accessible localities over-worked. Attempts to localise fellings in Cachar have led to a cessation of fellings, while in Sylhet the saleable timber is said to be exhausted and purchasers are going elsewhere. The obvious remedy lies in opening up communications throughout the forests. The expenditure on new road works in these two districts was *nil*, while 25 miles of bridle paths were repaired for Rs. 167. The action of purchasers in refusing to work in the areas allocated is scarcely to be wondered at. Selection fellings were carried out in three districts over an area of 8,408 acres. The total quantity of timber and fuel removed by purchasers was 6,182,367 cubic feet, a decrease of 6,310,484 cubic feet compared with the previous year. This decrease is due to the reservation of mature stems for departmental sleeper operations. The number of tea boxes of local manufacture on which royalty was paid was 373,661, a substantial increase of 107,863 on the last year's figures. The total value of minor produce extracted by purchasers increased from Rs. 1,04,924 to Rs. 2,25,845 during the year under review. The increase is due to the royalty on elephants captured and sale proceeds from Elephant Mahals now being credited to the Forest Department instead of to the Civil Department, to receipts on foreign rubber, and to increased sales of bamboos.

The system of issuing free permits to settlement holders on Government land for forest produce for their domestic use has

been abolished. The people are now allowed absolute freedom to help themselves in Unclassed State Forests with the sole restriction that the produce must be for their own domestic use.

The estimated total value of free grants amounts to Rs. 4,54,774. The total outturn of major produce from all sources was 11,715,412 cubic feet of which 10,688,505 cubic feet were derived from Unclassed State Forests. The falling off from reserves in spite of greater actual activity in working is explained by the fact that the large waste in conversion of sleepers would, had the timber been extracted in the round, have resulted in a substantial increase. The gross revenue of the year amounted to Rs. 8,77,584 which is Rs. 2,00,640 more than in the previous year. The expenditure was Rs. 5,02,729 or Rs. 50,842 in excess of the previous year and Rs. 1,39,292 more than the average of the previous five years. The surplus was Rs. 3,74,855 compared with Rs. 2,25,057 in 1903-04.

The establishment of Forest villages, with a view to making the department independent of outside sources of labour has continued to receive attention in almost all the Divisions. In Sylhet 8 new villages were started while three new ones were established in Goalpara where there are now 15 villages with 352 settlers. In Goalpara, the forest villages supplied 3,128 units of labour on payment, and 2,460 units in return for forest privileges. Operations which were undertaken to recapture a runaway elephant in Kamrup eventually led to the stockading of 22 elephants on the 22nd April. Six of the captures were handed over to the owners of the 'kunkis' or trained elephants who assisted in the operations; 11 were sold for Rs. 3,420 immediately after capture and 5 retained for Government: two of these however, have since died, and it is said that many of the animals disposed of met with a similar fate due mainly to the unfavourable season in which the capture was affected. The runaway elephant was not found among the captures. The total cost of the stockade, etc., was Rs. 1,446.

The circle appears to be very shorthanded, the absence of three Deputy Conservators on leave necessitating the placing of four divisions under two officers.

CURRENT LITERATURE.

The TROPICAL AGRICULTURIST for May 1906 contains a first paper by the Editor, J. C. Willis, on some possibilities of improvement in village agriculture. In these articles the author considers the subject under the heads—(1) The variety of products cultivated ; (2) The kinds of varieties of particular crops cultivated; (3) The methods of cultivation ; (4) The cleanliness of cultivation and freedom from weeds and disease ; and (5) The preparation of the produce for sale, etc. Under the first heading Mr. Willis suggests the formation of an experimental garden on a scale suited to each village at the village schools. A London broker who has visited over 65 rubber estates in Ceylon discusses the question of the Ceylon Rubber Industry. Ceylon plantation rubber, in the order of its attractiveness to buyers, runs as follows :—Sheet, biscuits, lace, crépe and worms. "But there is no difference in their value whatever."

In his Sixth ANNUAL REPORT of the AGRICULTURAL CHEMIST of MYSORE, Dr. Lehmann in Part II deals chiefly with the experimental farm which has been recently inaugurated. The bulk of the report is devoted to the growth, tending, and extraction of the sugarcane. The import of sugar into India for 1904-05 was 290,000 tons or nearly 2 lbs. per head of population. This large and increasing import, says Dr. Lehmann, shows that there is something radically wrong with the Indian sugar industry.

In the ANNUAL REPORT of the BOTANIC GARDENS of SINGAPORE and PENANG 1905, there is the following interesting note on Para rubber :—The demand for plants and seeds of Para rubber still kept larger than any possible supply ; of seeds 390,724 were disposed of as well as 8,920 plants. Most of the seed went to the Colony and Native States ; lots were also sent to Jamaica, Lagos, and Nigeria. These long-distance voyages were usually very successful ; thus of 7,500 seeds sent to Jamaica, after nearly 3 months' travelling, Dr. Fawcett reported "all germinating very well," we shall scarcely lose 500. Of 135 sent to Kew, 123 germinated. These seeds were sent in charcoal carefully damped and packed in biscuit tins. These successful experiments show that Para rubber seed,

though short-lived, can be sent to almost all parts of the world with but a comparatively small loss.

The March 1906 number of the ANNALS of the ROYAL BOTANIC GARDENS, Peradeniya (Ceylon), contains two most valuable papers. Mr. Petch describes in the first some new Ceylon Fungi, whilst Mr. Parkin in the next treats of Fungi parasitic upon Scale Insects (Coccidæ and Aleurodidæ), giving a general account with special reference to Ceylon forms. The literature on this latter subject is not extensive, although it is necessary to go back as far as 1848 for the first reference. In that year Desmaziéres described a new Fungus in the conidial stage growing upon the scales of a coccid on young willow stems in France. This Fungus has since been proved to be the conidial fructification of a species of Sphaerostilbe and has been shown to have an extensive distribution on Scale Insects in both the old and new worlds. During the last 12 years Webber of America has made some researches on this subject and other workers have more recently made contributions to the subject. All these Scale Fungi are either complete ascomycetous forms or incomplete conidial ones. The latter are provisionally placed in the Fungi-imperfecti, an artificial group, the individuals of which are generally considered as conidial stages of various ascomycetes. But as their ascus-fructifications are as yet unknown, they cannot with any degree of certainty be classified with them.

In the BULLETIN ECONOMIQUE publié par la Direction de l' AGRICULTURE et DU COMMERCE for March, M. E. Dovarche has a paper, very poorly illustrated, on Les Bovidé's du Toukin, II Buffles, in which the various races of buffaloes are described and the uses to which they are put detailed. M. E. Dauphinot considers the subject of Le Commerce entre la Chini et la Birmanie whilst M. Krempft has a paper Sur les invasions D'Acridiens de 1905 en Cochin chine, au Cambodge et en Annam. There is also a note by R. P. Maccy Sur un bois de Santal de Laos.

We have received a copy of the New CYPRUS JOURNAL (No. 1, April 1906) from which we see that the journal has been reconstituted, the whole of the text now being in English. It

would appear that the Agricultural Bulletin of the Straits has been taken as a model. In the new issue the number deals with various agricultural matters of interest in the Island.

In the first number of the Chemical Series of the Memoirs of the Department of Agriculture in India, Dr. J. Walter Leather considers the subject of the composition of Indian Rain and Dew. In this paper Dr. Leather shows that there is a higher ratio of nitrate to ammonia in Dew than in Rain, and that there would seem to be relatively more nitrate in the lower strata of the atmosphere than in the upper.

The BOTANICAL GAZETTE for April 1906 contains the second of V. R. Spalding's interesting papers on the Bilogical Relations of Desert Shrubs. In this part he considers the absorption of water by leaves. In his experiments woody plants were chiefly employed, and the author shows that certain species of desert plants of Southern Arizona absorb water presented to their leaves and internodes, whilst others do not.

SHIKAR, TRAVEL, AND NATURAL HISTORY NOTES.

IN OKAPI-LAND

Of late years the ambition of every British sportsman in Africa has been to bag an Okapi, as well as to observe this animal in its native haunts, and there to endeavour to obtain some clue as to the reason for the style of colouring which renders this animal so peculiar and remarkable. Although this praiseworthy object does not appear to have been actually realised, it has been nearly approached by Captains Alexander and Gosling during their expedition to Congoland. Neither of these gentlemen seems to have seen the Okapi alive, at all events in freedom, although Captain Gosling is stated on one occasion to have got quite close to an individual, which was, however, unfortunately concealed by the dense vegetation among which these animals habitually dwell. The Portuguese collector of the party was, on the other hand,

more fortunate; and if he did not actually see the animal in its untrammelled surroundings, he must at any rate, it would appear, have seen it alive in the pit in which it was captured. The fact that these animals can be taken in this manner without any very great difficulty, again raises the question whether there is any possibility of a live Okapi ever being seen in Zoological gardens. The transporting of such a tropical forest creature to Europe would, however, be a matter of extreme difficulty; the food question alone being one which would seem to be almost insuperable. If any attempts in this direction were made, and a couple or so of specimens captured, undoubtedly the best chance of keeping them alive in captivity, if the dangers inseparable from the voyage were overcome, would be to place them in the Calcutta "Zoo" rather than in the establishment in the Regent's Park where such animals would almost certainly die within a comparatively short period after their arrival.

Supposing the practicability of capturing an Okapi or two were to be definitely ascertained, it would be worth the while of the authorities of the Calcutta Zoo to give the matter their best consideration. As to finance, the City of Palaces would, we feel sure, take care that there should be no difficulty on that point, if the proposal were found to be within the scope of "practical politics." A trip to India to see the live Okapi would be a fine advertisement for shipping companies.

Undoubtedly the most interesting part of the account sent home by Captains Alexander and Gosling is the description by the latter gentleman of the haunts of the Okapi, for hitherto we have had but one, which is by no means complete, and was also "made in Germany." It was high time that something was done in this way by Englishmen, and therefore the following notes by Captain Gosling, which we quote in full, are of the greatest interest:—

"The Okapi here," writes that gentleman, "is generally found singly or in pairs, but Mobatti hunters state that sometimes three may be found together. An essential to the life of the Okapi is a small stream of water with some muddy and swampy ground

on either side. In this grows a certain large leaf that on its single stalk attains a height of 10ft. It is the young leaf of this plant that is the favourite food of the Okapi, and I venture to say that where the plant is not to be found the animal will not exist. During the night he will wander along in the mud and water in search of it. Here he may be found feeding as late as 8 A.M. in the morning, after which he retires to the seclusion of the forest, where he remains till nearly dusk. On the three occasions that I was at close quarters with the beast he was perfectly concealed in this swamp leaf."

The Alexander-Gosling Okapi is to find a home in the Natural History Branch of the British Museum, where the species (for we do not believe there is more than one) is at present represented only by the two strips of skin sent home by Sir Harry Johnston, which gave the first clue to its existence, by the mounted female obtained by the same gentleman, and by two skulls of females and the cast of one of a male. It is much to be hoped that the new specimen belongs to the latter sex.—*The Indian Field.*

EXTRACTS FROM OFFICIAL PAPERS.

OBITUARY.

We regret to have to record the death at Maymyo, Upper Burma, from appendicitis of Mr. C. W. A. Bruce, Deputy Conservator of Forests, at the early age of thirty-eight years. Mr. Bruce joined the Department on January 6th, 1890, and spent the whole of his service in Burma where he had the reputation of being an excellent hard-working officer. He was a keen naturalist and a Fellow of the Linnean Society. His loss will be keenly felt in Burma both in the Department and amongst a wide circle of friends.

REVENUE DEPARTMENT.

NOTIFICATION.*

Dated Rangoon, the 27th April 1906.

No. 221.—In exercise of the powers conferred by sections 18 and 58 of the (Lower) Burma Land and Revenue Act, 1876 (II of 1876), and with the previous sanction of the Governor-General in Council, the Lieutenant-Governor is pleased to make the following additions in the Rules published in Revenue Department Notification No. 244, dated the 22nd July 1897, as subsequently amended by Revenue Department Notifications No. 31, dated the 17th February 1898, and No. 360, dated the 3rd September 1902, namely,—

After Chapter IV, the following Chapter shall be added, namely :—

CHAPTER IV A.

Grants and leases of land for the cultivation of Rubber.

29A. Grants or leases of waste land not exceeding 1,200 acres in area for the purpose of planting rubber trees may be made by the Deputy Commissioner, with the previous sanction of the Commissioner, in any District of the Tenasserim Division, and in any other District specially notified by the Local Government.

When the area, which it is proposed to grant or lease, exceeds 1,200 acres, the application shall, with the recommendations of the Deputy Commissioner and the Commissioner, be submitted to the Financial Commissioner for his orders.

29B The following special conditions as well as the general conditions of Chapter III, so far as they are not inconsistent with the special conditions, shall apply to all grants or leases made under this Chapter, namely :—

(1) The grantee or lessee shall, within five years from the date of the instrument of grant or lease, plant not less than 50 trees per acre of the area granted or leased.

(2) At the expiry of the twelfth year from the date of the instrument of grant or lease the number of trees growing on the area granted or leased shall not be less

* We are able to publish this paper through the courtesy of the Secretary, Revenue and Agricultural Department, Government of India.—[HON. ED.]

than an average of 150 trees per acre of the total area granted or leased, and shall be fairly distributed over the whole area :

Provided that in computing the total area the land occupied by, or appertaining to buildings erected for the purposes of the grant or lease and the land, if any, declared by an officer, deputed by the Conservator of Forests for the purpose, at the instance of the Deputy Commissioner to be unsuited for the purpose of growing rubber trees, shall be excluded.

(3) The grantee or lessee may cultivate such other crops as he desires in addition to rubber trees, but such cultivation shall be strictly subordinated to the cultivation of rubber trees.

(4) During the continuance of the grant or lease the average of 150 trees per acre of the total area, as computed in the proviso to Condition (2), shall be maintained.

29C. If at any time the Deputy Commissioner considers that a grantee or lessee is infringing any of the conditions imposed by Rule 29B, he shall make such inquiry as may be necessary, and if he suspects that there is an infringement of Condition (3), he shall take the opinion of the Conservator of Forests as to whether the grantee or lessee is prosecuting the cultivation of rubber with sufficient attention.

29D. If the Deputy Commissioner considers that the grantee or lessee has failed to observe any of the conditions imposed by Rule 29B, he may resume the whole or part of the area granted or leased. In the event of a partial failure by the grantee or lessee to observe the said conditions the area to be resumed shall be determined by the Deputy Commissioner, in consultation with the Conservator of Forests, on taking into consideration the extent to which the grantee or lessee has failed to observe the conditions.

Provided that an order of the Deputy Commissioner under this Rule shall not take effect until it has been sanctioned by the Commissioner.

29E. The term of a lease granted under this Chapter shall be thirty years, and the lessee shall have the right to a renewal for a further period of twenty years, subject to such revenue as may be prescribed under Rule 29G.

29F. The land granted or leased shall be exempted from assessment to land revenue (which term shall in this Chapter and in leases issued under this Chapter be deemed to include rent) for a period of twelve years from the date of the instrument of grant or lease.

29G. After the expiry of the period of twelve years specified in Rule 29F, the entire area of the land comprised in the grant or lease (or such portion thereof as remains with the grantee or lessee) with the exception of any areas excluded under the proviso to Condition (2) of Rule 29B, shall be assessed to land revenue at such rates (not exceeding the highest rate sanctioned for paddy land in the same District) as the Local Government may by general or special order prescribe.

Land excluded from the computation under Rule 29 B (2) as unsuited for the purpose of growing rubber trees shall, after the expiry of the twelve years' exemption, be liable to assessment at the same rates as similar land in the neighbourhood.

By order,
R. E. V. ARBUTHNOT,
Offg. Rev. Secy. to the Govt. of Burma.

MISCELLANEA.

A JOURNEY THROUGH THE FORESTS OF UGANDA.

Mr. M. T. Dawe, Officer-in-charge of the Forestry and Scientific Department at Kew, has written a useful and interesting report (now published as a Blue-book) of a 3,000 mile journey through the virgin forests of Uganda and the Nile Provinces, which he made last year. Mr. Dawe's main object was to find out where rubber trees grow and trees which afford useful timber.

He brought back a large collection of timbers, and these are now being technically tested to ascertain their utility and durability, with a view to commercial use. Some had a fragrance and even grain which would be of particular value for cabinet work; others, very hard and mottled, would be useful for inlaying. A new kind of banana, from 12 to 15 inches long, and from 7 to 9 inches round, was found—excellent to eat, and very useful for cooking. A Carapa, with a very large seed, full of oil, was found in Western Ankole, and an expert suggests that the oil may be worth £22 to £30 per ton for technical purposes. Near the Luimi River are hot springs rich in mineral salts, and esteemed by the natives as a cure for all their manifold ailments. Samples have been brought home for analysis.

Mr. Dawe had many adventures while exploring the forests—such as being charged by a stampeding herd of elephants, and ambushed by suspicious natives. But he is far more concerned to describe his trees than his escapes. Herds of hippopotami are only mentioned as features of the landscape. In the Banyoro district there is a village where the wild pigs periodically root up all the potatoes from the fields. Then the elephants come, eat up the gardens, and drive the natives from their homes.

In the Semliki Forest, to the south of the Albert Nyanza, Mr. Dawe met some awkward opposition. On the other side of the river the natives had assembled in large numbers at the sound of the bugle and war drum, suspicious of the mission. They were armed with bows, arrows and spears, hideous in war paint, some with long hair, others decorated with gaudy turaco feathers, and hairs of the wild pig. "It was fortunate for me that my guide, who was one of the minor Mboga chiefs, possessed six wives, for three of them he had sought and won on the east side of the Semliki. Owing to this fact he was acquainted with the chief who led the people on the bank before us, and it was through his instrumentality that we were given the canoe and allowed to enter into their country."

"The Baamba people are a fine race, well proportioned physically, and remarkably free from disease. They frequently

fight against other villages, or with the Bakonjo people of the mountain slopes. They are attributed with a morbid taste for human flesh. It is difficult to get reliable information on this point, as they are very reticent on the matter. They acknowledge that the custom prevails, but no village or clan will admit it of themselves; no Muamba will admit to a European that he is a cannibal."

Each village contains a club, with six to eight open entrances. It is probably used as a stockade in case of attack Here the people meet and discuss their topics, drink banana beer, and smoke hemp from long pipes or from a banana stalk, which is usually passed round to the whole company. Their staple food is the plantain, but they also cultivate taro, beans, maize, sugar-cane, and pumpkins. The flesh of certain kinds of snakes eaten with plantains is considered a delicacy. A wine is extracted from the Phœnix palm. The castor-oil plant is cultivated at every village and a black oil is extracted from the seeds, used for anointing the hair and as an unguent. A Muamba is never more happy than when the black, greasy oil is trickling down his neck from a copious application to the hair.

THE TREATMENT OF RAMIE.

HOPEFUL DEVELOPMENTS

Some interesting remarks were made on the treatment of ramie before the Society of Arts, London, on the 4th April by Mrs. Ernest Hart, who has devoted time and attention to a study of the best method of treating the fibre and to practical experiments in weaving it. As the result of her efforts Mrs. Hart, who is perfectly aware that in the past ramie has almost been killed by the enthusiasm of its friends, maintains that technical difficulties have been overcome, and that the future of ramie is assured. In the course of her interesting lecture on the cultivation of the plant and the manufacture of the fibre, Mrs. Hart naturally referred the action of the Indian Government from time to time in offering prizes for a machine that would successfully decorticate the fibre.

Well intentioned as the offer was, the lady considered that it was a mistake, because it set those who were interested in ramie on a wrong tack. She insists that where cheap labour is available, it is a mistake to decorticate by machine. "It is more important," she observed, "to ascertain the correct scientific principles of treating the fibre in order to prepare it for manufacture than to decorticate by machinery on fields, particularly in India, where, owing to the abundance of cheap labour, ramie can be better decorticated by hand than by any machine." Mrs. Hart supported her argument by reference to the hand-stripped China grass, debarked on the fields with Chinese care and laboriousness, which will always command a higher price in the market than any machine-decorticated fibre.

Still, the lady admitted that in certain circumstances machines were not only advisable, but necessary; in Mexico, the Straits Settlements, and in the Southern States of America, on the great rubber lands where ramie would be a good catch crop, machinery is essential. The disadvantages of machine-decortication she enumerated as the initial expense, the delay in bringing the stems from the plantations, during which time some of the gums undergo fermentative changes, the smallness of the output of the machines, and the fact that the fibre is not so completely cleaned of its brown pellicle as by hand. But she believes that past experiments with machines have been of service in leading up to the perfect machine which is almost ready to appear.

Mrs. Hart told the oft-heard tale of woe of the apathy of Government Departments in view of the importance of ramie as a commercial textile. At the Colonial Office, the India Office, Kew Gardens, and elsewhere, she met with no encouragement in her efforts to move the authorities, and when enquiring for information on the subject of the growth and treatment of the plants was told that the Departments were too busy to give the matter their attention. In forceful contrast she told of her experiences in Germany, where the scientific spirit of painstaking industry is now at work endeavouring to solve the problems connected with the ramie industry. "It is because the national museums and

institutes of Germany are the living sources of present-day information to the people," she remarked with emphasis, "instead of being, as here, the lumber rooms of ill-described samples, that technical knowledge is there, not a matter of the class room, but of the life of the factory from the head downwards." Germany, France, and Japan possess several ramie spinning mills of considerable size ; Great Britain has not one ; but it is in Great Britain that the best machinery is made for both spinning and decortication.

The lecturer insisted that the great thing at the present time is to teach the planter how to prepare the fibre for export in order that it may arrive at the mills in a sound condition. In giving details of the conditions under which the plant flourishes, Mrs. Hart insisted that although it will absorb any amount of moisture from the air it is intolerant of standing water in the soil. The plant will endure drought, but the roots will be killed in a short time by a swampy condition of soil. Irrigation, therefore, is necessary in countries where the rainfall is insufficient, or where it alternates with long periods of drought. Under ordinary conditions four crops a year may be counted upon, but where irrigation of the soil can be regular, six crops a year may be obtained. The most recent and careful experiments give, said Mrs. Hart, an estimate of 45 stems to every plant, that is, on an average 180 per plant per year, or, with 10,000 plants to the acre, 1,800,000 stems as the crop per year per acre. "The weight of this crop is estimated at 90,000 kilograms, and calculating that the stem yields 5 per cent of the fibre, an acre of land should yield $4\frac{1}{2}$ tons of dry fibre. "This," she added, "at £20 a ton would give a gross production of £90 per acre. Deducting 50 per cent for the cost of working and treatment £45 per acre would be the net value of the fibre, or £10 a ton, which would find an easy market at £20 a ton." From £34 to £38 per ton is the market price of China grass to-day, and even at that price it cannot be bought in open market, but must be ordered for delivery three months hence. Ramie, she stated in conclusion, can be profitably grown in India, as in other parts of the British Empire ; it can be hand-stripped, hand-decorticated, and is indistinguishable from

China grass ; it can be put on the market at moderate prices and will yield handsome profits to the growers.

Mrs. Hart's personal efforts to secure a place for ramie among the important textiles of British commerce began in a shed in her garden in the neighbourhood of London ; step by step they have advanced until now, by the aid of American money, mills in Yorkshire have been purchased, and are executing large orders and Government contracts.

TREELESS IRELAND.—Some encouraging remarks were made by Mr. Bryce, Chief Secretary for Ireland, in reply to a deputation from the Irish Forestry Society, which was recently introduced by Lord Castletown, at Dublin Castle. He said that Ireland suffered more from the want of trees than any other country he was familiar with.

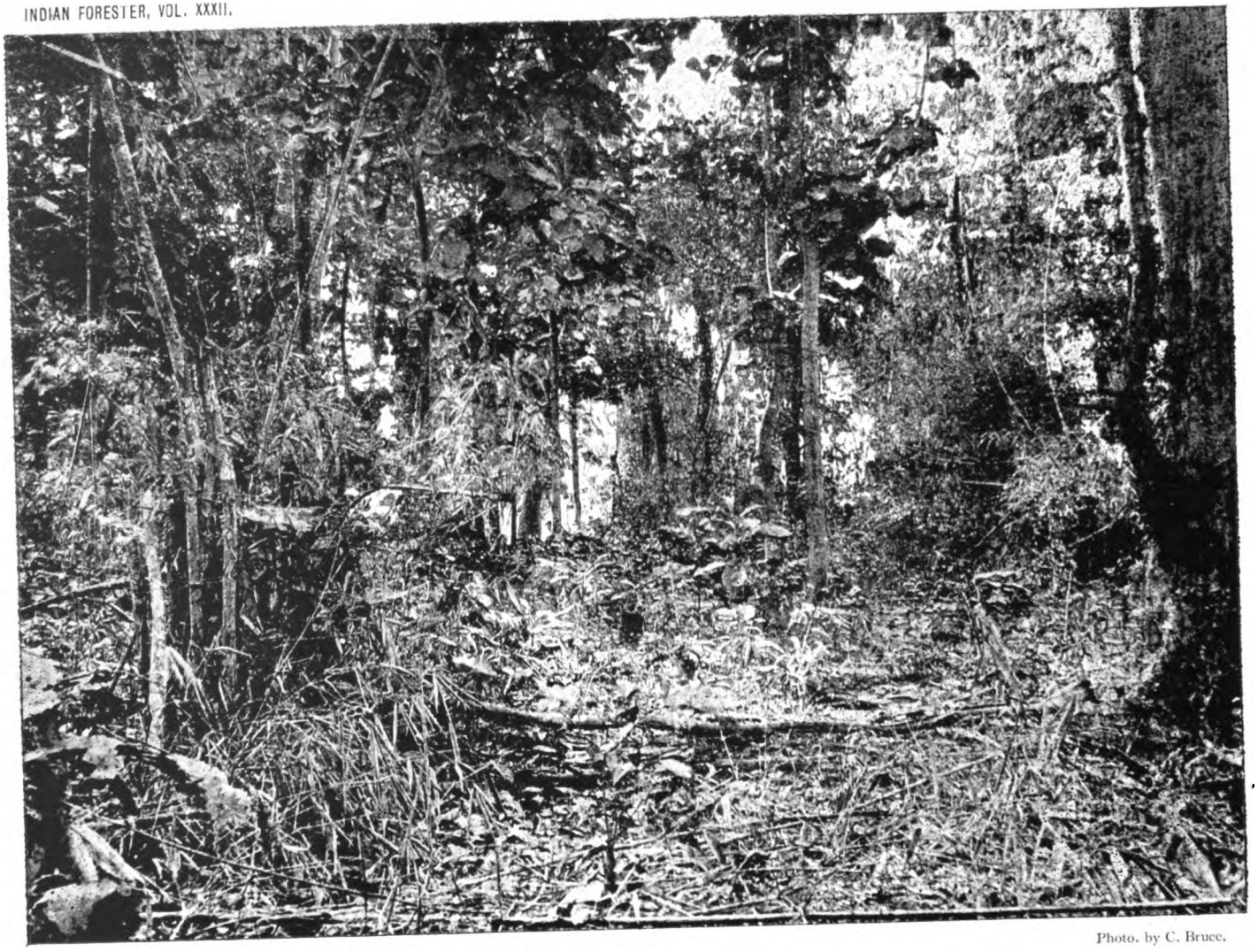
He was always struck with the number of bare spots and with the extent of the bogs, which were largely filled with the remains of trees, a fact which seemed to prove the statement that in the Anglo-Norman period and before it Ireland was well covered with timber. He thought there was good reason to do something with regard to forests in Ireland, and he felt that the Government would agree to some scheme. As far as he could see, there was a large quantity of land in Ireland suitable for planting with timber, and if such a scheme were carried out it would provide a source of employment in the winter for agricultural labourers who were occupied during the summer.

He believed that the timber industry could be made profitable in Ireland, even though it did mean asking men to remain out of their capital for a long period, as it would take thirty years at least before timber could be expected to pay. It would be interesting to know if the Irish climate was favourable to the growth of large timber, and he felt that what was really wanted was positive scientific information to show whether Ireland could be planted with trees in a remunerative way.

At any time he would be glad to have information from the society or its members.

FORESTS OF RUSSIA.—In a series of articles in the new Liberal daily, the *Tribune*, on Russian finance, speaking of the forests of that vast country, the writer states that in timber Russia comes third after Canada and the United States in the extent of the forest area, which is estimated at 600,000 square miles. As the value of timber tends to appreciate, this may fairly be regarded as a source of profit that is likely to increase rather than diminish as years go on. After grain the total exports in 1903 comes second in importance among Russian exports, being valued at about £6,000,000 sterling annually. The timber industry is assisted by the great rivers, with their countless tributaries, which enable timber to be floated down very cheaply to the sea. Other important products of the forests which account for many subsidiary industries and for a considerable foreign trade are resin, tar, potash, turpentine and wood pulp.

MIDLAND REAFFORESTING ASSOCIATION.—The report of this Association, which has now completed its third year, states that there are in the district 30,000 acres of useless land which could be planted and made pleasant to look upon. The area, however, at present available for the operations of the Association is about 14,000 acres. Altogether the Association has planted 43 acres, and 70,630 trees have been used. About 37 acres have been laid out since last April. The Association now numbers 250 subscribers, an increase of 100 on last year. The Council wish to see a demonstration plantation, and they hope subsequently to have such plantations in every district in the Black country. For this purpose they have been in treaty with Lord Lichfield, who has agreed to let or lease at a nominal rent two acres of pit bank at Deepmore to be planted next season. A large number of willow cuttings have been offered for next season's work. In September last a circular was issued asking for these cuttings, and among the first to respond was the King, who ordered 20,000 to be forwarded from Windsor. Altogether there are in stock for next season 23,918 trees and 35,500 cuttings.



Photo, by C. Bruce.

Photo,-Mechl. Dept., Thomason College, Roorkee.

TEAK REGENERATION IN THE NAMME RESERVE,
RUBY MINES, UPPER BURMA.

VOLUME XXXII NUMBER 8

INDIAN FORESTER

AUGUST, 1906.

THE SECRETARY OF STATE AND THE FOREST DEPARTMENT.

CESSANTE CAUSA, CESSAT ET EFFECTUS.

A month or two ago it was our pleasing task to allude to the graceful and eulogistic references made to the work of the Forest Department by members of the Council of the Governor-General and by the Viceroy himself during the debate on the Indian Budget. The remarks on the subject of the position and progress of the Service were pitched in no uncertain key and we think that the Service as a whole was justified in being well content with the praise so liberally bestowed. It was also, perhaps, permissable to feel that the words uttered were spoken with a set purpose and implied an assurance that the satisfactory progress made in the past would not be hindered in the future. It is no secret that the Government of India have under consideration not only the increase in establishments absolutely essential to keep pace with the rapid progress being made, but that their full sympathies are also on the side of improving the present and future prospects of a staff whose work, performed in solitude without murmur or complaint has so

entirely won their commendation and of whose importance to the State all are now so fully agreed upon.

This position of affairs was alluded to in the leader last May and our readers may be reflecting upon the dubious value of referring to the matter again after the lapse of so short an interval. The reason will, we feel sure, excuse the repetition. Although the last budget debate in the Governor-General's Council so fully expressed the Government of India's opinion upon the work of the Department in charge of their valuable Forest Estate, we could not but feel that the present Secretary of State was an unknown quantity; that his views on the subject might not coincide, for unfortunately there have been occasions when the views of a Secretary of State have not coincided with those of the Governor-General's Council. In these instances, although *causa latet, vis est notissima* and is by no means always appetising to our, perchance perverted, Indian palate.

We have all read Mr. Morley's great speech, for great we think it is entitled to be called, since to fill six columns of the daily papers with graceful literary periods on so dull a subject as a Budget speech is a feat of no mean nature and marks the man of no small mental calibre. We are not here concerned with the several political (and therefore controversial) aspects of the speech. *Cum multis aliis* Mr. Morley alluded to the great work the State undertook in India. "In India the State undertakes not only railways, but other gigantic operations for the direct development of the economic resources of the country. It constructs railways and canals; it conducts irrigation operations; it conserves forests. The net revenue under the three heads of railways, canals and forests five years ago was only £2,750,000. What is it to day? £5,000,000."

It has become a matter of common knowledge, a knowledge learned by painful practical experience in Nature's workshop, that the maintenance and safety of canals, irrigation, the rivers (the main water supply of the country) and consequently of its chief industry, agriculture, are entirely dependant upon the forests being under the highest and most skilled supervision that money can

procure. For the results of the faults committed by a couple of generations of unskilful Foresters would inevitably fall, half a century or so hence, with a terribly heavy hand on the country at large. That the Secretary of State is fully alive to this fact and has fully realized the good work of the Department and the great value of the State Forests in times of famine and other distress and as a source of supply for the daily wants of the people and of revenue to Government, his graceful and gratifying allusions to the work of the Department must make apparent to all.

Mr. Morley said: "The State Forests of India cover an area of 250,000 square miles and 660,000,000 cubic feet of timber from the State forests have been extracted, and there has been an increase in the forest revenue in five years of more than £600,000. I cannot wonder that those who are concerned in these operations look forward with nothing short of exultation to the day when this country will realize what a splendid asset is now being built up in India in connection with these forests." That that day is approaching, that it is probably much nearer than many who have not given the subject careful consideration would dream of, those connected most closely with the Department in India are perhaps in the best position to know. We are not here, however, so much concerned with that aspect of the matter as with the far more important and satisfactory fact that Mr. Morley's generous tribute and appreciation indicate that he also has understood the immense importance of her Forest Estate to India. With such a recognition publicly avowed we think the Department may look forward with some confidence to the sympathetic attitude of the Government of India meeting with a ready response at Home. We publish in this number a letter from a distinguished correspondent who bears *clarum et venerabile nomen gentibus*. We are not, we may say, in entire agreement with all that the writer says, but we recognise, equally fully with himself, that to get good men, and we now require good men and men with the best scientific training procurable, we must be prepared to pay for them. With the Secretary of State, the Viceroy and the Members of his Council who have been connected with Forest work in the country in accord it

is not too much to hope that the steps taken to remove present discontent, and its invariable accompaniments (for we cannot shut our eyes to the presence of these) slackness and loss of keenness, the inevitable results of stagnation of promotion, heavy work and poor pay, will be on a liberal scale commensurate with the requirements of the case. The Department has the ripe and mature experience of those at present responsible for the organization of the Service at its back and a sympathetic Secretary of State. For ourselves it will be necessary to bear in mind the words of our head line *cessante causa, cessat et effectus.*

SCIENTIFIC PAPERS.

ON POLLARD-SHOOTS, STOOL-SHOOTS AND ROOT-SUCKERS.

BY R S. HOLE, F.C.H., F.E.S.

PART II.

How pollard-shoots, stool-shoots and root-suckers develop.

10. Having cleared the ground to some extent with these preliminary remarks, we must now pass to the immediate subject of the present paper.

When a tree or shrub is felled, new shoots may arise—

(*a*) From dormant or adventitious buds developed on the remaining portion of the stem.

(*b*) From adventitious buds developed on the roots.

When the stump of the tree is high and the shoots arise at some distance from the ground, we usually call them pollard-shoots, whereas if the tree is cut low and the shoots arise close to the ground they are called stool-shoots or coppice-shoots, while, finally, the shoots springing from the roots are termed root-suckers.

In all cases the buds from which these shoots arise consist largely of embryonic cells

Pfeffer quotes a case in which an entire normal plant was developed from a fragment of the suspensor of an *Orobanche* embryo

and there is no *à priori* reason for believing that, under suitable external conditions, the embryonic cells contained in the above-mentioned buds are incapable of reproducing the entire tree body in which they occur or, in other words, that true vegetative reproduction cannot be effected by such buds, provided that they have not lain dormant for too long a period and that they are separated from and become independent of the main body of the parent plant.

Root-suckers may become entirely separated from the parent plant.

11. Taking the case of root-suckers first, it is, I think, generally accepted as a fact that they may become independent of the mother tree and develop into strong and healthy trees similar in all respects to the parent. With regard to European experience, we may note the following opinion of Kerner's who, when discussing the case of an aspen which had been felled and produced root-suckers, says :—

"For the most part the roots, after giving rise to a series of shoots, died and decayed, whilst the shoots developed into separate and independent trees, each furnished with roots of its own, so that they look as if they had been deliberately planted in the earth in rows. As a matter of fact, however, the aspen itself produced these saplings from its subterranean portions, and planted them out, thus not only renewing its own youth but multiplying.* At first the shoots appeared one by one, then by dozens, and at last by hundreds, at a time. They grow up into trees, and now, instead of the single aspen, there is a little wood composed of trees." While regarding this method of reproduction generally he states : "Not only a great number of trees, but also many shrubs, and a host of herbaceous plants, great and small, exhibit this kind of revival and multiplication, and for many species it is the safest and most fruitful mode of reproduction." * We may also note the following quotation from Boppe given on p. 313, Vol. XXX, of the *Indian Forester*: "The root-shoot frees itself easily from the parent root, to form an independent stem ; better than the stool-shoot, it assures the reproduction and expansion of the tree."

* Kerner, *Natural History of Plants*, II. 25—27.

12. That in the case of several of our Indian trees the root-suckers may at an early age become separated from the roots of the parent tree, and thus entirely dependent on their own root system, is shown by the observations of Mr. G. M. Ryan, who on p. 451 of Vol. XXX of the *Indian Forester* refers to the suckers of Populus euphratica and notes that they "ultimately acquired a separate and independent existence by the decay and death of the original connecting roots," and again with regard to the suckers of teak he says in the same paper "the connecting subterranean roots * * entirely disappear and this is the case with most species."

Reason to believe that true vegetative reproduction may be effected by means of root-suckers.

13. That a root-sucker, which thus soon becomes independent of the parent plant, is incapable of developing into an individual, equal in all respects to the parent, or in other words that true vegetative reproduction cannot be effected by means of root-suckers, there appears to be no evidence to show, and in the absence of such evidence, it is as unreasonable to assume this fact as to assert that a strawberry or bramble plant must be inferior to the parent from which it has been separated by the decay of the connecting "runner" or branch respectively.

Importance of root-suckers in Indian forests.

14. We must, moreover, consider the following facts, which now appear to be well established :—

(1) A very considerable number of our Indian trees and shrubs reproduce themselves readily by means of root-suckers *vide* the interesting papers by Messrs. Lushington and Ryan printed on pp. 161 and 450 respectively of Vol. XXX of the *Indian Forester*.

(2) A considerable number of the young shoots which appear after a felling in our coppiced areas are in reality root-suckers.

(3) The reproduction by seed of many species, which produce root-suckers readily, is often very slow and uncertain, and finally I think we must all agree with Messrs. Lushington and Ryan that in a considerable portion of our Indian forests this question is one of great importance and deserves far more attention than has hitherto been given to it, and as Mr Ryan justly points out, we must from a forester's point of view, not only consider the great utility of their

method of reproduction, when exhibited by valuable species but also its disadvantages when it leads to the rapid multiplication and successful reproduction of undesirable inferior species.

Root-suckers which do not become entirely separated from the parent plant.

15. With regard to those suckers which do not become separated from the parent-roots and where more or less of the old root system is supplied with food and kept alive by the suckers, it is of course very difficult without careful experiments to judge how far this condition influences the development of the suckers. Probably in the majority of such cases the suckers, besides utilising the services of part of the old roots, develop a more or less extensive root system of their own, and it should be pointed out that the mere fact of the suckers remaining connected with one another (in the absence, of course, of the parent stem which we assume has been felled) by living roots is not necessarily in itself an abnormal condition which might be expected to cause abnormal development in the suckers, for at p. 267 of *Disease in Plants* under the head of root-fusions, Marshall Ward states: "It is regarded as probable in some old forests that the majority of the roots of trees of the same species, are linked up together by such natural grafts," and *F.G.* apparently considers that such root-fusions often occur at an early age, *e.g.*, in the case of seedlings of *Populus euphratica* and teak, *vide* p. 269, Vol. XXXI of the *Indian Forester*.

In some of these cases, however, the question of decay spreading from the stool and old roots of the parent appears to be a factor which must be considered. Such decay may proceed very slowly and be confined to the dead heartwood in the older roots, in which case it is probably of very little importance, or it may spread rapidly, in which case it may not only weaken the power of resistance to windfall of the root system of the sucker-tree but may also spread into its stem and thus diminish the outturn of timber.

Finally, when caused principally by a parasitic fungus, this decay may soon cause the death of the sucker-tree. It is, however, worthy of note that injurious parasitic fungi do not appear to

constitute a serious danger in many of our dry Indian forests which are treated as coppice or as coppice with standards. Thus Dr. Butler on pp. 487, 488 of Vol. XXXI of the *Indian Forester* says, "Even the jungle is too often dry scrub, the last place in which fungi could flourish," and again when discussing the conditions favourable for the development of fungi says, "I can hardly imagine anything more unsuitable looked at from this point of view than the plains of Northern India from the Punjab to Behar or the bare uplands of the Deccan." Again, in the case of many trees, we know that the production of seed is not possible until a period of vegetative activity has been passed through, resulting in the accumulation of the necessary food materials. It is therefore possible that suckers, springing from old roots in which there are large stores of food materials, are in some cases induced to produce flowers and seed earlier than they would otherwise do and this may in turn result in diminished height growth and longevity.

16. In any case we must recognise that there is an essential difference between a root-sucker which becomes separated from the parent plant at an early age and one which does not do so and we must recognise that careful experiments with our Indian trees are essential before we can accept as true any sweeping generalisation to the effect that root-suckers as a general rule are, as such, necessarily inferior to seedling trees as regards their longevity, their power of height growth or of producing fertile seed or in any other respect. There is, however, no doubt that there is a widespread belief among forest officers to the effect that there is something necessarily abnormal and unwholesome about a root-sucker, and on p. 313, Vol. XXX of the *Indian Forester* we read: "It would, however, perhaps not be wise to induce such reproduction (*i.e.*, of root-suckers) on too large a scale in a high forest if it is really true that the longevity of a tree sprung from a root-shoot is smaller than that of a tree from seed." No one who has watched the rapid establishment of practically pure woods of tendu (*Diospyros tomentosa*) and tinas (*Ougenia dalbergioides*) from root-suckers on

Necessity for collecting reliable data and obtaining proofs before accepting as true any general statement regarding the characteristics of root-suckers.

deserted fields in the Central Provinces, in places where reproduction from seed is very unsatisfactory, can fail to be impressed by their possibilities and it appears high time that we set about the collection of data.

The relations existing between stool-shoots or pollard-shoots and the parent plant.

17. Turning now to the subject of pollard and stool-shoots which we know are often developed in the place of the original crown of a tree which has been cut off, it appears that they must be burdened with the task of maintaining in full vigour, a more or less extensive root-system with masses of cambium and living conducting tissues. To some extent, at first, the balance of the food materials which were stored away in the tissues, before the tree was felled or pollarded, and which were not required for the development of the shoots themselves, may aid in this task, but it seems certain that, in a short time, the living tissue of the whole tree-body must depend for its food on the supplies manufactured in the leaves of the young shoots. In the absence of definite experiments it is of course impossible to speak positively, but it does, at all events, seem highly probable that the closer the resemblance between the new crown of foliage formed by the young shoots and the old crown of which the tree has been deprived, the better will the new crown be able to do its duty in providing food for the maintenance of the old root system in full vigour.

Cases in which the damage done to the parent plant by coppicing or pollarding may be very slight.

In many cases we know that these young shoots in a few years are capable of forming a crown fully as extensive, if indeed not more so, than that which has been cut away, and we must, I think, conclude that in many cases the removal of the crown has had no permanently injurious effect and, in the absence of reliable and often repeated observations, it would be as unreasonable to assert that coppice and pollard shoots are necessarily inferior to seedling trees in their power of height growth and of producing fertile seed, as to say that a young plant which, in early youth, happened to have been cut back by frost or fire or otherwise injured, can never develope into a normal tree.

The vigour and size of the young shoots must depend directly on the quantity of reserve materials available in the remaining portion of the stem, the roots, or both, of the parent tree, at the expense of which they are produced, but subject to this, it does appear that the younger the tree when felled over, the less injurious is the felling likely to be, for the closer will be the resemblance between the small crown of foliage removed and that formed by the young shoots and the smaller will be the root system to be supported. In the case of young trees also, the small area of the cut surface of the stem is, as a rule, quickly covered by the healthy tissue at the base of the vigorous young shoots and the access of air and water being obstructed, the spread of decay into the root system is to a great extent prevented, which in this case, where the object is to keep the original root system healthy and intact, is obviously an advantage.

As a general rule the younger the plant is when cut over the less injurious is the cutting likely to be.

18. Mr. Leete on pp. 328 and 329 of Vol. XXV of the *Indian Forester* has already drawn attention in the case of *sal* to the resemblance noted on above between a young tree which has been coppiced and a seedling tree, the young shoot of which has been injured by some cause other than felling or which has died back naturally.

Necessity for distinguishing between the artificial removal of a shoot by an external injury and the natural death of the same.

It must, however, be pointed out that the natural annual dying back of the aerial portions of many of our Indian trees in early youth appears to be a necessary part of their normal life history, just as is the shedding of entire branches in the case of the swamp cypress (*Taxodium distichum*) or the shedding of shoots in the case of some species of *Strobilanthes*, and this can therefore be no more compared to the artificial injury induced by coppicing than can the defoliation of a tree by insects be compared to the normal leaf fall. As a general rule, the greater part of the valuable food substances are withdrawn by a plant from an organ before it is shed *naturally* and no open wound uncovered by projecting tissue results.

Cases in which the damage done to the parent plant by coppicing or pollarding may be considerable.

19. Following up the idea of comparing the new crown of foliage with that which has been removed, it appears certain that, in many cases, the young shoots cannot adequately perform the duties of the old crown of foliage and that the supply of food made in the leaves of the young shoots, not being equal to the demand, can only provide for a portion of the original root system. Here the damage done and the interference with the normal life history of the tree would appear to be far more serious than in the cases considered above in para. 17.

In the case of a tree damaged by drought, the higher branches and tips of the branches first die back, *i.e.*, those parts of the tree situated at the greatest distance from the tips of the roots whence the water-supply is derived. Similarly, in the case of the food-supply from the shoots being insufficient for the roots, we should expect the roots to die back from their tips, those portions dying first which are furthest from the leaves, *i.e.*, the source of the food-supply, and we should expect the damage done to the root system of such a cut tree to resemble, in a general way, that caused by a severe drought in the crown of a healthy tree. In such an injured crown, if the damage has not been too severe, we know that young shoots appear on those portions of the stem and branches which are still alive. These grow and gradually take the place of the dead branches, which ultimately fall off, and, in a few years, the recovery may be so complete that we can see no signs of the damage remaining.

It is probable that a very similar process often takes place in the case of a tree which has been pollarded, or coppiced. In examining the old stools of teak trees which have been felled, I have often found numerous young roots which appear to have developed adventitiously from the old roots.

All appear then here to have a crop of young roots replacing those which died from scarcity of food, just as in the case of a tree damaged by drought we have a crop of young shoots taking the place of those which have been killed. The tree, as it were,

appears to be trying to start life again with a new crop of shoots and young roots.

Different species of course vary greatly as regards their power of recovery from injuries of various kinds, but we should certainly expect that some species, at all events, are, under certain circumstances, capable of recovery completely from even severe damage by pollarding or coppicing, and that they are ultimately able to produce flowers and fertile seed just as a tree may which has recovered from severe damage by frost or drought.

Improbable that the life of the individual plant can ever be materially prolonged by repeated coppicing or pollarding.

20. Assuming that such a complete recovery may be effected we must still remember that any demand made on the powers possessed by a plant of recovering from an injury is usually very harmful if *repeated* (as an instance of which the injurious effects of repeated freezing and thawing may be taken), and it therefore appears highly improbable that the life of a tree can, under the most favourable circumstances, ever be materially increased by *repeated* coppicing or pollarding, and in Europe experience has shown that if ash or maple are repeatedly cut over they often die after the second or third operation.

Effect of the height above the ground at which the stem is cut on the production of young shoots and advisability of pollarding in certain cases.

21. Hitherto no difference has been drawn between what are commonly known as pollard-shoots and those usually called stool-shoots, seeing that, so far as their mode of development and the relations existing between them and the tree-body generally are concerned, there appears to be no essential difference between pollard-shoots springing from a stem 6 feet high and stool-shoots borne on a stool a few inches in height at most. At the same time the height at which the stem is cut above the ground often appears to be a factor exercising an important influence on the production of shoots and to which sufficient attention is often not paid. It is, for instance, often stated that *salai (Boswellia serrata)*, as a general rule, produces vigorous shoots with greater certainty if cut at a considerable height above the ground than if cut close to the ground, and it appears that, in some

valuable fuel forests of the Central Provinces, coppicing is gradually exterminating this species. If this is substantiated by careful experiments, the substitution of pollarding for coppice fellings in some of our fuel forests would appear to be a matter of urgent importance. In many cases, coppicing, or cutting low, appears to give the best results with young trees and pollarding, or cutting high, with old trees. This may in part be due to reserve food materials being principally stored in the stem and branches of old trees and in the roots of young trees, and it is suggestive that a stout branch, cut from a *salai* tree too old to coppice, will, if placed in damp soil in the rains, often develop numerous roots from the lower cut surface and shoots from the upper, thus forming a successful cutting.

Pollard-shoots also, situated at some height above the ground are, generally, less exposed to damage by fire and cattle than are coppice shoots springing from a low stool and, in view of these facts, it would appear to be a mistake to endeavour, as is done in some provinces, to enforce a general rule of felling low in village forests, where the demand is chiefly for fuel and small timber and where the forests are much subject to injury from fires and cattle.

On the other hand the spread of decay is perhaps more injurious in the case of a pollard than with a coppiced tree. In the former, decay spreading from the cut surface to the stem would weaken it, make it less able to support a heavy crown of foliage and more liable to damage by windfall, while in the coppiced tree the injurious weakening of the old roots by the spread of decay from the stool would probably be largely compensated for by the improved grip on the soil due to the development of adventitious roots.

(*To be continued.*)

ORIGINAL ARTICLES.

THE REPRODUCTION OF TEAK.

BY THE LATE C. BRUCE, F.L.S.

I enclose a photograph taken in the teak forests of the Namme Reserve, Lower Shweli Range, in the Ruby Mines Division.

This forest was once evidently the ordinary mixed teak forest with tinwa (*Cephalostachyum pergracile*) but has been for the last 15 years or so intensively worked by villagers for bamboos. The bamboos being used to raft *In* logs (*Dipterocarpus tuberculatus*) down to Mandalay.

The effect of the continuous and yearly felling of the bamboo has been marvellous, practically a huge improvement felling has been done free and regularly for the last 15 years, the result being that the teak has sprung up in a way that baffles description. I have never seen a teak plantation of any sort to equal some of the groves of Teak Pole forests in the Lower Shweli. The effect on the bamboo also has been no less remarkable ; the clumps having gradually been killed out, as the shoots every year get smaller and feebler. In the photograph clumps in a moribund condition can be seen, the vegetation having the appearance of grass being really shoots of bamboo which the weakened clumps have sent up instead of the usual 30 ft. stems. The bamboos lying cut are some to be extracted this year ; the only ones left in the area photographed.

Both inside and outside fire-protected areas the effect is the same, but outside the germination is better.

In the same forests, once away from the areas attacked by bamboo cutters, and inside the fire-protected area, the bamboo is found covering the ground with magnificent clumps, while careful and prolonged search will not enable one to discover one teak seedling which has germinated in the last nine years, *i.e.*, since fire protection was started, while the old teak stools even, which were on the ground previous to the commencement of the fire protection, are being killed off by the dense shade of the bamboo combined with that of other trees.

Photo-Mechl. Dept., Thomason College, Roorkee.

FOREST SCHOOL, VALLAMBROSA

THE ROYAL ITALIAN INSTITUTE OF FORESTRY.

Charmingly situated within easy distance of Florence stands an ancient and romantic Tusean monastery, a building of vast size placed on the northern face of an extensive amphitheatre of mountains, whose summits rise to an elevation of 1,400 metres. Vallombrosa, for this is the home of the chief Italian school of forestry, can be easily visited from Florence in a day, the journey *viâ* Pontassieve to St. Ellero by rail occupying about an hour. Thence a cable railway ascends to Saltino five miles distant, with a gradient of 1 in 5, passing through groves of oak and fertile fields to the Pratomagno range, from which exquisite views are obtained of the valley of the Arno. From Saltino a walk of half an hour through dense fir forests leads to Vallombrosa, where in addition to the monastery, now the Forest School, there are two passably good hotels. We are here in the midst of smiling meadows, but to these succeed, as we continue to ascend, forests of silver fir, while the higher summits are crowned by secular beech. During summer numerous visitors resort hither, both foreigners and inhabitants of Florence, to breathe the pure aromatic air in the silence of the dense forests of gigantic silver fir.

It was in the solitude of this hermitage that the genius of Milton, steeped in sublime contemplation, drew inspiration for the immortal poem of Paradise Lost.

> "Thick as autumnal leaves that strew the brooks
> In Vallombrosa, whose Etrurian shades
> High over-arched embower."

Mrs. Browning, speaking of Milton, writes:—

> "He sang of paradise, and smiled,
> Remembering Vallombrosa."

Here Dante also loved to walk.

The monastery is said to have been founded in the early part of the 11th century by Giovanni Gualberto, a monk of noble Florentine family, and was organised in conformity with the rules of the order of St. Benedict. After its suppression in 1866, a large forest of 1,400 hectares, along with 68 farms formerly the property

of the church, reverted to Government and now forms the estate attached to the Forest School.

About the same time the necessity of finding in Italy an intelligent agency, imbued with scientific principles, to administer the forests, inspired the happy idea of founding a school which, thanks to the zeal and intelligent co-operation of its director and professors, has acquired a deserved reputation.

The proximity of Florence, when this city was the capital of the kingdom, suggested the possibility of utilising the monastery situated in this solitary spot for a course of education in forestry, a project definitely realised in 1868

The Ministry of Agriculture was not slow to recognise the value of these studies, and orders were passed for the establishment of a course of instruction commensurate with the importance of the subject, and adapted to the needs and conditions of the country, on the lines already developed in Germany, France and Austria. Hence the Decree of 1869, approving the fundamental principles of the school of Vallombrosa.

At first the course of instruction was limited to three years, but this was afterwards increased to four. The subjects correspond to those taught in similar institutions in other countries,but are arranged with regard to their relative importance to the needs of Italy. During the first three years considerable time is devoted to the study of the French, German, and Italian languages. The sum payable annually by each student at the school is 600 lire equivalent to £24.

On passing out graduates are appointed Assistant Sub-Inspectors on a salary of 1,200 lire or £48, and may rise to the following grades :—

Sub-Inspector	3rd class	on a salary of	1,500 lire = £		60
	2nd	„	„	2,000	„ „ 80
	1st	„	„	2,500	„ „ 100
Inspector	3rd	„	„	3,000	„ „ 120
	2nd	„	„	3,500	„ „ 140
	1st	„	„	4,000	„ „ 160
Chief Inspector	2nd	„	„	5,000	„ „ 200
	1st	„	„	6,000	„ „ 240

The present Director of the School, Commandant Piccioli, an officer of Engineers, is well known in the scientific world for numerous works on Forestry, the latest being his "Boschi and Torrenti," which deals with the planting of areas denuded by torrents.

He has been Professor since 1870 and Director since 1878, and has taken a leading part in framing the forest policy by which the Italian administration is guided. He has also been largely instrumental in creating and developing the first climatic station of Italy, which is now frequented by numerous strangers, and especially by Anglo-Saxon pilgrims to the spot which inspired the English Alighieri.

H. K.

SANDAL WOOD AT KURNOOL.

BY M. RAMA RAO, MADRAS FOREST DEPARTMENT.

I was agreeably surprised to find sandal in all stages of growth up to small poles growing in the compound of the Kolhapur Raja's bungalow in Kurnool town, the tree being associated with Inga dulcis, Melia azadirachta, Albizza Lebbek and other species. The soil is black cotton and moistened by a channel from the Jungabhadra canal. The young sandal forms a regular thicket. I observed a few young poles cut away by the gardener probably in ignorance of the value of what he was destroying, or through sheer carelessness. Before arriving at Kurnool, I had neither heard nor read of the existence of sandal in Kurnool itself and hence my surprise.

Mr. A. W. Lushington has since informed me that the late Mr. Sheffield reported in 1864 that there was young sandal in the Pechernvu plateau covering about 200 square miles, that the wood was scentless, that there were no trees over 4 inches in diameter and that it was much stolen and taken to Hyderabad territory. Mr. Lushington himself found in July 1905 heaps of sandal plants on the plateau but none above 2 inches in diameter. Mr. Sheffield's report

that the wood was scentless was probably based on an examination of young trees which had not developed heartwood. The fact that stolen wood was taken to Hyderabad indicates that there must have been scented heartwood in bigger trees which had disappeared in Mr. Sheffield's time.

Some months ago I was walking along the Jungabhadra canal bank when I noticed between the Hindri aqueduct and the toll-gate on the Kurnool-Dhone road a few sandal trees of fairly good size and partially mutilated crowns growing along the outer foot of the canal bank. On approaching the trees I found the trunks of the largest two of them had been sliced off from the base to a height of about 2½ to 3 feet on the sides away from the bank and the wood taken away. The heartwood was well scented and some thief who knew what the trees were must have damaged the trunks. The crowns had been lopped off for feeding goats as I found twigs and branches lying under the trees shorn of their leaves. Officers connected with the canal knew nothing about the existence of these trees or that they were sandal trees until they were told so by me. There were in all five trees including the two above mentioned, which were the largest—one measuring 3 feet 4 inches in girth at base and 33 inches at breast height (4½ feet from base) and the other measuring 32 inches at a height of 2 feet 9 inches from the base.

In the course of felling the two biggest trees the following points were noticed :—

1. *Soil.*—This is black cotton soil excavated from the canal and thrown on to the embankment. Just outside the embankment the soil is also black cotton, pretty deep and resting on black or grey shale (Kurnool series). The canal which contains water almost throughout the year at that particular locality must have kept the subsoil always moist by percolation.

2. *Elevation.*—This is about the same as Kurnool town which is 900 feet above the sea-level. It is situated at 15° 50′ north latitude and 78° 6′ east longitude.

Climatic conditions.—The average annual mean temperature of Kurnool is 83°—the average maximum of the past five years

in the hottest month (May) being 109·2° and the minimum in the coldest month (December) 49·4°. The average annual rainfall recorded at Kurnool for the past 20 years is 27·48 inches.

Associates.—Margosa (*Melia azadirachta*), Inga dulcis, Albizzia Lebbek, bushes of Anona squamosa, and a few cork trees (*Millingtonia hortensis*) on the top of the embankment and a few babool bushes (*Acacia arabica*). Of the above, Albizzia Lebbek, Anona squamosa, Inga dulcis, and margosa trees were growing very close to the sandal trees.

Root ramification.—In both the trees felled it was noticed that the bulk of the main side roots extended towards the canal; and the few that grew away from it were dead or dying. It appeared probable that the unhealthy and dying condition of the roots of the latter was due to the trunk on their side having been sliced off and damaged long ago. I believe this is due to the descent of the *elaborated* sap being prevented by the loss of bark and sapwood on the damaged side and to the consequent starvation of the roots below on that side. The same or similar reasons may explain the occurrence of *spike* in portions of the crown of a sandal tree while the other portions are healthy and normal.

Whether the large extension of the side-roots towards the canal through the embankment was due to the position of the majority of the hosts on that side or to the moisture in the canal or to both, it is difficult to say without examining the whole root system, which of course it was impossible to do, but I think that these were the main inducing causes.

Fructification.—In the first week of January last I noticed only one tree bearing flower buds on a large scale, while in others no inflorescence was observed, but in two of the five trees there were a few ripe fruit which were picked off for sowing. Under the two big trees about two measures of ripe seed were gathered during that week and since sown and found to germinate well. The seed thus gathered must have been shed by the trees during November and December. On the 26th February flower

buds were observed on all the trees except one in which young fruit had already begun to form. As the trees were close to each other this difference is striking and has therefore been recorded.

Natural reproduction.—Both in the Kolhapur Raja's compound and on the canal bank above referred to young sandal plants are found in plenty, although at the latter place the plants have suffered considerable damage from cattle and goats. A few plants were dug up and found to be seedlings. They are chiefly found amidst Anona squamosa and babul bushes. That these young plants are the result of natural reproduction from the seed shed by the larger trees and from their roots there is absolutely no doubt whatever. The reproduction is as plentiful and promising here as in the natural *habitat* of sandal.

The origin of these sandal trees.—I could get no reliable information on this point. It may be presumed that it was introduced into the Kolhapur Raja's compound from somewhere. But how the trees on the canal bank came there could not be accurately ascertained. An old Mahomedan woman living in the Mahomedan *kabrasthan* close by the trees informed me that there were a few plants there just before the canal was dug in 1861 or so. But if this were so the plants would have been destroyed during the formation of the canal. I therefore think that her story is hardly credible. Could they have resulted from seed brought down by the flood of the Jungabhadra river which traverses the sandal tracts of the Thimga District in the Mysore Province and those of Hospet Taluq and Tandur State in the Bellary District? If this be so, sandal plants should be found along the banks of the river higher up. This latter surmise seems to be very probable, as I have found sandal plants along the canal bank four miles above Kurnool near Munigulpand, where the village officials informed me that it is found here and there up the canal as far as Sunkesala where the canal branches off from the Jungabhadra.

Points observed regarding *growth and development in the two felled trees.*

Particulars.	*Tree No. 1.*	*Tree No. 2.*
(*a*) Height up to end of woody portion.	28′-3″	38′
(*b*) Girth	32″ at 2′-9″	33″ at 4½′ from base.
(*c*) Concentric rings ...	42 counted at 2′-9″ from base.	52 counted at 4½′ from base.
(*d*) Height up to which heartwood extended.	17′	30′
(*e*) Average diameter of heartwood.	6″	7″
(*f*) Total yield of scented heartwood.	123* lbs. of which 35 lbs. rootwood.	260* lbs. of which 40 lbs. rootwood.

**N. B.*—The yield would have been much greater had not the trunks been sliced off and taken away. It would be within the mark to add 20 lbs. to each tree as that is the estimated quantity of the heartwood stolen.

The average radius of the transverse section of No. I tree comes to 5·09 inches and that of tree No. II to 5·25 inches. Deducting therefrom 0·25 inches for the thickness of the bark, the radii of the woody cylinders would be 4·84 inches and 5 inches respectively; and this works out to 8 rings per inch in tree No. I and 10 rings in the other. This indicates that the growth of the trees at Kurnool is as good as the sandal trees on the Javadis, if not better.

As regards the yield of scented wood, the output of these trees compares very favourably with that of the trees of similar girths grown on all the hill ranges of the Salem District and also of the North Coimbatore District (*vide* table No. 2 on page 7 of my "Notes on Sandal"). It may be here remarked that these two trees had not attained their maximum physical development, and but for the serious damage done to their trunks and crowns they could have gone on growing and developing for a number of years.

The scent of the heartwood was well developed both in the stem and the roots, and appeared to me to be not inferior to that of similar trees grown in the Salem District. In personally undertaking the extraction of scented wood in these trees, my chief object has been to test the accuracy of observations made by some writers on sandal that at low elevations scented wood is not developed, and where it is, that it is very poor in oil. This theory did not appear to me to be correct and I was therefore on the look out for evidence to test its accuracy. The results now obtained at Kurnool prove beyond all doubt that the theory cannot hold water and that sandal does produce heartwood even at such low elevations as 900 feet provided other conditions of growth are favourable.

In the beginning of 1905 having observed some fairly big sandal trees growing in the compound of Mr. Shutie, Principal of the Salem College, I felled two of the largest trees with his permission, one of them was 6¾ inches in diameter with a heartwood ring 3 inches broad. The other tree was 27¾ inches in girth and the diameter of heartwood was 5½ inches. These trees were growing associated with Melia azadirachta, Morinda citrifolia, Zizyphus jujuba, Eugenia jambolana, Streblus asper, mango and tamarind trees. The soil was deep black loam. Salem is at an elevation of 950 feet above sea level. Through the kindness of Mr. A. W. Lushington, Conservator of Forests, Northern Circle, Madras, I received a piece of sandal wood grown in the Ranee Sahib's compound in Vizagapatam not 30 feet above sea level. The wood was scented but faintly, and this latter circumstance is evidently due to its being comparatively young and immature. This piece of sandal wood and a piece grown at Kurnool have been sent to the Imperial Forest College Museum at Dehra Dun; and another piece of Kurnool grown wood to the Coimbatore Gass Museum.

With this positive evidence before us of the development of scented heartwood at such low elevations, I think the cause for non-development of scent elsewhere must be looked for not in the *elevation of a locality* but in something else; and what this latter is

must be ascertained by a careful study of the surrounding conditions. This evidence strengthens my belief already recorded elsewhere *that the associates of sandal play a very important part in the development of scent.*

BASSIA LATIFOLIA GUM.

BY P. SHANKERNATH, FOREST RANGER, CENTRAL PROVINCES.

In 1905 whilst engaged in making collections of various products for the Indian Museum in Calcutta, my attention was drawn to a milky exudation from cuts made in the bark of the Mohwa tree. I was able to collect a small quantity of this gum, and the specimens so collected by me were in due course forwarded to the Reporter on Economic Products to the Government of India. Mr. D. Hooper, the Officiating Reporter, was apparently much interested in these samples, and in drawing attention to them he wrote as follows :—

"This gum has the properties and composition of Balata gum or gum Chichla, a natural substitute for gutta-percha, collected and exported in large quantities from British and Dutch Guiana. This discovery is of some interest, and I should be pleased if you could ascertain if this product is available in any quantity and if the trees would bear tapping at the suitable season of the year in order to induce a larger yield of gum. The *Bassia* is abundant in several parts of Northern India and the gum has been occasionally referred to, but hitherto its character has not been determined. The samples of gum from your division had the following percentage composition :—

	I.	II.	III.
Moisture ...	3·8	6·7	4·9
Gutta ...	49·5	43·6	46·5
Resins ...	37·5	35·0	37·6
Ash and dirt ...	9·2	14·7	11·0

"I should be glad to have a large sample of this gum for Museum purposes, and any remarks you may have to offer on the collection of the gum as a commercial article."

Accordingly during the past few months I have been engaged in carrying out certain experiments, with results that may be found sufficiently interesting to your readers.

Some 50 large Mohwa trees, growing in more or less isolated positions, in the Government Forest village area of Barwani of the Hoshangabad Division, were selected and marked for experiment; and arrangements were made to "*tap*" each of these trees in exactly the same way as pine trees are tapped for resin. Incisions were made into the bark of the tree, and small earthen pots were placed below the cut to collect the gum as it exuded.

The 50 Mohwa trees selected for treatment varied in girth from $3\frac{1}{4}$ feet to $11\frac{1}{4}$ feet, and three different kinds of notches were tried, namely, perpendicular |, slanting \ and V-shaped V. It was soon found that Mohwa trees below 6 feet in girth were of little use, as the quantity of gum exuded was inappreciable; and that the slanting notch, \ gave the best results. Further, the flow of "gum" or milk continues only for about 24 hours after the notch or cut is made. At the end of this time the flow stops and it is not renewed by shaving or scraping or deepening the notch. Moreover, this flow or exudation is more abundant in the early mornings or late evenings after the notch is made, and practically stops in the middle of the day.

Other general results noted may also be briefly alluded to. As might well be expected, trees growing in the open in fields exude larger quantities of gum than trees of the same girth growing in the forests; and the greater the girth of the tree, the greater the quantity of gum obtained. Again, a tree tapped in more places than one at one time gives almost the same total quantity of milk as a tree of the same girth in which the same number of notches are made one by one at intervals of 24 hours, provided the notches are made in both cases at the same height above the ground; a slanting notch made at a height of about 3 feet above the ground giving the best result.

Bearing in mind these details which affect results, it is only necessary now to give a few figures. As above explained, 50 Mohwa trees were tapped, 20 of which were below 6 feet in girth

and yielded little or no gum. The remaining 30 trees exuded gum from each notch in quantities varying from ¼ tola to 4⅛ tolas per notch ; the total quantity so collected from the 30 trees being about 80 tolas. In other words, by careful and systematic tapping, to be continued for a series of years, an outturn of about 2½ tolas of gum per tree may be expected under favourable conditions, and provided the trees available are of large girth.

In addition, experiments were carried out to ascertain what would be the maximum quantity of gum that could be obtained from one mature tree by a concentrated process of heavy tapping. Accordingly six notches were made in a circle at a height of 3 feet from the ground, with an interval of about 10 inches between each notch. As a result a quantity of gum varying from 1½ to 2 tolas was obtained from each notch, the six notches yielding 10¾ tolas. As soon as gum had ceased to exude from this row of notches, a second row of six notches was made one foot higher, that is, at a height of 4 feet from the ground. These six notches yielded 8¼ tolas of gum, the amount varying from ¾ to 1¾ tolas per notch. Similarly, a third row of six notches was made in the same tree at a height of 5 feet from the ground ; but this row only yielded 3 tolas of gum, varying from ¼ to ¾ tolas per notch.

Thus from a single tree a total quantity of 22 tolas of gum was obtained; and this may be taken to represent the maximum quantity that could be obtained from a good average tree in any one year ; but naturally no tree could be tapped to this extent annually.

These results from a purely commercial point of view are wholly unsatisfactory, and the verdict must naturally be that *le jeu ne vaut pas la chandelle.* In practice, under systematic working some 20 mature Mohwa trees would have to be tapped to yield an annual outturn of 1 lb. of this substitute for gutta-percha. In the *Indian Forester* for April 1906 Burma India-rubber is quoted in the London market at 1*s.* 6*d.* to 3*s.* 8*d.* a pound, and this is exclusive of expenses connected with the collection and carriage of the product. The profit, therefore, to be derived from the tapping of Mohwa trees is indeed small. On the other hand in Central India the Mohwa is a tree of the very greatest economic value both on

account of the fleshy sweet corollas of its flowers and of its fruit; full information regarding the uses of this important tree will be found in Watt's Dictionary of Economic Products, Vol. I, page 406.

No information has so far been collected as regards the damage that may be done to a tree by tapping, both to the tree itself and to the flower crop. A curious fact, however, has come to my notice whilst carrying out these experiments, namely, that the aboriginal tribes of these forests, the Gonds and Korkus, are in the habit of making a ring of cuts with an axe round the bottom of the stem of Mohwa trees with the object of increasing the yield of flowers.

RESEARCHES ON THE REGENERATION OF SILVER FIR.

BY E. RADCLIFFE, KASHMIR FOREST DEPARTMENT.

It was with much interest that I read the article by A. G. H. H. in the May number of the *Indian Forester*. The question of the regeneration of Silver Fir in the Kashmir Valley proper is one of most vital importance as, owing to the position of the forests and the special demand for the timber as firewood for the Sericulture Department, these forests are being worked up to, if not over, their yield. As a matter of fact the reproduction of Silver Fir in this valley is perhaps better than in most other Himalayan forests, but at the same time it is not satisfactory. From my own observations there appears to be no certainty with regard to young growth as there is with Deodar and Blue Pine and reproduction is found flourishing in different parts and under, apparently, totally different conditions. No efforts have yet been made to try and reproduce the species artificially, and even if sowings and plantings were carried out the results, as has been the case with all Deodar and Pine sowings and plantings, would be *nil* under the present conditions when the Forest Department has no power to control even grazing in first class forests.

In Gulmarg, where the forests are principally composed of Silver Fir, the best growth, as a rule, is found on stony islands in streams running through the forests but at the same time

excellent thickets are found on dry open ridges and, rarely, in grassy blanks. Once young trees establish themselves they thrive wonderfully, but grazing undoubtedly kills numbers of seedlings and also stunts the growth of the hardier plants which have survived this drastic treatment. The tree itself is more open to the attacks of fungi than any other coniferous species owing, undoubtedly, to the want of any separate heart-wood and there is no doubt that fungoid growth is more common in these forests than others. The question is whether this growth is natural as it is or whether it is aggravated by the presence of large quantities of cattle manure? Judging from the places in which reproduction is found there appears to be some connection between the two as, generally, reproduction is found on stony islands, where cattle will not usually go, or it is found on steep ridges up which these animals, as a rule, will not climb. There is no doubt that a continuous pure growth of one particular tree must tend, in time, to impoverish the soil for that species in the same way that agricultural crops do, and unless a proper rotation of cropping is taken in hand and, especially, unless some green crop, such as any leguminous plant, is put down, after a certain period the quantity of nitrates in the soil is reduced to a minimum. Under ordinary circumstances in a forest, the chemicals taken up by a tree are returned when the tree dies, but in forests which are being worked the trees are removed altogether, so that the soil becomes more quickly impoverished. In this way the soil is reduced to a weed or shrub producing condition. With regard to the manure theory, there are some weeds which thrive on it especially the Dock which may be seen growing all over ground where cattle or sheep and goats have rested in their wanderings, and such growth effectually prevents any other from coming up even if it would do so in such places, which is highly improbable; there seems but little doubt that this action of manure is gradually getting worse in the Kashmir Valley as herds and flocks increase, which they are doing rapidly in proportion to the number of forests closed in India to grazing. Where there is a collection of fallen trees the reproduction is good, but whether this is due to the presence of returned chemicals

chiefly, or to the fact that these trees act as a barrier to cattle and so the young plants are not disturbed, is a matter which cannot be decided without a special study of local circumstances. Whatever are the reasons for this extraordinary want of regeneration of Silver Fir, which, it must be remembered, is not the case with other coniferous species, the only way to discover them is to place certain similar areas under different conditions and to judge from the ultimate results.

CORRESPONDENCE.

TO THE HONORARY EDITOR OF THE INDIAN FORESTER.

FORESTRY TUITION AT OXFORD AND DEHRA DOON.

SIR,—You have, of late, brought out several articles in which you have run down the arrangements at Oxford, and run up those at Dehra Doon, until you have arrived at the conclusion that the course of instruction in Forestry at Dehra Doon compares very favourably with that lately inaugurated at Oxford. That result seems to be very pleasing to you, but, I fear, the whole of your arguments merely raise a smile on the face of those who are acquainted with the actual facts of the case.

We have here a student who passed out of the Dehra Doon School with Honours at the top of the year and he seems to find something additional to learn here !

As far as I can make out, you seem to be somewhat in ignorance of the amount of time bestowed here upon various branches of study. When we came to Oxford, I was determined that Natural History should be adequately taught. Thus the students devote now the following time to Geology, Botany and Entomology.

Geology.—58 lectures and 96 hours' practical work in the laboratory. There are also occasional excursions.

Botany.—144 lectures and 288 hours of practical work, one-half of it given in the Botanic Garden.

Entomology.—72 lectures and 144 hours of practical work. About half the time is devoted to general zoological work, and the other to special entomological work. All this instruction is given by first class scientific men, two of them being Fellows of the Royal Society.

I leave it to those who know Dehra Doon to judge whether the instruction in Natural History is equal or superior to our course here or not.

Our course of instruction in Forestry is practically the same as that at Coopers Hill during the last few years, which I need not describe. I must, however, take notice of what you say regarding the practical course in the third year. I consider it of the first importance that the students should become well acquainted with the details of managing and administering a Range (Oberförsterei-Inspection) in those countries where Forest Administration has been brought to the highest efficiency. All those who have gone through this will, with the greatest ease, find themselves soon at home in Indian conditions, and they will be far better able to see in what direction improvement is wanted than if they had been trained in India itself. This is what men like Brandis, Hill and Eardley-Wilmot have done, who, I feel sure, would never have become what they are, if they had not become acquainted with practical work in French and German forests

I also notice that you run down the new method of selection. Candidates must now bring evidence—

(1) that they have received a sufficient general education, such as is provided by a first class public school;

(2) that they have assimilated a fair knowledge of Physics, Inorganic Chemistry, certain chapters of Organic Chemistry, and the elements of Botany;

(3) that they have a sufficient knowledge of German, without which they could not derive full benefit from their practical course in that country.

I confess I fail to see what more you expect, considering the rate of pay prevailing in the Forest Department. If you desire to attract Senior Wranglers or Double Firsts with a knowledge of,

say, German, French and Danish you must first ask the Government to raise the emoluments of the service so as to make them at least equal to those of the so-called "Civil Service." To expect men of that class to join the Forest Department, as matters now stand, is simply unreasonable.

W. SCHLICH.

CHICKRASSIA TABULARIS.

SIR,—I do not know *à propos* of what Ranger Rai Mohan Chakravarty is writing about the 3-celled capsules of Chickrassia tabularis as described in Hooker, but most of the capsules in Ramandrug, Bellary District, and in the North Coimbatore forests which I found were 4- and occasionally 5-celled. I found moreover that the dehiscence was septifragal—as in Cedrela—and not loculicidal—as given in Hooker; and on referring the matter to Mr. Gamble the last time I was in England, he found out for me that it was so described—septifragal—by Engler.

A. W. LUSHINGTON.

19th June 1906.

BRUSHWOOD BURNING IN THE CHANGA MANGA PLANTATION.

SIR,—I have read with interest the comments of S. Jagat Singh on my article on this subject published in the *Indian Forester* of February last, but I am unable to consider that they answer my questions. I for one am quite against brushwood burning. My reasons against it are given in the contrast published in the article above referred to. I propose now to illustrate them.

As an experiment the brushwood in one of the compartments felled last winter was not burnt. In the rest it was burnt in March-April. Water was let in in all the compartments after the burning was over. The result is very remarkable.

Results of non-burning—(compartment 55).

(1) The coppice shoots of sissu and mulberry are now over 4½ feet high, very vigorous, of a dark green colour, and encircling the entire stools, sissu being more abundant than mulberry.

(2) Hardly any blanks exist, except those little ones caused by nature. This does away largely with the necessity for sowing or planting and consequently saves a lot of money and trouble to Government, involved in the operation and after-tending.

(3) The bunds erected have greatly facilitated irrigation and have done away with the necessity of retrenching and have proved economical. It might be asked how irrigation can be effected without trenches. The answer is that we do not confine ourselves to these small interior trenches (12″ × 9″). Water is allowed to pass over them to drench the whole area. The climate being hot and dry and the soil porous, often somewhat saline with kankar beds beneath, watering by the small interior trenches is quite insufficient. Without the irrigation bunds, water naturally collects in the low levels filling which it rises up to the higher ones, this involving a waste of money and time.

These bunds should be 2′ × 2′ and made at the known levels of the compartments and could be planted along with advantage.

(4) The brushwood is not interfering much with the coppice shoots; where it does only the leading shoots require to be freed, and these cases are very rare.

(5) The brushwood left on the ground is sinking and crumbling down under the influence of water. In the course of time—two or three years at most—it will not only have decomposed but will also yield a good soil humus and form a beneficial vegetable manure. This is certainly bound to do enormous good to the soil and to the production of better trees.

(6) Standards left in the area are all very healthy and growing vigorously.

(7) Along the *khals*, water courses and other open places, the presence of natural seedlings of sissu here and there, about a month old, provides food for thought.

Results of burning—(compartments 53, 54, 56, 73, 74).

(1) The coppice shoots are hardly 12″ above ground (the growth being retarded by fire), are weak, thin, of a palish green colour, and cover only a small part of the parent stools. The mulberry is more plentiful than the sissu the latter being killed

in many places. This predominance of the mulberry appears to be one of the chief results of burning; the reasons advanced for its predominance appear to be that it is a hardier species than sissu, more tenacious, shade bearing, gregarious, its seed is easier disseminated by birds, etc. These are all true to a certain extent, but regard is not paid to the potent fact that burning greatly retards the growth of the sissu.

(2) Many blanks are caused, parts appear desolate where stools are burnt or injured down to the roots. This necessitates the reafforestation of the blanks by means of sowing and planting involving much expenditure to Government with results not always satisfactory.

(3) The work of retrenching is in progress, costing not less than Re. 1 per acre. This is being done for the sake of sowing, planting and irrigation.

(4) The brushwood having been burnt away and the soil humus and vegetable mould along with it, the soil looks a dreary waste, quite bare and nude of vegetation in many places, especially so where the brushwood was heavy.

(5) Owing to the burning the soil is rendered too poor to produce even grass until it is watered freely. During the course of two rotations which is 30 years or after a second firing in the same coupe the soil will undoubtedly become too poor to produce good trees or to send out good coppice shoots. This is a consideration of a very serious nature demanding the notice of the experts.

(6) Some of the standards have died and the rest do not look so healthy.

(7) The seed shed by the standards or brought by wind or water early in spring, much of which should have appeared in beautiful young seedlings by now, is alas! burnt down to ashes in the brushwood burning.

IV.—About the fungoid growths and attacks of insects as the results of burning or not burning I will say something later on, when the experiment has fully developed itself.

LAHORE: ATMA RAM,
28th June 1906. *Extra Asst. Conservator of Forests.*

GERMINATION OF TEAK.

SIR,—The method of germination of teak I suggest is but a modification of one communicated some time ago by Mr. Damle of the Bombay Forest Department, but, I fancy, has more chances of success than that referred to. It consists in cutting into the ground a bed 3½ feet long and 2½ feet wide, with a depth of about 6 inches, all the lose earth being removed from it; the bed is then filled in with cowdung well mixed with water, so as to reduce it to the consistency of a paste. Then select good healthy seeds, put them into the mixture thus made, and water the bed every alternate day for about a fortnight, when you will see that some of the future plants have already made their appearance. Continue watering for about another week, and you will find that almost all the seeds have successfully germinated. During last rains, I treated two hundred seeds in this way and had very marked results.

I also tried some seeds in the droppings of sheep, but they all failed, and I think the abnormal heat given out by the stuff might have retarded their germination.

NEMAR, INDORE STATE: A. B. PUNDE,
15*th June* 1906. *Assistant Conservator of Forests.*

REVIEWS AND TRANSLATIONS.

TRAITÉ D'EXPLOITATION COMMERCIALE DES BOIS.

Traité d'exploitation des bois par Alphonse Mathey, Inspecteur des Eaux et Forêts, Digon. Lucien Laveur, 13, Rue des Saints Pères, Paris.

The first volume of this treatise has recently reached us. Its aim is to supply a text-book to sylviculturists and to those engaged in the utilisation and transport of timber. Its scope is therefore necessarily wider than would be the case in a treatise dealing solely with the subjects usually looked for by the professional forester in a work of this class. The volume is divided

into five parts each of which is subdivided into its own series of chapters.

Part I commences with a short summary of the composition of ligneous tissues, then passes into a classification and identification of the various timbers according to characteristics visible without the aid of a microscope. Timbers commonly imported into Europe are included. The chemical and physical characteristics of timber together with the influences determining their variation are discussed at some length. It will interest Indian Forest Officers to hear of the author's suggestion, that the durability of teak is perhaps attributable to its smell of caoutchouc. The qualities or usefulness of timber depending on the proportion of heartwood to sapwood, the fineness or coarseness of its grain and influences of soil and altitude on the above are discussed, in what is a very short chapter considering their extreme importance.

Part II deals with the defects and diseases of timber, both physical and parasitic. The author deals with the subject in detail and illustrates his statements with excellent coloured plates drawn by himself from typical specimens. The subjects referred to above are usually sought for in special text-books on Botany or Timber. In this volume over 200 out of 488 pages are devoted to matter which, in our opinion, is misplaced in a treatise on the commercial utilisation of timber.

Part III deals with the natural and artificial preservation and storage of timber. The illustrations showing methods of stacking billets and railway sleepers so as to minimise the percolation of water into the stacks are of practical interest. The various processes of injection and immersion are described and there are many details of value to European Foresters such as the degree of absorbtion of the preservatives by the various species. Natural and artificial processes of drying, though they afford little of practical interest serve to complete this, the first really practical and useful part of the book.

Part IV deals with the technical exploitation of timber including felling and conversion, together with rules for the clearance

of fellings even including suggestions for scales of damages assessable for delay in clearing coupes and injury to standards. The chapter on tools used for felling and conversion is well illustrated but contains nothing not already dealt with in existing text-books on Forest utilisation.

Part V deals with means of export and is one of the most interesting and exhaustive subjects of the volume, occupying about 180 pages. The opening remarks on the influence of the cost of transport on the value of timber are interesting. Ordinary wheeled transport, floating and sledging are treated in detail. Chapter V describes the various forms of slides. Those who do not already possess a work of reference showing the effective gradients of slides on different soils for varying sizes of timber will find much of practical value in this chapter. India, however, has little to learn from Europe in the construction and uses of forest slides and sledge ways. The chapter on wire ropeways also contains much practical information on the strength of the different materials, details which would ordinarily be searched for at considerable labour and time in works on Engineering. Chapter VI deals with tramways and although a great deal of the matter is already accessible, there is some valuable statistical information to be found. The portable De Cauville system alone is described. Much more might have been made of this subject. The safe loads on the various weights of rails, also the effect of varying the spacing of the sleepers, would have been information of practical utility. The illustrations are mainly from the catalogue of the firm of De Cauville. The monorail is very cursorily treated. In about two pages with two illustrations of a monorail borne on wooden trestles, the system is dismissed. This is disappointing when we remember that the modern monorail is of French origin and promises to solve many problems depending on cheap transport. The last chapter treats of carriage by canal and railway. The rates in force on the various railway lines or systems are quoted for the different classes of produce. Rates in France, as elsewhere, are presumably liable to periodical revision and therefore the value of the information will probably soon become of doubtful accuracy or utility.

The volume is a complete encyclopaedia of information on all subjects pertaining to Forest utilisation in France. It will no doubt be welcomed by the timber merchant, seeking to study the technical and scientific aspects of his trade The treatise will, on account of the mass of tabulated information, form a valuable addition to every Forest Officer's library.

CURRENT LITERATURE.

FOREST BULLETIN NO. 4 on FICUS ELASTICA, *its Natural Growth and Artificial Propagation* has recently reached us. Mr. E. M. Coventry, the author, first considers the natural growth of the trees, and then describes the various methods of artificial propagation under which the different methods of propagation by layers, cuttings, gooties, seedlings planted in the forks and on branches of trees and seedlings planted on split stumps, etc., are discussed ; the reproduction by nursery seedlings includes the collection of seed, preparation of the nursery and seed beds, method and season of sowing, etc., etc. ; the planting out in the forests and maintenance of the plantation are then treated of in detail. Chapter II details the method of tapping the tree, the age at which to tap, season, preparation and packing of the rubber for export and cost of these operations. The plantation upon which the Bulletin is based is the Charduar Rubber Plantation in the Darrang Division in Assam and some appendices give height and circumference measurements, area statements and outturn of rubber from the plantation. The Bulletin is an important one and should be in the hands of all who are interested in rubber plantation and the rubber trade.

FOREST BULLETIN NO. 6 on MECHANICAL TESTS of *Some Indian Timbers* by Mr W. H. Everett is issued in the Appendix Series with the present number of the *Indian Forester*.

THE CANADIAN FORESTRY JOURNAL for the quarter ending May 1906 gives an interesting description of the annual meeting of the Canadian Forestry Association. The report of the Board of Directors congratulates the Association "on the most successful year in its history," a remark which all who have followed the

fortunes of the Association will heartily endorse, the year having witnessed the great Forestry Convention of January last. The number contains an interesting article by A. Harold Unwin on Logging in Southern Nigeria and a paper on Canadian Forestry Education by A. H. D. Ross of the Yale Forest School.

The TRANSACTIONS of the ROYAL SCOTTISH ARBORICULTURE SOCIETY, Vol. XIX, Part II, contain an article on the "Planting of Waste Lands for Profit" by John Nisbet, D. ŒC., in which the author discusses his subject in a practical manner, pointing out what profits may be reasonably looked for and the steps Government can be reasonably expected to take with reference to legislative and administrative improvements and to plant up waste lands.

In a Note on the Area of Woodlands in Great Britain in the same number some interesting data are given. The woodland area is returned under the several categories (1)—Coppice, *i.e.*, woods, whether containing standards or not, that are entirely cut over periodically and reproduce themselves naturally by stool shoots; (2) Plantations, *i.e.*, land planted or replanted within the last ten years; and (3) "Other woods" which include all land (not returned as coppice or plantation) used altogether or mainly for the growth of wood (other than orchards). Summarising the amounts we find that there are 576,871 acres of coppice, 103,683 of plantations (since 1895) and 2,087,689 other woods, the total wood lands amounting to 2,768,243 acres.

SHIKAR, TRAVEL, AND NATURAL HISTORY NOTES.

CONCERNING BONGAS AND FIRE-PROTECTION.

"The Heathen in his blindness
Bows down to wood and stone."

Even granting the full latitude allowed by poetic license to the learned author of the hymn from which the above couplet is an extract, it is not easy to reconcile such an astounding statement with facts. It requires neither the erudition of Nancy nor the training of Coopers Hill to see that in the vast majority of cases, it

is *the wood that bows down to the heathen* and not the heathen that bows down to the wood. A thousand barren hillsides seamed with scoured out watercourses testify to the fact. Yet there is a notable exception to be found almost throughout India. Among the "heathen"—this opprobrious term is none of my making—exist a class who jealously guard the finest groups of trees within their particular villages. These are the Bongas or wood spirits of whom certain enthusiasts from Exeter Hall and elsewhere would have us believe that their existence is a myth. Be this as it may, the Bonga exists for all practical purposes amongst the more intelligent jungle folk of India. Moreover he is a forester, born and bred, and encourages the reservation of trees. My point is that more use might be made of him, and an attempt to do this is being made in this division by extending and fire-tracing his dwelling places. It is obvious that no one who lives in places where the thermometer runs to over 110 degrees can look forward to the addition of fire with complacency! This however our Bonga is often expected to do, but, I think that, if the point were fully explained to his adherents, as well as the fact that his grove will eventually disappear if regularly burnt, a good deal might be done to instruct the said heathen in living up to his reputation as set forth in the hymn above quoted. In any case the experiment costs little or nothing, and it is possible that good may come of it. In common with other people the Bonga is not above the pleasures of the table, and a little sympathy in this direction finds a ready response among his friends, with whom, I regret to say, is not numbered the Accountant-General, Bengal, who is inclined to jib at the expense of the feast when entered in the divisional accounts.*

SINGABONGA.

* To those who are not acquainted with the characteristics of the jungle folk alluded to, the following explanation may be of interest. For organising forest villages in the division referred to where labour is scarce it has often been found that the people require to make considerable sacrifices to the presiding spirit of the grove (Bonga-sarna) to ward off calamity and sickness. The Divisional Officer has occasionally found it politic to himself give a goat or fowl to prevent the people leaving the new site. He has not found, however, that sympathetic spirit looked for when charging such items in his accounts – [HON. ED.]

EXTRACTS FROM OFFICIAL PAPERS.

PAY OF ACTING APPOINTMENTS.

A SENSIBLE CONCESSION.

Simla, 11th August.

The following resolution appears in the *Gazette of India*:—

The Government of India have had under their consideration the question of abolishing or modifying the rule contained in Article 99 of the Civil Service Regulations, which lays down that, subject to certain provisions, no acting allowance is to be given to an officer acting in a higher appointment or grade in consequence of the absence of another officer on privilege leave for the first thirty days of such acting appointment, unless the acting officer is transferred from another station, in which case he may draw three-fourths of the acting allowance otherwise admissible. The rule has been in operation for twenty-five years, having been adopted in 1881, at the instance of the Secretary of State for India primarily as a measure of economy, though it was also anticipated that its effects would be of benefit as tending to prevent the withdrawal for short periods of many officers from the duties of their substantive appointments.

The Government of India have long been aware that the rule is regarded by officers generally as both illogical and illiberal, and they think it probable that the economies which it has effected are incommensurate with the irritation which its application has aroused. Up to the present time they have not felt able to ask the Secretary of State to reconsider a decision of such authority and long standing, but it appears to them that the important change in the rules introduced in January 1901 has altered the position sufficiently to justify a reconsideration of the matter. The theory underlying the decision of 1881 was that privilege leave is intended to be an annual holiday, and that, as is the practice in England,

the duties of an officer absent for a few weeks should be carried on by an officer on the spot without extra expense to the State. Now that the regulations permit the combination of privilege leave with other kinds of leave, privilege leave is much less frequently taken by itself for short periods, and the acting appointments made in consequence of an officer going on combined leave last for periods of from six months to two years.

The rules as they stand present the anomaly that when an officer takes conbined leave for any period from six months to two years, his *locum tenens* draws no acting allowance for the first thirty days, although his duties being new to him are for the first month usually more arduous than in the later period for which he receives an allowance. Another illustration of the anomalous manner in which the rule operates is to be found in the case of an officer acting for another deputed on special duty, who, on the completion of his special work, proceeds on privilege leave combined with other leave. In this instance the acting officer is with no interruption or change of duties deprived of the acting allowance which he was drawing before the commencement of the privilege leave, and which he draws again after the first thirty days of the leave.

The Governor-General in Council is pleased to announce that the Secretary of State, to whom the matter was represented, has now sanctioned the abolition of the rule in Article 99 of the Civil Service Regulations. His Excellency further directs that while the total abolition of the rule will have effect from the 15th July 1906, the date on which the Secretary of State's last despatch on the subject was received, the restriction hitherto imposed by Article 99 should be inapplicable (1) in the case of ministerial officers, (2) in the case of non-ministerial officers who were promoted in privilege leave vacancies to act in appointments which entailed increased work or responsibility, that is to say, officers who were promoted to act in a class as distinguished from a grade within a class, as for instance a Deputy Commissioner acting as a Commissioner, or an Assistant District Superintendent of Police acting as a District Superintendent of Police, and (3) in the case of officers

transferred in consequence of privilege leave vacancies to act in another station, with effect from the 19th February 1906, the date on which a former despatch sanctioning these concessions was received. The necessary amendments in the Civil Service Regulations will be made.

MISCELLANEA.

THE FLOWERING OF ARUNDINARIA KHASIANA.

We have received the following communication from the Deputy Commissioner in charge of the forests of the Khasia and Jaintia Hills, Assam :—In accordance with Part III, section XVII, para. 33 of the Assam Forest Manual, I have the honour to inform you that I have, during my tours, seen Arundinaria Khasiana flowering on the southern slopes of the Khasia Hill. The flowering is apparently general and took place from March to May of the current year.

Dated Shillong, the 10th July 1906.

THE COCHIN FOREST TRAMWAY.

The forests of Cochin form one of the State's most important assets, their approximate area being 605 square miles or nearly half the extent of the State. Their commercial importance began to be vaguely realised at the beginning of the last century, but the earliest attempts to work the forests were of a spasmodic and unsystematic nature. In 1835, however, a regular department was organised with a European officer at its head and it worked for over 60 years on somewhat old fashioned lines. Though the department brought in a fair amount of annual revenue during this period, the importance of forest administration on scientific principles was not sufficiently recognised. The result was that while the interior forests, from which there were no facilities for transporting timber, remained altogether untouched, the easily accessible portions were almost denuded by indiscriminate and

unregulated fellings. In 1895, the then British Resident Mr. (now Sir) James Thompson brought to the notice of the Darbar the necessity of improving the administration of the forests and at his suggestion and by the kindness of the Madras Government the services of Mr. Foulkes, a British Forest Officer, were obtained early in 1897 to inspect the Cochin forests and make suggestions for their better administration. On a perusal of the valuable report submitted by that officer, it was found that the improvement of forest administration required the services of a trained and experienced officer, and the Darbar accordingly obtained from the Madras Government the loan of the services of Mr. V. Alwar Chetty for a period of seven years.

Mr. Alwar Chetty took charge in April 1899. His first care was to give the over-worked portions of the forest a long-needed rest and to secure a suitable outlet for the interior virgin forests. After an extended tour through the latter, Mr. Alwar Chetty suggested the appointment of an Engineer to co-operate with him in inspecting those forests and preparing a practicable scheme for providing an outlet for them. Mr. R. E. Haffield was accordingly appointed Special Forest Engineer in August 1900. When these officers inspected the river route and the land routes from the interior, it was found that the Chalakudy river in its higher reaches was so full of obstructions that the cost of training it for floating timber would be prohibitive, and also that the river could be used for the transport of timber for only about four months in the year, while a land route could be used throughout the year and would also tap a richer forest than the river one. They, therefore, recommended and the Darbar sanctioned the construction of a tramway of three sections. The first section was to cover a distance of 8 miles in the valley, to be followed by a self-acting inclined railway 5,000 feet long, and then by the second section 4½ miles long. This was to be followed by a slide of 7,000 feet in length, whence the third section, 4½ miles long, was to extend to the Kurumali river. From this point timber could be floated to the Railway station at Trichoor during the rainy seasons and carted to the Chalakudy station in the dry months.

Teak and other timbers from the Parambikolam forest were, according to this scheme, to have been floated by the Parambikolam river to the tramway terminus in the valley. But in October 1903, when His Highness inspected the tramway and travelled right through the Parambikolam and Nelliampathy forests, Mr. Alwar Chetty suggested the extension of the tramway to Parambikolam, a distance of about 12½ miles, the chief reason for the extension being that the experience gained during the preceding two years showed that the Parambikolam river could not be relied on to carry every year anything like a year's yield of timber. Survey of this extension was accordingly started early in 1904.

According to the original scheme, the traction of timber trucks was to have been by manual labour. But when the length of the line was extended to a total of about 31 miles, it was felt that traction by manual labour would prove too laborious and expensive. In September 1904, the substitution of traction by steam-engine for traction by manual labour was decided upon and sanctioned by the Darbar.

The modification in the original scheme already referred to necessitated a reconsideration of the question of transport of timber by the Kurumali river to Trichoor and by road to Chalakudy. It was found that the combined river and road transports would not clear out the accumulations of timber at the tramway terminus and Mr. Alwar Chetty therefore in December last recommended, and the Darbar sanctioned, the extension of the tramway to Chalakudy, a distance of 15 miles, to meet the Shoranur-Cochin Railway at that station; and, in consultation with the Madras Railway authorities, a connection was secured between the Railway and the Tramway.

In the particular working, especially in the case of heavy and long logs, the timber slide was unfortunately found to be unsatisfactory and the handling of logs both at the top and at the foot of the slide expensive. The slide is, therefore, being converted into a self-acting inclined tramway, which will do away altogether with the necessity for it.

The tramway, as finally designed, is in three sections connected by two inclined tramways. The first section from Parambikolam to Pothupara watershed is 20½ miles long, the second from Pothupara to Thoppathikavala has a length of 4½ miles, and the third from Anapandan (foot of Thoppathikavala) to Chalakudy 19 miles in length. The first section is connected with the second and the second with the third by two inclined tramways of 5,000 and 7,000 feet in length respectively. The total length of the line is thus a little over 46 miles.

The interior of the Cochin forests has an extent of about 300 square miles of which nearly 250 square miles are virgin forests, full of fine, tall, well-grown teak and other valuable trees. Of this area 127 square miles have been constituted into a working circle and are worked on rotation. The tramway is the medium for transporting the timber collected from this area. It is estimated that the department will be able to collect and transport by the tramway to the place of sale at least 500,000 cubic feet of teak, blackwood and hard jungle woods a year. This can be done at a cost not exceeding Rs. 2,50,000 and the quantity of timber so transported can be sold for at least Rs. 5,50,000. Thus a minimum net revenue of three lakhs of rupees a year is anticipated with confidence.

The tramway is estimated to cost ten lakhs of rupees, of which over eight lakhs have already been expended. The expenditure on the tramway is not debited to capital account, but is met from the net revenue of the Forest Department.

The project is thus one of considerable importance and anticipated profit to the State, and the Darbar cannot be sufficiently thankful to Mr. Alwar Chetty for conceiving it and carrying it out with so much skill and energy. In him, in the words of my predecessor Mr. P. Rajagopala Chari, "The Darbar has fortunately secured an officer who thoroughly knows his work, and who is determined to do it thoroughly." The thanks of the Darbar are also due to Mr. Haffield and his subordinates for the able and energetic manner in which they have carried out this difficult work.

In spite of the natural difficulties, they have worked with a zeal and devotion that do them credit, and although the work is not

fully completed yet the greatest portion of it, barring some gaps which will not take long to fill up, has been finished, and is, I have no doubt, destined to work long to the material advantage of the State and its loyal subjects.

CREATION OF A HEAD CONSERVATORSHIP IN THE CENTRAL PROVINCES.—We are in a position to inform our readers that the Secretary of State has sanctioned the formation of a Chief Conservatorship, on the same lines as the one already existing in Burma, for the Central Provinces.

THE MAINE BOX-SHOOK INDUSTRY.—For many years the box-shook manufacturing trade has brought a large amount of money into the State of Maine, but this industry has now been lost mainly to the cuteness of the Germans in securing American machinery, and also to the advantages they have for securing cheap labour. In past years the quantities of shooks exported annually from Bangor and Eastport have reached enormous proportions, some four million boxes being shipped from these ports to the South of Europe in a single season. The shook makers of Maine, moreover, had a valuable assistance in creating a monopoly in this branch of the trade—a veneer machine, by the use of which a small flat board of even thickness could be peeled off a tree whose diameter was not more than half the width of the board. The manufacturers of Maine shooks were thus able to turn out the articles in greater quantity and less time, and consequently sell them cheaper than could the German manufacturers, who, up to five years ago, had known no way to manufacture shooks except by sawing them out of a log as the Maine millmen would saw out a board. But, unfortunately for Maine, the American machine was exhibited at the Pan American Exposition of 1901 and caught the favourable eye of some Germans, who were, or wished to be, interested in the shook trade. Some of these machines went home with the business-holiday makers; they were set up in mills in Austria, principally in Trieste, where skilled labour can be obtained at 2*s*. a day; they had any quantity of the necessary timber to draw upon, and, moreover, they were right on the market, and could supply the consumers in the Mediterranean districts at the shortest

notice. The shook trade in Maine, owing to the above-mentioned drawbacks, is now a thing of the past, and the makers there are of opinion that many foreigners could have well been spared the Buffalo Exposition of 1901.

TEAK TIMBER EXPORTS.—A great expansion in ship-building and in some other branches of construction in the United Kingdom, Germany and the United States has synchronised with a contraction in the available supplies of Teak and has induced a rise of price—in some cases prohibitive. The average price in 1904-05 at Calcutta was Rs. 111 to Rs. 116 per ton of 50 c.ft., in 1905-06 it was Rs. 120 to Rs. 125. Exports of Teak have increased in quantity by 12·5 per cent to 53,000 cubic tons and in value by 17·25 per cent to Rs. 70·4 lakhs. But the difference between these two percentage rates of increase does not gauge the enhancement in average value of a uniform quality of timber, for it is understood that a good deal of inferior wood has gone forward in the twelve months under report. Exports from Burma to India proper decreased by a further 5·9 per cent, and reached a value of only Rs. 71,30,683, while Imports into India from Siam and Java increased by some 34·7 per cent to a total of Rs. 57 lakhs. But as was pointed out last year, practically the whole of the teak trade in the north of Siam is controlled by British Companies.

SNAKE-BITE.—A resolution is published in the *United Provinces Gazette* calling the attention of Chairmen of District Boards to the permanganate treatment of snake-bite, and recommending that Lauder-Brunton lancets should be purchased and supplied to every *thana* throughout their districts. The lancets are already being supplied by Government to all dispensaries, but a wider distribution is necessary if they are to be of much use. Simple rules for the use of lancets and permanganate are also published.

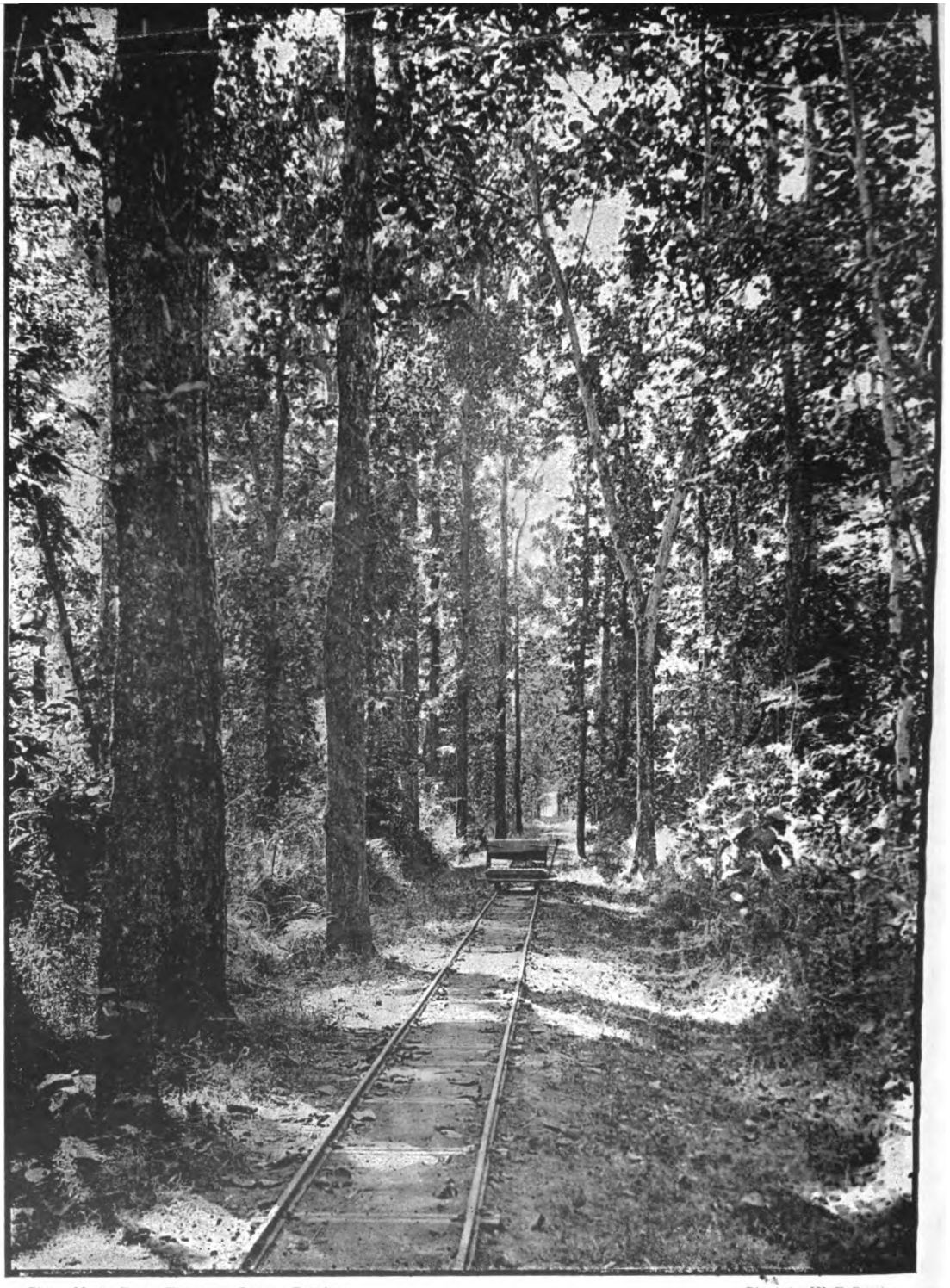


Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by W. F. Perrée.

THE GOALPARA TRAMWAY.
(ASSAM).

Frontispiece.

NOTICE.

Owing to the improvements made in the "Indian Forester" and the consequent enhanced cost of publication it has been found impossible to continue to issue the Magazine at Rs. 6 per annum to Forest Officers drawing less than Rs. 200 per mensem. In future the charge made to such officers will be Rs. 9 per mensem. It may be mentioned that this rate is still below the cost price of production.

It is proposed in future, unless objections to the procedure are received, to issue the January number V.-P. P. for the annual subscription to all subscribers as this method has been found to be the most satisfactory.

E. P. STEBBING,
Honorary Editor.

CAMP, *26th October* 1906.

held sway over India, it is only now that the real importance of this question is beginning to receive that meed of recognition which has been accorded to it for a century and more, for even in the Middle Ages some attention was paid to this subject on the Continent

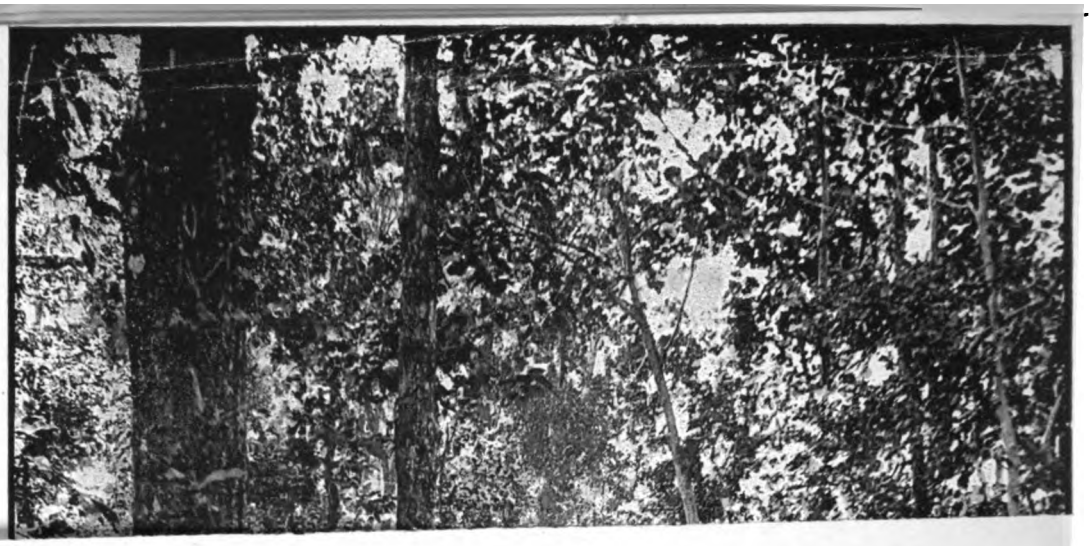


Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by W. F. Perrée.

THE GOALPARA TRAMWAY.
(ASSAM).

Frontispiece.

VOLUME XXXII NUMBER 9

INDIAN FORESTER

SEPTEMBER, 1906.

FORESTS AND THE WATER-SUPPLY.

The connection between the forests and water-supply of a country is of such an intimate nature that at first sight it is almost inconceivable that its full significance and importance should not be obvious to all well-educated men. And yet it is the general rule amongst the well-educated Englishman to question this intimate relation. To point his arguments he will instance his own well-watered, damp, cold, misty and richly-rained-upon country.

We have no large forests and yet we have plenty of water is the argument put forward, the Englishman being entirely oblivious of the fact that his little Island home is entirely surrounded by water! It is to his upbringing doubtless that the Englishman, both collectively and individually, takes so little interest in forestry and all appertaining thereto. In spite of the length of time the British have held sway over India, it is only now that the real importance of this question is beginning to receive that meed of recognition which has been accorded to it for a century and more, for even in the Middle Ages some attention was paid to this subject on the Continent

of Europe. Those who have followed forestry literature during the past decade are aware that slowly but surely a great awakening has been taking place all over the world, and that opinions formerly cast-iron in their conservative ignorance have been modified and revolutionised. It may, we think, be said that this great reformation has found its real birth in India and America. Questions which affect numerically small nations and comparatively small areas of the surface of the globe have but a slight influence as world-wide factors in forming opinions held by the human race as a whole. When, however, populations and areas of the magnitude of those of India and the United States, let alone such great Colonies as Canada, Australia and Africa, are faced with similar problems, and problems involving the future well-being of the entire race, what was the common knowledge of the few becomes merged into the deep-rooted opinions of mankind at large. Such a state of affairs is rapidly becoming a *fait accompli* so far as the recognition of the importance of the forests on the water-supply of a country is concerned.

An article which deserves to be widely read entitled "Tree Influence on Rainfall" has, we note with pleasure, recently appeared in the columns of the Indian Press,* and we publish in this issue an interesting paper on the "Protection of the Sources of the Cauvery," in which some very noteworthy criticisms on the protection of the headwaters of the rivers in Madras appear.

Before proceeding to a consideration of some of the points raised in these articles, it may prove of interest here to quote the opinions on this subject of that eminent authority, Dr. Schlich, as expressed in his "Manual of Forestry." We read that—

(1) Forests reduce the temperature of the air and soil to a moderate extent and render the climate more equable.

(2) They increase the relative humidity of the air and tend to reduce evaporation.

(3) They tend to increase the precipitation of moisture.

(4) They help to regulate the water-supply, produce a more sustained feeding of springs, tend to reduce violent

* Allahabad *Pioneer*, September 15th, 1906.

floods and render the flow of waters in rivers more continuous.

(5) They assist in preventing erosion, landslips, avalanches, the silting up of rivers and low lands, and arrest shifting sands.

(6) They reduce the velocity of air currents, protect adjoining fields against cold or dry winds and afford shelter to cattle, game and useful birds.

Many of our readers will be able to quote from their own personal experiences cases where the absence of or destruction of forest in this country has removed some of the benefits or given rise to some of the evils above enumerated.

Turning now to the article on "Tree Influence on Rainfall," the writer draws attention to the curious anomaly, which so well illustrates our opening remarks, that the Irrigation Commission which recently toured round the country entirely failed to take any cognisance of or to make any enquiries into the state of the catchment areas of the rivers upon which the whole foundation of their proposed elaborate network of canals entirely rested. We read—

This Commission travelled all over India, conferred with many authorities, visited works in the South, in the United Provinces, and in the Punjab, and then sat down and wrote what was meant to be an exhaustive report. They formulated proposals for new works or rather they re-stated authoritatively what had been proposed in former years, and on their recommendations colossal schemes of irrigation, costing millions sterling, have been approved and sanctioned by the Secretary of State. Yet in that Report (consisting of several hundred pages) the incidence that forests have on the question of irrigation, at the present time and especially in the future, is a factor to which no reference whatsoever is made! This is a fact which German and French critics of this voluminous report cannot understand; as the intimate connection between rainfall, forests, and the discharge of rivers is a fact so early instilled in the minds of the educated on the Continent, that the omission of even a casual reference to the ultimate sources of water in a formal and in its way an epoch-making report, such as that presented to

Government by the late Irrigation Commission, is, to our foreign critics, inexplicable.

Possibly this otherwise unintelligible omission has an explanation. It may have been that an expression of opinion in this connection was ruled to be out of court for reasons of State, as a full exposition of the matter trenches upon somewhat delicate political ground. It may have been thought by the Commission that their mandate did not extend beyond the limits of British India. This is unfortunate, for as a matter of fact the territories between the 7,500 contour above the sea and the head works of our important irrigation systems in the north of India lie almost entirely in States beyond the administrative frontier of British India. Now it is between the level of the head works and about 7,500 that the intensity of the rainfall is at a maximum, that is to say, that the rain falling in that zone is chiefly, if not exclusively, responsible for the great floods that not only are wasted as far as irrigation is concerned, but that also are so destructive and cause such anxious moments to those in charge of the head works of our big canals.

If we take the excellent map of the Punjab published with the Punjab Administration Report for 1904-05, which exhibits quite sufficiently well the various canals and irrigation systems of that Province, as well as that of the North-West of the United Provinces, we find that the effective catchment basins of the Upper Indus, of the Jhelum, of the Chenab, of the Ravi, of the Sutlej, of the Jumna, and of the Ganges are all in foreign territory. The effective rain and snow that tends to feed the flow of these rivers and the forests whose function in nature is to maintain this flow as a uniform and perpetual discharge, all occur in tracts over which the Government of India has not hitherto exercised its right of efficient control, the only exception being the Bias river, whose sources are in British territory. Consequently the rulers of these extra-territorial tracts are at liberty to cut down their forests, to hew down their trees, and allow reckless grazing without system or on any organised plan. To argue that this system can be continued with impunity or that our agricultural interests are not jeopardised by such reckless disboisment shows a lamentable ignorance of the

most elementary principles of forestry. Surely it is not too early yet to bring influence to bear on the rulers of our Himalayan border and induce them to consent to their forests being administered on scientific principles.

That the evil of deforesting mountain ranges is a very real one, the well-known case of the Alps from France to Austria has proved once and for all. Wherever in these mountains extensive deforestation has taken place the consequence has been the gradual formation of a series of torrents in all places where the surface did not consist of hard rock; the débris brought down has covered more and more fertile land at the base of the torrents; and this evil has grown to such an extent that not only in France, but also in other Alpine countries, great efforts have been made to re-afforest the denuded area at a great outlay. When once the evil has been created, immediate afforestation is not possible; it must be preceded by the construction of dams, dykes, walls, etc., to steady the soil until the young forest growth has had time to establish itself and once more lay hold of the surface soil. It requires no detailed calculation to estimate the enormous cost such operations would entail in this country, nor the magnitude of the losses the covering up of the cultivated lands at the foot of the mountains would give rise to. The writer of the article alluded to above raises another aspect of the question, one which was alluded to in considering the position of the Cauvery river and the power required for the Kolar Goldfields. He says:—

Hitherto the rivers and canals have been regarded almost entirely from an agricultural point of view. If the rivers run low, or if the canals afforded an inadequate supply that was a matter that affected the ryot alone, and the disturbance to the canal revenue was a departmental incident whose occurrence did not affect other interests acutely. But will this be the case a generation hence? Will not other interests be concerned and will not other influences make themselves felt and demand imperatively a better regulation of the sources of their prosperity? A generation hence the value of hydraulic motive power along the whole southern aspect of the Himalyan Range from Gilgit to Assam and

thence south to Siam may have so increased, and its importance may have so appreciated, that any diminution of its effective force that can be possibly prevented will be resented by the whole power of industrial India, which a generation hence will certainly not be a negligible quantity. When new industries are set on foot, fresh demands are inevitably made on a Government. It has to undertake duties which before were not dreamt of; for instance, some twenty years ago that portion of France that is bounded on the north and west by the Rhone and on the east by the Alps and south by the Mediterranean was almost wholly given over to agriculture. Now it teems with industrial mills and factories, all actuated by hydro-motive power either directly or by means of electricity. Its area is about 22,000 square miles, or equivalent to the area comprised between Simla, Sirsa, Lyallpur and Jammu. Within this portion of France there were in 1904 no less than 46,000 hydraulic installations varying from 16 h.-p. to several thousand h.-p.

It will be unnecessary here to quote from our correspondent's letter on the "Protection of the Sources of the Cauvery" which will be found elsewhere; but attention may be drawn to the fact that the writer points out a state of affairs in the south which greatly resembles that existing in the Himalayan ranges to the north. In the interests of the community at large there can be no doubt that the time has arrived at which it has become of the very first urgency that the entire question of the available water-supply of the country should be enquired into by experts, and that an authoritative report on the catchment areas of all the important rivers, whether actually in British territory or in that of the great Native States, who are ever so ready to demonstrate their loyalty and allegiance to the Crown, should be drawn up. With this report before them the Government of India would be in a position to lay down definite rules upon the subject which would secure what may almost be termed the most important areas on the Continent from the destruction they have experienced in the past. This destruction has ever been in the interests of the few, either to satisfy a pecuniary greed or with the object of starting, in ignorance, experiments for

the cultivation of coffee, tea, or, as in the newly projected idea in Madras, of rubber on the catchment areas of rivers or far up on mountain slopes, the removal of the forest covering of which can but result, as in the case of the Alps, in heavy and lamentable denudation of the hillsides and the covering up of the cultivated lands below to the ruin of the unfortunate ryot.

In conclusion, we would suggest the formation of a small expert Commission consisting of an expert Irrigation Officer, a member of the Indian Civil Service who has had experience of the losses ryots have suffered from wanton destruction of hill forests, and a Forest Officer of experience. That this Commission should visit all the catchment areas of the important rivers of the country and submit a report on their present condition. That they should be also required to frame lists of all districts, no matter at what distance they might be away from the catchment areas of the rivers in question, which in their opinion depended on particular rivers for their water-supply. That in addition to reporting upon the matter from the agricultural point of view in the interest of the ryot, the Commission be asked to record, wherever possible, a note upon the possibility or otherwise of the rivers visited being serviceable as sources of hydraulic power.

SCIENTIFIC PAPERS.

ON POLLARD-SHOOTS, STOOL-SHOOTS AND ROOT-SUCKERS.

BY R. S. HOLE, F.C.H., F.E.S.

PART III.

22. Hitherto in so far as we have considered pollard and stool-shoots, it is clear that we have been dealing with cases in which the individual tree, injured by the removal of its crown of branches, endeavours to repair the damage done and to regain its normal state of health. Under the most favourable circumstances then, all that we have here is a

In all cases hitherto considered neither pollarding nor coppicing can be regarded as a method of reproduction.

more or less complete rejuvenation of the individual tree, there is no division of the parent plant with the establishment of new and independent individuals, and hence no true *reproduction* in the correct sense of the term.

Authority for believing that vegetative reproduction may be effected by means of stool-shoots.

23. The question next arises whether, under some circumstances, stool-shoots do become independent individuals provided with root systems of their own and not relying on the old roots of the parent tree; if so, we should be forced to conclude that true vegetative reproduction may take place not only by means of root-suckers but also by stool-shoots.

The following authorities support the belief that such a supposition is at all events not impossible.

Dr. Schlich speaking of stool-shoots and root-suckers on p. 175, Vol. I, of his *Manual of Forestry*, says: "If the new individual is capable of producing root-buds and of developing them into roots it becomes independent of the mother plant; in such a case reproduction is established by a division of the mother plant."

On p. 263 of Hartig's *Diseases of Trees (Eng. Trans. by Ward and Somerville)* we find the following remark on stool-shoots: "As it is very desirable that these should become self-rooted, so that the new plants may be unaffected by the health of the parent stool it is an advantage to have them as low down on the stool as possible."

Stool-shoots of teak may produce independent roots.

24. No one who has had experience of teak coppice forests can have failed to notice when an old tree, the interior of whose stem has entirely decayed, has been felled level with the ground, that vigorous coppice shoots often make their appearance from the periphery of the old stool, and that, after a few years, in the place of the stool which is no longer traceable on the surface, several young plants are found which, in shape and appearance, resemble healthy and vigorous seedling trees. Such shoots are often several feet apart, there is no visible connection between them at the ground surface, and at the first glance we recognise that we have conditions here which differ widely from those

obtaining in the case of pollard-shoots, or of a group of coppice shoots situated on the top of a small and healthy stool. I have recently dug up several teak coppice stools and have had sections of them prepared. There is, I think, no room for doubt that with teak at all events coppice shoots are capable of developing independent roots of their own.

25. Whether or not the young shoots, in such a case, ever become entirely separated from the parent stool I have been unable to prove as yet. From the specimens seen by me, however, it does appear that in the case of teak coppicing, especially of old trees, usually results in the production of young shoots, many of which are provided with an independent root system of considerable extent, but which usually maintain alive in their immediate neighbourhood a more or less extensive area of tissue belonging to the parent tree. From this living tissue, which is situated below the level of the ground, adventitious roots are usually developed in considerable numbers which, it would seem, must help in procuring the necessary water and salts required by the young shoot nearest to them in return for the food materials supplied to them by that shoot. May we not then reasonably conclude that the living tissue which, before the cutting of the tree, was subservient to the dominating individuality of the parent stem, has, since the removal of the latter, become mainly devoted to the service of the individual shoot from which it receives the greater portion of its necessary food supplies; that, in other words, we have under such circumstances a more or less complete division of the living tissue of the mother plant with the establishment of distinct individuals?

Probable that in the case of teak a division of the parent stool may occur with the establishment of independent individual plants, *i.e.*, that true vegetative reproduction is effected by means of stool-shoots

It appears, it is true, possible that in many cases all the shoots arising from one stool, as above described, are connected, more or less, directly with each other by links of living tissue, but there seems to be no *primâ facie* reason for believing that such connection between different individuals is in itself likely to be injurious, as already noted in paragraph 15 above.

Decay spreading to the young shoot is probably not a serious danger in the case of teak.

26. The question of decay spreading from the old stool to the young shoots, in the case of teak at all events, does not appear to be a serious danger. A young shoot 13 years old examined showed that the decay had only spread slowly downwards in the centre of the heartwood of one of the old roots of the parent stool in one case, whilst in others there was no sign of decay spreading to the young shoot or its roots.

27. Such evidence may surely afford us reason to believe that with some of our Indian species continued reproduction is possible not only by root-suckers but also by means of stool-shoots.

Best method of cutting the stool in coppice felling.

28. The shape of the cut surface of the stool is a point on which much stress is often laid in the rules to be observed in coppice fellings and a dome-shaped surface is usually recommended, *i.e.*, one which is highest at the centre. It has been noticed, however, that a high stool may interfere with the development of the independent root system of a young shoot.

The rapid decay of the old stool thus appears not only to afford the necessary room for the development of such young roots but also to provide a soil enriched with decaying organic material from which they can obtain their needful supplies of salts.

In the class of cases mentioned in paragraphs 17 and 19 above, it has been pointed out that the object to be kept in view is the rapid recovery of the parent plant from the injury inflicted, the body of the parent plant being kept as far as possible *intact*, and this object would clearly be promoted by the rapid healing and covering over of the cut surface of the stem by healthy living tissue.

In the class of cases now under discussion, however, it would appear that the more extensive the independent root systems of the young shoots and the more rapid the decay and disappearance of the greater part of the stool and roots of the parent tree, the more successful are the young shoots likely to be from the point of view of reproduction. In other words, the object to be kept in view is not to maintain the body of the parent plant intact but to ensure its *rapid disintegration*.

29. It is doubtful whether we shall be able for several years yet to draw up sound rules for the management of our coppice forests based on an accurate knowledge of the life histories of our species, but on the evidence at present available, it would certainly seem preferable to adopt, as a general rule for coppice fellings, a flat section cut level with the ground, and not a dome. The former offers no obstruction to the rapid covering of the cut surface by vigorous young shoots on a small stool, and, in the case of old stools, every extra bit of wood left in the stool may be distinctly injurious to the young shoots by obstructing the development of their roots.

In some cases, of course, where the decay is spreading from the old stool is likely to be injurious to the young shoots, or where natural decay is not likely to ensure the disappearance of the central portion of the stool with sufficient rapidity, it may be advisable to cut away the greater part of the stool, and, where the object is to favour the production of root-suckers, the removal of the entire stool will often be necessary.

It is interesting to note that so long ago as October 1875, in a paper read at the Forest Conference held at Simla in that year, Mr. Fernandez recommended the following procedure for the coppicing of old teak :—

"The soil has to be dug up round the tree to be felled until the whole stem and principal roots are exposed. The stem should then be cut out as near as possible to its junction with those roots and the earth thrown back and gently pressed down."

It would obviously, however, in all cases be a question for decision whether the extra expenditure involved by such operations is justified by the improved condition of the resulting shoots.

30 Sufficient has now, I think, been said to show that both root-suckers and stool-shoots may vary greatly in their character and with regard to the conditions under which they develop. Moreover, we know how greatly the same species may vary in different localities, and how much different species may vary in their behaviour where exposed to similar conditions and treatment,

Necessity for obtaining proofs regarding the characteristics of stool-shoots and root-suckers in the case of particular species and definite localities before accepting as true any general statement regarding them.

in consequence of which we must recognise the necessity of not accepting any sweeping generalisation, such as "coppice shoots can never produce fertile seed" until we have obtained for ourselves proof that this is so with coppice shoots of the various types indicated in this paper, in the case of the particular species and locality we have to deal with. Mr. Fischer, for instance, has recently reported experiments on p. 198 of Vol. XXX of the *Indian Forester* from which it appears that seed obtained from sal coppice shoots was found to be fertile in Ganjam.

Advisability of commencing the systematic collection of data bearing on the points here alluded to without delay.

31. Seeing that such a large proportion of our Indian forests are now managed as coppice or as coppice with standards, the subject of the present paper appears to be one of great and daily increasing importance, and I have therefore ventured to draw attention to it now, when the establishment of a Forest Research Bureau with its complement of botanical and sylvicultural experts, being on the eve of becoming an accomplished fact,* encourages the hope that a commencement may now be made to systematically collect reliable data bearing on some of the points here mentioned, some of the most important problems perhaps being—

In the case of definite species, in selected localities :—

(*a*) Can true reproduction be effected by root-suckers or stool-shoots?

(*b*) What are the principal conditions which respectively favour and obstruct such reproduction?

(*c*) In each case which method of reproduction is the best?

(*d*) In what cases is pollarding preferable to coppicing?

(*e*) What are the best practical methods of felling to be adopted in each case with the object of helping the tree cut to recover from the injury inflicted as quickly and completely as possible?

It should be noted that the problems here referred to do not necessarily only concern those forests which are to be permanently

* Created on June 5th, *vide* R. and A. Department, Government of India, Forest Circular No. 11—166-2-F., dated Simla, 5th June 1906.

managed as coppice or coppice with standards. Their solution will for instance enable us to decide whether, in some cases, a preliminary round of coppice fellings is not a better treatment to apply to a poor and irregular crop when it is desired to manage the same ultimately under one of the High Forest Systems than that usually known in India as the System of Improvement Fellings.

No apparent necessity for immediate anxiety regarding the possible denudation of our coppice forests.

32. In conclusion, it seems advisable to draw attention to the despairing strain so often found of recent years in our Annual Reports to the effect that our coppice forests are being denuded, as a good example of which we may take the following extract from the Bombay Northern Circle Report for 1894-95, printed at p. 457, Vol. XXX, of the *Indian Forester*:—

"It cannot be overlooked that there is a great dearth—too often a total absence—of seedlings to replace the present stools when their reproductive power shall be exhausted. The vitality of the present stools may last out two or even three revolutions, but unless seedlings are produced to replace them as they fail, the ultimate result must be denudation."

Seeing that there is reason to believe that both stool and pollard-shoots are not necessarily inferior to seedling trees in their power of producing fertile seed, and also that the continued reproduction of many of our species may be ensured by means of root-suckers or by stool-shoots, there certainly seems to be no ground for immediate anxiety regarding the possible denudation of our coppice forests.

ORIGINAL ARTICLES.

THE GOALPARA FOREST TRAMWAY.

BY W. F. PERREE, I.F.S.

PART I.

In places where ordinary means of transport are scarce or costly, where the use of carts is possible only for a short season, and where materials in quantity have to be transported in excess

of the capability of ordinary local means, tramways may often offer a solution of transport difficulties. The Goalpara forests, which are situated under the Bhutan Himalayas at distances varying from 30 to 60 miles from the Brahmaputra river, have always suffered from insufficient means of export. The resident population has never kept draught cattle for any purpose beyond ploughing, and the transport of timber has been hitherto done by hand, large trees being cut into short logs (dhums) under 7 feet in length, which are rolled by hand sometimes for 12 or 15 miles to a floating stream. Smaller timber has been carried out of the forest on men's shoulders, *vide* Plate XXXIV. On reaching a suitable stream the timber is lashed to dugouts and taken to the Brahmaputra, whence it is rafted with the help of large boats to the principal towns of Eastern and Lower Bengal. It is evident that these extensive forests could not be worked successfully by means of such primitive transport; the inaccessible blocks generally remained untouched and the entire yield was seldom brought to market. The land adjoining the reserved forests is, with the exception of a few Mech villages, almost uninhabited. Local labour is therefore scarce, while the unhealthiness of the Terai tract renders work by imported labour possible only during the short season from December to April. Difficulties are enhanced by the presence of a waterless or "Bhabar" tract, varying in width from 8 to 15 miles, which is waterless during the open season. Attempts to sink wells have been made, but below 30 feet large boulders are encountered rendering excavation next to impossible, and water is not found even at a depth of 80 feet. In deciding on additional means of transport, it was therefore necessary to always bear in mind that workmen in the "Bhabar" tract would have to be supplied with water. Elephants are in use for dragging timber and a part of the outturn has been extracted with their help, but these animals are liable to outbreaks of anthrax and are unsuited for work at a distance from water. Buffaloes or bullocks could have been used for draught, but they would have involved the construction of roads for cart traffic which in forests where the rainfall exceeds 150 inches are soon churned into quagmires, and

the local cattle are infested with rinderpest and foot-and-mouth disease, so there was clearly great danger in relying solely on horned cattle. After due consideration, it was decided to lay a tramway in the Western Range which is the most remote from the sale depôts and offers the greatest difficulties of transport as well as disadvantages regarding water-supply. The line was commenced from a convenient floating stream and gradually pushed northwards to deal with the coupes in succession. Some re-arrangement of coupes was necessary to ensure the most economical use of the tramway. In 1901-02, a commencement was made with 2½ miles, subsequent additions bringing up the total to 9½ miles. The gauge and strength of materials had first to be settled. Portability is an important factor, and the universal 24 inch gauge was therefore adopted. In deciding on the strength of materials, it was necessary to know the safe loads for rails of different strength. The weight per yard of rails is used to indicate the quantity of metal in the various sections, so that the strength varies with the weight. The safe load is indicated by the maximum pressure which a wheel can carry without causing deflection in the rail, and this again varies with the spacing apart of the sleepers.

The following table shows the wheel pressures for different weights of rails with the spacing of sleepers in most general use :—

Sleepers apart.	Wheel pressures for rails of—					
	10 lbs. per yard.	14 lbs. per yard.	18 lbs. per yard.	18¾ lbs. per yard.	20 lbs. per yard	24 lbs. per yard.
40″	990	1,700	1,960	2,485	2,900	3,970
36″	1,100	1,900	2,130	2,755	3,210	4,600
32″	1,275	2,150	2,500	3,170	3,685	5,300
27″	1,450	2,510	2,900	3,650	4.230	6,075

These figures are approximate for mild steel and it should be remembered that laboratory tests require a substantial margin of

safety. The comparatively large differences between rails of 18 lbs. and 18¼ lbs is due to the difference in section; the latter is nearly ½ inch taller, and while offering greater resistance to vertical pressure is obviously more liable to lateral deflection. It is, however, important to realise that a comparatively light rail may carry the same load as a heavier one if more closely sleepered, a useful fact to remember in determining the initial outlay. In the present case it was considered that the maximum size of logs which the rails need carry would not exceed 50 cubic feet, allowing 70 lbs. per cubic foot and three such logs per bogie truck on eight wheels, the wheel pressure would be only 1,312 lbs., so that 14 lbs. rails would clearly be of sufficient strength, especially as the above maximum load would be very exceptionally carried. In order also to keep the initial expenditure as low as possible, 14 lbs. rails were decided upon, and, with a view to maintaining portability, corrugated steel sleepers weighing about 12 lbs. per yard and 40 inches apart were adopted. It has, however, been proved that on temporary lines where the sleepers do not always rest on a firm bed, it is preferable to place them at about 32 inches' interval. This admits of placing sleepers nearer the rail joints, at which places the rails always show a tendency to bend, especially on gradients where the speed of loaded trucks is considerable.

The rails are in 5 metre lengths (16½ feet); the materials were purchased in Calcutta from Messrs. Martin & Co., the then agents for Messrs. Arthur Koppel & Co.* I am greatly obliged to the latter firm for allowing me the use of woodcuts from their illustrated catalogue and for the table of wheel pressures above quoted.

The laying of the line offers no practical difficulty and is easily accomplished by unskilled labour. The ground in the tract here dealt with is generally level with a slight slope from north to south which is the general direction of the alignment. A few undulations and shallow depressions necessitated small embankments in order to keep the slope down to 1 in 200. After selecting the alignment, the trees are felled by the roots to a width of 10 feet, a track 6 feet wide is then raised about a foot above the

* Messrs. Arthur Koppel & Co. have now their offices at 1, Mission Row, Calcutta.

surrounding level by cutting drains 2 feet wide on either side and throwing the earth on the centre. In high land this is sufficient, but in places liable to inundation the line must always be above flood level. The surface is then approximately levelled by eye—see Plate XXXII. The tramway materials are fixed together by a simple system of bolts and nuts. Mech and Santhal coolies were employed. It is important to keep a check on the issue of clips, bolts, nuts, etc.; such small articles are easily mislaid and lost. It is advisable to issue each morning the approximate quantity required for the day's work. The materials are roughly placed in position and bolted together—see Plate XXXII. The rails are fixed to the sleepers by clips which are bolted through the sleeper as shown in the annexed woodcut—Figure 1. There is a rectangular hole in the

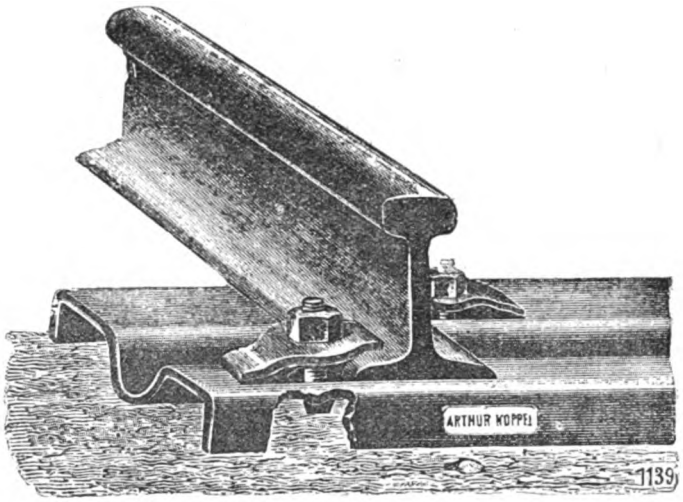


FIG. 1.—CLIP AND BOLT FASTENING FOR ATTACHING RAILS TO SLEEPERS.

sleeper through which the similarly shaped bolt head is passed. The bolt is then turned through 90° and the clip firmly screwed down. The holding is found to remain firm for years. In the last extension of 3½ miles, which it is calculated will remain in position for 6 or 7 years, wooden sleepers (4½′ × 5″ × 4″) at 33 inches interval have been employed. The cost is very little less per mile than if

steel sleepers at 40 inches interval are used, owing to the enhanced cost of laying by skilled labour.

The defect in the steel sleeper is that, resting on the surface and the end being open, it does not offer the same resistance to lateral displacement as a wooden sleeper firmly buried to a depth of 4 inches in the well-trodden earth. Wild elephants walking between the rails kick them outwards as they pass along and displace the line laid on steel sleepers laterally but have no such effect on the section laid over wooden sleepers. After the line has been securely bolted it is straightened with crowbars and packed. For this purpose some earth is thrown on the line from the drains and packed firmly under the sleepers—see Plate XXXIII. This is an important operation as the line must at the same time be finally levelled, and the firmness of the rails as well as the durability of the line depends on this. Ballasting is unnecessary, but good drainage is essential. Men should patrol as soon as possible after rain and open all drains which may be choked and let out any water which may collect between the rails. Plate XXXI shows a finished section of line.

For control of traffic and also in order to facilitate laying, long straight lengths are preferable to a series of curves, however slight. The laying of curves is a simple matter As a rule this can be done by eye, remembering always that too steep a curve is apt to cause trucks to derail ; on the other hand, it is not advisable to bend more rails than are absolutely necessary, as this may affect the usefulness of materials later on. A jim crow—see Figure 2—is applied at intervals of a foot or so along the rail until it reaches the necessary curve. Some practice is required to apply force evenly all along the rail and thereby avoid an uneven curve. Having completed one rail, the other is placed on top of it now and then, as the jim crow is applied, in order to gauge the progress and thereby ensure exact correspondence of adjoining rails. When lifting the line and relaying it in another place, it is not necessary to open the sleeper bolts at all, the fish plates only need be opened and the line lifted in rail sections. In practice it is found easy to lift the 14-lb. plant in sections of two rail lengths.

For this purpose the rail joints should be kept exactly opposite each other. This is not possible on curves, where the inner rail soon projects beyond the outer. The former can be cut or on temporary lines a block of wood may be inserted to fill up the gap.

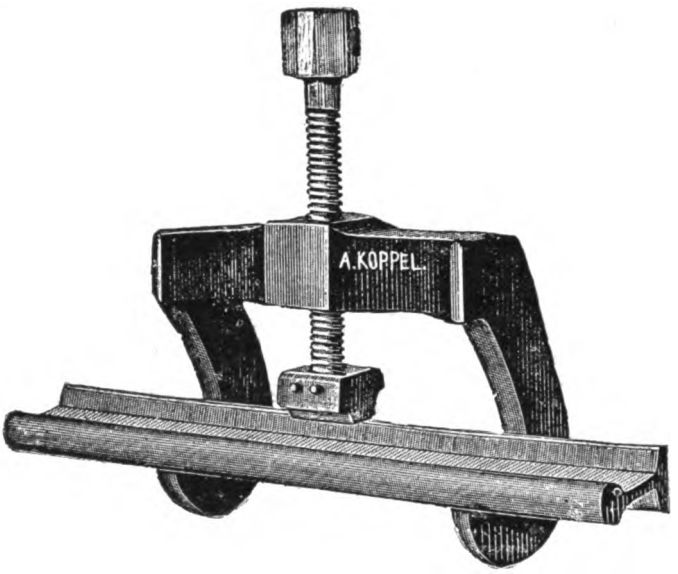


FIG. 2.—"JIM CROW" OR RAIL BENDER.

If hard wood is employed and firmly fixed to a wooden sleeper renewal will not be necessary more often than twice a year.

Rolling stock, the outlay and working of the tramway will be dealt with in a subsequent article.

THE PROTECTION OF THE SOURCES OF THE CAUVERY.

In the May number of the *Indian Forester* appears a short article entitled "Mysore Forests and the Cauvery River," calling attention to the necessity for the careful preservation of the forests on the catchment areas of the Cauvery. Judging from the various articles which have been printed in the *Indian Forester*, any stick is good enough to beat Mysore; but is Mysore alone to blame

for want of protection of these important areas? The answer must surely be in the negative. Every tree that grows must, of course, have its effect on the distribution of water ; but though I have never seen this principle clearly laid down, I think it is generally accepted that from the water point of view the deciduous forests represent the copper, the semi-shola the silver and the true shola forests the gold. If this axiom be true, it is the protection of the actual evergreen forest which is of the first importance, when the proper distribution of water is considered. As far as my experience goes in the south of India, no reckless destruction of Government shola forest is going on for the sake of the revenue from timber. The most valuable trees in this class of forest are the Mesua ferrea, the Ebonies, the Gluta Travancorica of Tinnevelly, the White and Red Cedars of the West Coast and the Poonspar and Artocarpus hirsuta of the Anaimalais and the West Coast. Valuable as are these species, their distance from the various centres of consumption renders them less remunerative than the more easily extracted Teak, Vengai and Rosewood. There is then little danger from over-extraction of timber, but, in other ways, much of this valuable forest has been or is being destroyed, and an examination of the Cauvery river cannot but be instructive from several points of view. Not only is Mysore benefited by the supply of water in the Cauvery but a great deal of the wet cultivation of Coimbatore, Trichinopoly and Tanjore is dependent on it, and the value of a regular supply of water can therefore scarcely be over-estimated.

My geography is distinctly weak and I am quite open to correction, but are not the actual sources of the Cauvery outside Mysore and somewhere up in the Western Ghats of the Bombay Presidency *? If this is the case, then Mysore is not able to control the chief source of supply, and can only assist in its maintenance by the proper upkeep of the shola forests of the principal streams which fall into it. At all events Mysore is not in any way responsible for the proper supply of water in the Kabbani, a large river which falls into the Cauvery before it reaches the Sivasamudram

* The Cauvery river rises in the Western Ghats in Coorg.—[HON. ED.]

works, and which alone should, if properly controlled, give sufficient water for the continual supply required by those works. Now the Kabbani is a Mysore river and belongs to Mysore alone, but Mysore has practically no control over it whatever. Throughout its course it runs through dry arid plains, with no forest near it but the dry deciduous forest round Kakenkotta and the neighbourhood. But the Kabbani itself is formed by three considerable Malabar rivers, known locally as the Pannamaram, the Manantoddy and the Bavali rivers. All these rise in the dense sholas of Malabar and run through the Wynaad, a country which should be dense with evergreen and semi-evergreen forest. As regards the sources of the Pannamaram I know very little; but it rises in the region of heavy rainfall and runs through a country, which must at one time have been dense shola which, however, was subsequently converted into coffee estates. When these estates were abandoned, the original sholas became a dense mass of lantana or bare grass land, the remaining forest being subjected to that pernicious system of cultivation known in various districts as Tuckle, Ponam, Podu, Kumri, and a variety of other names. The Manantoddy river is formed by three considerable streams which rise in dense sholas, but to my certain knowledge a large part of the catchment area of the chief of these has been cleared for coffee and abandoned, and the shola which contains the headwaters is now to be opened out for the sake of an experiment in rubber. Now it may be argued that Government has nothing to do with these lands, because, as is usually the case in Malabar, the lands belong to private owners; but considering the vast interests at stake both in Mysore and in British territory, ought not the Government to step in and acquire the catchment areas of these streams and rivers and insist on their rigid protection? The Bavali rises in what is now Government evergreen forest and runs for a great part of its length through semi-shola at the bottom of a deep valley, which forms a splendid catchment basin. Unfortunately, however, considerable areas in the valley were at one time given over to coffee estates, but under protection these are gradually reclothing themselves with forest, and it is the duty of the department to see

that this forest is properly protected and so contributes its proper share towards the perennial water-supply of the Cauvery.

The next portion of the Cauvery to be considered is that between the Sivasamudram Falls and the Bhavani. In this portion there are no large rivers, but there are three considerable streams which ought to add considerably to the water-supply. These are the Gundila, the Odontharai Halla and the Palar. Most of the water of the Gundila drains into a series of large tanks near Kollegal, where it is absorbed by wet cultivation, but the balance drains into the Cauvery, and all the drainage from the Kollegal fields must also eventually find its way to that river. This stream is dependent on the dense sholas around Bellagie, the chief of which is the fine Bellagie shola itself. It is therefore surprising to learn that part of this splendid shola is to be given up to the rubber craze. Apart from this, the fire protection is not what it ought to be in this neighbourhood, and, what with the mischievous sholagar and the incendiarist shepherd, there is little doubt that the shola forest, instead of increasing in area, is little by little being eaten into by fire. The Odontharai nalla rises from the same neighbourhood and has been chiefly mentioned to call attention to the fact, noted by Mr. A. W. Lushington, that within the memory of man it was a perennial stream but is so no longer, clearly proving that our protection of the sholas is not what it ought to be. As regards the Palar, I can say very little, for though I have often been along its banks, I have never traced it to its source, which is, I believe, in a somewhat inaccessible portion of the Burgur Hills. Its very inaccessibility may have assisted in the protection of the head-waters, but as all that part of the country is a vast grazing ground, I consider it very possible that the protective forests are being lessened by fire, which, in North Coimbatore, appears to be the natural concomitant of grazing.

The next important tributary of the Cauvery is the Bhavani, with its perennial affluent, the Moyar. Of what importance this river is may be judged by the fact that for many years there has been a project under investigation of bunding up these two rivers with a big dam, thereby forming a large lake of about 40 square miles.

The chief object of this scheme is to lead the water into the Cauvery during the dry weather, and thus secure the third crop of paddy in the Tanjore District.

The Moyar is very nearly as important as the Bhavani itself, for, though it is only a small river, yet in the hot weather it is always full of water, and from this I should judge that its sources are well protected. These sources are, I believe, in the Nilgiri District in the Moyar reserve, but on this point I am not certain, and it is for the District Forest Officer of that Division to say to what extent they are protected.

For the greater part of its length this river runs through forest reserve and, after entering North Coimbatore, it receives useful additions from the reserve known as the Nilgiri Eastern Slopes. Even their protection is by no means perfect, as parts are occupied by coffee totes, and the Trulars are a source of nuisance breaking up out-of-the-way parts of forest for cultivation and setting fire to the slopes. As, however, the reserved area is large and the portions cultivated small, the sources of water cannot be greatly affected.

The Bhavani river itself rises in the Attapadi valley in South Malabar, and in this valley Government have been able to secure some small patches of reserve, but the greater portion has been declared to be private land, and disputes as to ownership have been innumerable and have actually given rise to bloodshed. Many years ago Mr. Porter was instructed to report on the forests required for the protection of the headwaters of this important river, and he seems to have made some judicious selections which, however, were not acted upon, possibly because Government were not prepared at the time to acquire such a large extent of private forest. Needless to say these private forests have since deteriorated under the woodcutter's axe and the Ponam of the hillman, but there are still large areas practically untouched, owing to their inaccessibility, and it would be well for Government to acquire them before they are destroyed, and to carefully protect them when they are acquired. This will mean the proper opening out of the valley and the spending of money on rest-houses without much hope of return from the forest point of view, but the return

will be there in the increased and properly regulated supply of water, not to Malabar, but to the Tanjore District, many miles away. What then are the lessons to be learned from this study of the Cauvery system?

(1) That we should not throw stones at Mysore, until we have thoroughly protected our own glass-houses.*

(2) That we should point out to Government that it would be wise to spend money on the protection of water sources without any hope of direct return.

(3) That our shola forests must be treated with the greatest caution and that we must look upon them as protective and not remunerative.

(4) That the hillman is out of place in a shola forest, and that if he will not conform to the uses of civilisation he will have to go elsewhere for the sake of the welfare of the greater number.

(5) That we must steel our hearts against the wiles of the planter so long as the land he requires is in the vicinity of an important source of water (which it generally is).

(6) That we should insist on the proper protection of sholas which are now in our possession, and spend money in fire protecting them without hope of direct return.

Government spends large sums of money in the investigation of possible irrigation projects. Is it too much to ask that they should properly investigate their natural sources of water and see that they are being protected in the right way?

P. M. LUSHINGTON.

CAMP ANTERASAUTA:
9th July 1906.

* The *raison d'être* of the *Indian Forester* is to draw attention to and impartially discuss any and every point bearing upon forest matters, amongst the most important of which is the subject here treated of. Our correspondent will therefore, we feel sure, admit that the writer of the note on the 'Mysore Forests and the Cauvery River,' who has no connection with either Mysore or Madras, has performed a service of no mean value; for his remarks and inferences with respect to the state of things in Mysore have resulted in our correspondent's most interesting and valuable note on the position of affairs in Madras. [HON. ED.]

CORRESPONDENCE.

TO THE HONORARY EDITOR OF THE INDIAN FORESTER.

FORESTRY TUITION AT OXFORD AND DEHRA DUN.

SIR,—I notice that some recent remarks of yours on the instruction imparted at Dehra Dun and Oxford have raised a protest on the part of Dr. Schlich. He labours to show that so much time is given up to lectures in one subject under the best instructors available, and so many hours to another. All this seems to me to be beside the mark. What the clear-headed business man cares to know is not the details of instruction but the result of it when put to the test of actual practice. Dr. Schlich quotes the case of one man who found, after taking honours at Dehra Dun, that there was still something to be learnt at Oxford. I do not for a moment doubt it; I would, on the other hand, suggest that if the men coming out in the Department from Oxford were to go to the Dehra Forestry College they would find that they had still almost everything to learn as far as practical forestry in India is concerned. There is always something new to learn in forestry, and the training at any centre can never be regarded as final. The instruction at Oxford may no doubt be imparted by Fellows of the Royal Society or other eminent specialists; these gentlemen are generally, however, unacquainted with our Indian requirements. What we want is that it should be imparted by men who have an up-to-date knowledge of what is required in India, of what will be most useful, and what will tend to make their pupils efficient servants of the Indian Government; the desideratum is not theoretical instruction (however good) aided by narrow practical work while on a small excursion or in a botanical garden, but theoretical instruction on broad lines backed by useful practical work that will adequately illustrate and allow to be assimilated this instruction in the actual localities where in after time it will have to be applied.

To my mind in spite of the eminent men at Oxford and the long hours of lecture, the training there, if the test be practical efficiency in India, must end in failure. Dr. Schlich goes on to say that the present course of instruction is what it has been at Coopers Hill during the last few years. This will not give unalloyed satisfaction to the Department out here. Should the opinion of almost any Conservator, who has the progress of forestry at heart, be asked, he will tell you that, although the Old Nancy and Coopers Hill men of the earlier years turned out as a general rule excellent practical officers, there has been a marked falling off of late years (though naturally there are brilliant individual exceptions), and if the course of instruction at Oxford is what has lately obtained at Coopers Hill, the close observer will find ample cause for grave doubt as to whether the results will prove satisfactory. It is evident that if we are not obtaining the men we require, and there is little doubt about this, the cause must be that the stamp of man coming forward leaves much to be desired, or that the method of training as judged by the results is largely capable of improvement. If the right stamp of man will not come forward, surely Dr. Schlich must, unless he has lost all touch with India, also recognise the fact, and, while doing so, must see that it is his duty to point this out to the Government at home and advocate radical improvements in the pay and prospects of the service and in this way co-operate with the Government of India. If, on the other hand, the method of training is a barrier to our obtaining the men we require, the course at Oxford should be abolished or at least new blood should be infused into that portion of the teaching staff responsible for the education in the forestry subjects. By new blood I mean men who are keeping themselves intimately acquainted with the progress of forestry in India, who are in active touch with such progress, and can impart such instruction as, while meeting our present requirements, will be an incentive to greater progress in the future. There can be no doubt that a marked advance has taken place in the last few years, and that in order to keep pace with this at Oxford we require our "hopefuls" to be instructed

by practical men who have been and are taking part in this advance.

Dr. Schlich considers it of the first importance that the forest students should be well acquainted with the details of forest management in a country where forestry has been brought to the highest state of efficiency. I entirely agree. I must question, however, whether the younger Forestry Departments of the world have not overtaken and even outrun those of Europe, as far as efficient forest management and economics are concerned. There is a very widespread feeling that we, in some of the Indian provinces at least, have little to learn from France and Germany, and will have still less when the new Forestry College and Research Institute at Dehra are firmly established. On the other hand my impression is that Europe will, however unwillingly, be forced to recognise, at no remote period, that it has much to learn from the more practical and go-a-head methods of India and the United States. Very lately I met a member of the French Forest Service touring in India. He expressed himself absolutely astonished at our maps, our working plans, and frankly confessed that there is nothing comparable with these at home. The unprejudiced mind must be rapidly forming the opinion that forestry in India, no doubt partly owing to the far greater opportunities, is rapidly tending to leave forestry in Europe far behind, if this is not already an accomplished fact. The conclusion that I am being driven to is, always provided that we induce the right stamp of men to come forward (and this should and can be done by offering adequate pay and prospects, thus removing the discontent that is permeating the Department out here and finding its echo at home), that the training of our recruits is a mistake at Oxford or elsewhere in Great Britain, where natural training grounds are too restricted or non-existent, where the practical requirements of Indian forestry are subordinated to narrow theoretical instruction, imparted no doubt by men of high eminence but out of touch with the progress now discernible in India—that three years on the Continent would permit of an infinitely wider training, resulting in our obtaining men of a more practical bent—but that the best training ground of all is India itself where, at

Dehra Dun, our actual requirements would be duly appreciated and adequately met. The only objections that at present occur to my mind with reference to an Indian training are that men might be brought out to India too young (this could, however, be obviated by raising the age limit and by allowing the period under training to count towards pension), and that if, after spending two or three years at the Forestry College, they were found to be unsuitable, or for some reason or another did not enter the Forest Service, they would find it somewhat difficult to obtain a start in a more congenial career and might be stranded. What, therefore, I would advocate is two years' training on the Continent, followed by one year's probation at Dehra Dun. I believe that this would give us practical men and be a strong incentive to the advance of forestry that is now showing itself in parts of India after many years of comparative stagnation.

OBSERVER.

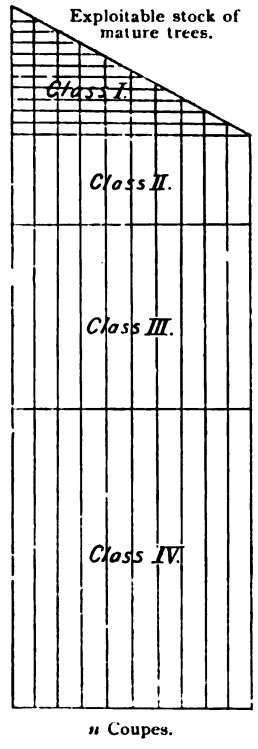
SELECTION BY AREA.

SIR,—In the July number of the *Indian Forester*, a letter appeared by Mr. Lovegrove, in which he condemned the method of calculation in the Working-plan under discussion, on the ground that the total number of second-class trees taken into consideration in calculating the possibility will not be included in the outturn during the first felling-cycle.

Without entering into any discussion as to the merits of the so-called selection-by-area method, or its value as a fresh discovery in the world of Forestry, I wish in a few words to combat the strange theory that an error is committed by any Working-plans Officer who allows any second-class trees that have been included in the possibility calculations to be left standing in the coupes after the first passage of the fellings through the area.

I feel that I owe an apology to the readers of the *Indian Forester* in re-stating the very obvious and elementary fact that the yield of an entire area of forest can only be realised annually of an $\frac{1}{n}$ of its surface, on the condition that n year's production of trees of the exploitable size have been allowed to accumulate on

this fraction of its surface. Consequently, in order to be in a workable condition, every forest must always be constituted in the manner roughly indicated in the accompanying diagram; the vertical distances representing the relative proportions of the different size-classes, and the horizontal distance the number of years in the felling-cycle.



If all trees already mature, together with all second-class trees attaining maturity within the first felling-cycle, were to be removed within this period, there would obviously be a very insufficient stock of trees left with which to continue the fellings during the second rotation, so that the constitution of a sufficient stock of exploitable trees which, though they must always be kept standing on the ground, are not "surplus" is (so far from being an "error") a matter absolutely essential to the regular working of the forest, and a much more important feature of the plan than the correct calculation for the next score or two of years of the exact number of trees available for extraction.

In an extreme (but by no means unheard of) case, the whole of the first-class, and the whole of the second-class trees attaining maturity during the first felling-cycle, might have to be left to form the exploitable stock to be kept standing on the ground (the size of which would be directly proportional to the length of the felling rotation), and nothing at all would then be available for extraction during the first felling-cycle.

H. JACKSON.

NAINI TAL:
14*th August* 1906.

REVIEWS AND TRANSLATIONS

SCHLICH'S MANUAL OF FORESTRY.

FOREST POLICY IN THE BRITISH EMPIRE.

Schlich's Manual of Forestry. Vol. I—Forest Policy in the British Empire, by W. Schlich, Ph. D., C.I.E., F.R.S., F.L.S., M.A., Oxon., 3rd Edition, revised and enlarged. London : Bradbury, Agnew & Co., Ld , 10, Bouverie Street—(1906).

We have to welcome a third edition of Schlich's well-known Manual of Forestry. In the preface to the first edition it was explained that this Manual was destined, in the first place, for the instruction of probationers for the Indian Forest Service. It was also stated that, during the progress of the work, alterations of the original plan were likely to be introduced. The third edition of Volumes I and II has accordingly been re-arranged. The second half of Volume I has been transferred to Volume II and instead the part of the first volume dealing with "Forestry in Britain and in India" has been enlarged so as to become an abstract of "Forestry in the British Empire." This new portion of the work is eminently readable, and the gifted author is to be congratulated on a re-arrangement which, by omitting the chapters on sylviculture, gives much more needed space to the discussion of the advancement of Forestry in the British possessions.

No changes have been made in Parts I and II, which remain identically the same as in the second edition, and therefore require no fresh consideration here.

Part III deals solely with Forestry in the British Empire and is divided into five chapters treating respectively of the British possessions in Asia, Australasia, British possessions in Africa, America and Forestry in the United Kingdom.

In Chapter I East India is first considered, being subsequently followed by Ceylon, the Straits Settlements, the Federated Malay States, Cyprus, North Borneo and Samarak. The forest conditions, policy and organisation are, in so far as is possible, treated of under each.

Under Australasia in Chapter II, Queensland, New South Wales, South Australia, Western Australia, Tasmania, New Zealand, and Victoria are respectively considered. The British possessions in South Africa treated of in Chapter III are Cape Colony, Natal, Orange River Colony, the Transvaal, Southern Rhodesia, the West Coast of Africa, East African Protectorate, Uganda Protectorate, Central African Protectorate, the Sudan and Mauritius. In America (Chapter IV) the Dominion of Canada and the West Indies, British Honduras and Guiana are discussed.

The mere enumeration of the above list of British possessions and Colonies serves to bring out in startling prominence the immense forest resources of the British Empire and to enhance the at present all too inadequate means the Empire possesses of affording the requisite forestry instruction and training to the number of professional experts she requires if her vast forest resources are to be maintained and improved.

As might be expected in a work of this nature, considerable space is devoted (Chapter V) to the subject of Forestry in the United Kingdom. Its importance is discussed as also the measures to be adopted and studies of certain types of woodland in England and Ireland are introduced.

In treating of the land available for afforestation, Dr. Schlich comes to the following conclusions :—

1. We require enormous and ever-increasing quantities of timber.

2. Prices are likely to be higher in the future than they were in the past.

3. Supplies from outside rest on a very unsafe basis.

4. An increase of the woodlands in this country (United Kingdom), if brought about by the afforestation of surplus land, will keep a large amount of money in the country, lead to an increased demand for labour in the establishment and management of such woodlands, and it is likely to cause the development of additional industries which use wood as their raw material.

With regard to the land available for afforestation, Dr. Schlich states that there are over fifteen million acres of

mountain and heath land available in the United Kingdom for planting.

Turning to Canada and Australasia, much stress is laid upon the necessity for an improved forest policy in these Colonies. There is also a valuable appendix detailing the progress in Forestry in the United States and the organisation of the Forest Service in that country which Canadians are recommended to study.

The book is well illustrated by numerous photographs depicting the characteristics and conditions of forests in different parts of the world. There are also charts showing the average annual rainfall and the direction of prevailing winds in different parts of India.

We think we shall be voicing a very general opinion in stating that the book is a marked improvement over its preceding editions. To Dr. Schlich we extend the heartiest congratulations on the evidence it shows of undiminished powers and an indefatigable industry.

CURRENT LITERATURE.

BULLETIN NO. 2 published by the Director of Forestry of the Philippine Islands deals with the *Charcoal Industry*. The charcoal industry in the islands, though not of paramount importance, is kept alive by demands which cannot be filled from other sources. The note is of interest since it describes and compares the advantages of the kilns prepared by the natives and those of the Japanese, to the advantage of the latter. The native kiln is made by piling the billets on end round a central guide post or pole having the desired height of the kiln. Each tier decreases in diameter and they finally converge to form a cone-shaped pile. In order to provide draught in burning a small radial vent leads along the ground to the central axis, then upwards to the apex of the cone. The Japanese construct permanent kilns on well drained hillsides, half the kiln being excavated out of the hill, while the front containing the door for filling is built up from stone and clay. The kiln is about a yard deep and has a capacity of 5 cubic meters. A chimney with a 3-inch diameter is constructed in the rear having its inner opening at the bottom of the kiln. The unfinished kiln

is filled with wood and rounded off at the top with a dome shaped clay roof in which three small holes are made to provide draught. In order to ensure complete and even burning the ground plan of the kiln is pear-shaped with the neck portion near the door. Species of Brugiera, Rhizophora, Sonneratia, Lumnitzera, Xylocarpus, Heritiera, Casuarina, Psidium and Gliricidia are used in the kilns.

Bulletin No. 3 of the same department is a compilation of notes on India-rubber and Gutta-percha in which the various species of commercial use are described and the progress made in planting in various parts of the world is detailed.

The BOTANICAL GAZETTE for June has an interesting illustrated paper by Karl M. Wiegaud on *Some Studies regarding* the *Biology* of *Buds* and *Twigs* in *Winter*. The author comes to the following conclusions :—Buds containing a considerable number of well differentiated organs are usually protected by scales. Those sunk in the bark usually contain little besides the growing point or rudimentary leaves. Bud scales are not only the most feasible structures for covering a large bud, but they also allow the bud to swell and protect the young shoot when unfolding. The bud fundament in most trees is laid down early in summer, grows gradually till late autumn, remains dormant until early spring. then passes through a period of swelling preparatory to unfolding Dark-coloured buds are usually warmer within than light-coloured ones. Ice may be found in most buds when the temperature has fallen as low as in 18° C. and usually in large quantities. Frozen twigs are smaller than normal ones. Their contraction occurs mainly in the bark. Frozen buds do not show this contraction so plainly, probably because of change of form in the bud scales.

Regarding the functions of bud scales, there is little evidence that they serve to keep water out; neither are they important to the plant as modifiers of temperature. Bud scales have probably been evolved to prevent excessive transpiration and to protect the delicate tissues from mechanical injury. When the buds open the scales often grow out, forming a tube-like structure which protects the young shoot from too great loss of water The wool in such

buds as horse-chestnut is not to modify the temperature but to protect the young shoot from too great transpiration.

In the Records of the Geological Survey of India, Vol. XXXIV, Part 1, Mr. Guy E. Pilgrim gives some notes on the geology of a portion of Bhutan. The foot hills of the Bhutanese frontier have been geologically unknown and the densely wooded character of the hills render a geological survey of the country very difficult. Mr. Pilgrim's observations confirm previous surmises that from Nepal to the Subansiri river or even further east still there are more or less continuous outcrops of the Upper Siwaliks, Gondwanas, Purana metamorphic rocks and older gneiss taking them in the order in which they are met going inward from the plains to the hills.

The number also includes a valuable paper by Carl Diener, Ph.D., of the University of Vienna, on some fossils from the Halorites limestone of the Bambanag Cliff (Kumaon) and a second on an upper Triassic Fauna from the Peshin District, Baluchistan, by the same author.

We have received the third part of the AGRICULTURAL JOURNAL of INDIA, and the papers it contains give evidence of the progress Agricultural Science is making in the country. To mention some of the titles of the papers—Flax Experiments in India by Bernard Coventry, The Benefits of Sheep Dipping by Captain F. Baldrey, Co-operation Credit by W. R. Gourlay, I.C.S., The Study of Fermentations as applied to Agriculture by C. Bergtheil, and Mineral Fertmilisers in India by F. G. Sly, I.C.S. The number is of considerable interest.

SHIKAR, TRAVEL, AND NATURAL HISTORY NOTES.

IN AN INDIAN EVERGREEN FOREST

There is a pleasure in the pathless woods

Green—all around is green, deep sage greens, brilliant Hooker's green, glossy yellow greens of an infinite variety. It is the depth

of a tropical evergreen forest. Great columns of stems stand up here and there, silent, massive sentinels

A pillar'd shade
High overarch'd

amongst their smaller slimmer brethren. Brightly coloured are they; of the deepest or most brilliant of browns and reds or green-coated with moss and sphagnum or flecked here and there with white lichens; or again, silvery grey or yellowish-green, the trunks towards the base projecting outwards into great flying buttresses running up to 20 feet or more above the ground level, with space between the wings to form a comfortable-sized room. Standing between these giants are trees of every size, appearance and colouring. Slim tall poles, already rivalling their mighty neighbours in height but tapering, willowy, graceful, for all their energies have been spent in keeping their crowns free and their later increase in girth is at present only conjectural. But their abundance, diverse size and bizarre colouring is not their only peculiarity. Their distinctive characters are as numerous as their different appearances for the evergreen forest contains a vast variety of species puzzling and muddling even to the botanist let alone to the casual visitor. Here are Lagerstrœmias of several species, Micelia, Mesua, Artocarpus, Cedrela, Gmelina, Stereospernum, Amoora, Cinnamonum, Albizzia, Morus, Shorea, Cassia, Dalbergia, Ficus elastica (the India-rubber) one tree of this species forming here in its native home a small forest of stems owing to its power of throwing down aerial roots from the branches, and a host of other species jumbled together in Nature's own mixture. And what a picture it is? The trees are linked and joined together by giant creepers, themselves of the size and thickness of ordinary tree stems. These, starting at the base of some mighty monarch, climb up, envelop and slowly throttle it to death, the while they throw out great arms which depend in massive ropes or mighty festoons from tree to tree forming an intricate mass and rendering it almost impossible to see anything but the lower portions of the trees. Here and there one comes suddenly upon a thicket of the most brilliant green some thirty feet high

and absolutely impenetrable, for it is a thicket of cane ; beautiful to look upon, with its erect whip-like shoots and delicate frond-like foliage of the most glorious glossy green. The whole plant however is covered with a mass of long sharp pointed thorns—thorns which even an elephant will not face with equanimity. What a brilliant spot of colour the cane brake makes set in a many-shaded green and yellow setting ! The plant does not only appear in patches in these evergreen forests. Suddenly, without warning, one plunges into an undergrowth consisting entirely of small cane plants about 6 feet high and this cover may stretch for a mile or more. Nasty stuff to get through, though to the eye it forms a most lovely carpet to the wonderful tangle overhead.

If we could see the crowns of the great trees we should find that many of them were in flower ; for it is April and the hot weather season in India during which many trees flower. At times these flowers are gorgeous. Brilliant reds, yellows or cream and white are the prevailing tints. But although we can only know of the glories far overhead from the fallen corollas strewing the under growth and floor beneath there is much brilliant colouring to be seen in the intermediate stages of the forest for

> 'Tis the heaven of flowers you see there
> All the wild flowers of the forest.

Amongst the creepers gorgeously-tinted inflorescences are to be seen and the smaller woody shrubs are in many cases bright with colour. Just now there is a dainty little creeper with a beautiful deep red orchid-like inflorescence in bloom whilst a woody shrub has tiny urn-shaped corollas studding its leafless branches and a smaller tree, also leafless, is a mass of madder brown and naples yellow streaked corollas. And the ferns ! Surely nowhere else can such a brilliant fernery exist !

> For wheresoe'er I turn my ravished eyes,
> Gay gilded scenes and shining prospects rise.

The forest is like some gigantic hot house but wrought on Nature's own wondrous scale. Perched in the loop of a great creeper or clinging to the smooth stem of a monarch of the forest enormous hard ferns are to be seen suspended, so to speak, in mid air with

pendant fronds 4 to 5 feet in length. From the ground shoot up giant tree ferns which form delicate touches of beauty in the wild riotous mass of creepers. Lower still in the undergrowth a mass of smaller ferns are to be seen, the largest however with fronds of some 5—7 feet high shooting straight up from the ground level. Dropping from the branches, from the trunks of the trees, the crowns of the tree ferns and the pendulous arms of the creepers, in fact from each and every coign of vantage, are the orchids, those dreams of delight of the damp evergreen forest. Too early are we as yet for the majority, but some have already begun to hang out their glorious delicate masses of gorgeous blues, whites, yellows and palely-tinted greens.

The only possible way to see such a forest is from the back of an elephant. In a howdah or on a pad, in addition to that peculiar free feeling such a forest engenders in one

> I am as free as Nature first made man
> Ere the base laws of servitude began
> When wild in woods the noble savage ran

at this season of the year the cool shady evergreen jungle is or would be far preferable to the hot dusty outside but—for the flies! Gad flies, Bot flies, horse flies, elephant flies and giant mosquitoes, all are there in their thousands. You have not proceeded 30 paces into the forest before they descend upon you and the plague is awful for they bite severely, buzz maddingly and, moreover, are very tenacious of purpose. The elephant on return is a sorry sight. His great head and trunk are covered with blood, the flies having bitten through the tenderer parts of the skin and the whole surface is now a mass of blood and dead insects. His inconvenience however is as nothing to ours, and these pests of the evergreen forest detract considerably, at this time of the year, from the enjoyment to be obtained from a scene of so much tropical beauty, for they are in their millions, their buzz is as the whirr of mighty machinery and their bite as the sting of many scorpions.

EXTRACTS FROM OFFICIAL PAPERS.

MEMORANDUM ON THE SUBJECT OF THE PLANTING AND MAINTENANCE OF AVENUES IN THE SALEM DISTRICT.

DRAWN UP BY F. A. LODGE, ESQ., DISTRICT FOREST OFFICER, SOUTH SALEM, AS REQUIRED IN G. O. NO. 315-REVENUE, DATED 6TH APRIL 1925, COMMUNICATED IN REVENUE BOARD'S PROCEEDINGS NO. 79 (LAND REVENUE), DATED 18TH APRIL 1925 *

1. The old days of cheap planting by the aid of the village officers and the Collector's walking stick are gone, and the District Board must be prepared to spend rather more money on the formation of new avenues than was formerly the case. In 1885, writing on the same subject, Colonel Campbell Walker, referring to the creation of the splendid avenues of the Salem District, stated that "Mr. Collector Orr watched over them year by year and held the village officers strictly responsible for their care, enforcing his orders by a stout stick, with an iron spud at the end of it," an excellent system for the protection of young avenues and probably more satisfactory to all concerned than punishment by fines, but as the system is now out of date the following memorandum may be useful to those in charge of the road avenues.

2. The first point to decide when an avenue is to be established is the species which are to form the avenue, and this must depend principally on the nature of the soil along the roadsides. The various figs (Ficus bengalensis, Ficus Tsiela, Ficus infectoria, Ficus Religiosa, Ficus glomerata) will grow well on almost any soil except laterite; they do best on loose sandy soils and in the vicinity of water, and do not object to a water-logged soil, as in the vicinity of paddy fields. They are excellent trees for shade, but they should not be planted on ridges or other portions of roads exposed to strong winds as they are inclined to be brittle. In rocky ground with patches of soil between the rocks they do well as they send out roots to enormous distances in search of soil and moisture.

*This memorandum was kindly forwarded to us by the author. The subject is of such importance throughout India that we are of opinion that no apology is necessary for inserting the note *in extenso*.—HON. ED.

The figs are par excellence the best shade trees; they have however one great failing, namely, they are not remunerative; their fruit is of no commercial value, and the only way in which they could be made to yield revenue while growing would be by selling the right to collect the fallen leaves, for which, judging, by the clean swept appearance of the roads under such avenues, there is considerable demand. At maturity their wood is, as a rule, unfit for timber and yields but indifferent fuel. It is possible that some of them might yield rubber of a certain value, but tapping for rubber if allowed would have to be very carefully supervised, as overtapping would kill the trees. In moist places at high elevations in the Hosur Division the Ficus elastica might succeed, and would prove very remunerative.

The mango will grow well in soil near paddy fields, but should be raised above water level; it also thrives on laterite, and if taken care of for the first five years, it can be grown successfully on soils formed by the decomposition of gneissic rocks. The graft mango is hardly a large enough tree for avenues, but the wild mango grows to a considerable size and makes an excellent avenue tree. Its timber is saleable and is in great demand for planks.

The tamarind prefers dry soils; it is one of the few trees that thrive on black cotton soil; it also does well on laterite and gneissic soils. It is a strong deeply rooted tree and will stand any quantity of wind, its shade is said to be hotter than that of most species and its leaves contain an acid injurious to tent fabrics. Its fruit is always in demand, and it is probably the most remunerative tree for avenues As hardly any thing will grow below its branches it helps to keep the roadside clear of scrub undergrowth. It yields a good timber which is not much used owing to the difficulty of working it. As fuel it is much used in brick kilns. At the beginning of the hot weather it is nearly leafless for a short time.

The margosa is a splendid avenue tree; it thrives on almost all soils, is never leafless, gives cool shade, is strongly rooted and is said to drive away malaria Its seeds are an insecticide, its fruit yields an oil used in medicine and also as an illuminant, its leaves are used as poultices, its bark as a febrifuge and its timber is valuable for building purposes; it is one of the timbers which white ants seldom attack.

The above are the principal avenue trees; the figs will thrive on shallow soil, and to a smaller extent, so will the mango, but the tamarind and margosa require deep soil for the development of their tap roots. Figs should not be planted near any masonry work as the roots appear to have a special affinity for mortar in masonry joints, and a still greater affinity for water, in search of which they will travel upwards of seventy yards from the tree trunk.

3. There are many other species suitable for avenue trees, and as variety of species is a desideratum in all avenues I have tabulated the principal species recommended for use in this district giving a little general information regarding each of them.

In addition to the above the following may sometimes be found to be useful:—

Mimusops Elengai (Magadam), a large evergreen tree with an edible fruit and a sweet flower.

Species.		Soils, etc.	Growth.
Botanical name.	Vernacular name.		
Dillenia indica...	Pinnay, Uva ...	Red soils and soils resulting from decomposition of granite gneissic rocks.	A large tree, evergreen, moderatley rapid growth.
Polyalthia longifolia.	Asoka ...	?	A large evergreen tree, growth fairly rapid.
Thespesia populnea.	(The tulip tree). (Purasa, Portia)	Prefers light, porous soils.	Medium sized, evergreen tree; growth fairly rapid.
Melia azedirachta	(Margosa) Vepam	Any soil, provided rock is not too near surface. Thrives on black cotton soil, and near wet cultivation.	Large semi-deciduous tree. Growth slow to moderate.
Mangifera indica	(Mango) Maa ...	Laterite, gneissic gravels. Likes a moist situation.	Large evergreen tree. Growth fairly rapid.
Anacardium occidentale.	(Cashew nut) Mundri.	Sandy and gravelly soils.	Small evergreen tree. Growth fairly rapid.
Pterocarpus marsupium.	Vengai ..	Gneissic soils at the foot of hills.	Large deciduous tree Growth rather slow.
Pongamia glabra,	Pungam ...	Gneissic soils ...	Medium sized, nearly evergreen. Growth moderate.
Tamarindus indica.	(Tamarind) Puli	Any soil, provided no sheet rock near the surface. Thrives on black cotton soil.	Large evergreen tree. Growth slow.
Acacia arabica...	Karuvelum ...	Black cotton soil ...	Medium sized, evergreen. Fairly rapid growth.
Albizzia lebbek	Vaghe ...	Any soil, does well even on laterite or black cotton, roots near the surface.	Large, deciduous, growth very rapid.
Albizzia odoratissima	Sela Vanjai or Karuvagai.	Gneissic and gravelly soils.	Ditto.
Terminalia Chebula	(Gallnut) Kadakai.	Foot and slopes of hills, especially above 2,000 feet elevation.	Large, deciduous, growth moderate.

Minor products.	Wood.	Remarks.
Fruit edible. Leaves used as sand paper.	Good for building, yields good charcoal.	Grows irregularly unless forced up in a thicket.
?	Light; I know nothing about its durability or value.	Introduced from Ceylo as an avenue tree.
Bark gives a good fibre. Seeds give a yellow dye.	Durable; used for boats, carts, and furniture.	Grows well from cuttings, makes a handsome avenue.
Bark gives a febrifuge. Seeds give an insecticide. Gum is used as a stimulant. Fruit gives an oil used in medicine and as an illuminant.	Very hard and durable, is almost white-ant proof.	.....
Fruit is edible. Bark gives a gum.	Soft; used for planks and boxes; white-ants are very partial to it.	.....
Fruit and nut edible; oil is used to keep white-ants off wood and insects off book bindings; also as a cure for corns and warts.	Soft; used for packing cases and charcoal.	Extend chiefly because it is remunerative; generally too small for large avenues.
Kino, a gum much used in medicine.	Good timber, very durable and easily worked; used for beams, rafters, cart wheels, etc.	.....
Seeds used medicinally, also yield oil. Leaves used for manuring wet fields.	Soft, not of much use for anything.	Grows well from cuttings.
Fruit used medicinally, also for preserves. The seed ground and mixed with gum gives a strong cement.	Wood hard, durable but difficult to work; used for oil and sugar mills. Fuel very good.	A very hardy and also a remunerative tree.
Yields a useful gum. Bark is used in tanning and dyeing. Pods used as fodder especially for goats.	Very durable, used for wheels, well-curbs and agricultural implements.	Very hardy, but very thorny; only recommended for heavy black cotton as a temporary avenue while the slower growing tamarind and margosa are coming up.
.....	Durable, used in building and for furniture.	Owing to its root system it is likely to be blown down in strong winds.
Leaves used as fodder ...	Durable, works well, used in buildings and for cart wheels.	.....
Fruit myrobalans, used for dyeing and tanning, also for making ink.	Durable, used for agricultural implements, carts and in buildings.	A remunerative tree.

Species.		Soils, etc.	Growth.
Botanical name.	Vernacular name.		
Terminalia Arjuna	Vellamaruthu or Tanikai.	Gneissic, gravelly and sandy soils, near streams or wet cultivation.	Large, deciduous, growth fairly rapid.
Poinciana regia	Panjadi (The Gold Mohur tree .	Any soil, but does not grow well on black cotton.	Large, semi-evergreen, rapid growth, spreading branches.
Poinciana elata ...	Padenarayan ...	Thrives best on gneissic soils.	Medium sized, rapid growth.
Eugenia jambolana	Naval or Naga...	Gneissic soils, laterite or near wet cultivation.	Medium sized, evergreen, medium growth.
Anthocephalus cadamba.	Kadamba ...	Near wet cultivation and on loose soils near streams	Large, deciduous, growth moderate to rapid.
Bassia latifolia...	Illupai ...	Nearly all soils ...	Large, deciduous, growth moderate.
Bassia longifolia	Kut Illupai (The Mohwa tree).		
Millingtonia hortensis.	(The Cork tree) Katmalli.	Nearly all soils ...	Large, semi-evergreen, growth rapid. Reproduces by root-suckers.
Ficus bengalensis	(The banyan) Ala	Near wet cultivation, also gneissic soils and soils containing lime.	Large evergreen with aerial roots. Growth very rapid.
Ficus infectoria...	Jovi ...	Ditto.	Large, semi-evergreen, aerial roots, scanty.
Ficus religiosa ...	(The peepul) Arasa.	Ditto.	Large semi-evergreen.
Ficus elastica ...	The India-rubber fig.	Do. above 3,000 feet..	Large, evergreen, many aerial roots.
Ficus glomerata,	Atti ...	Near wet cultivation, also gneissic soils and soils containing lime.	Large, evergreen, growth rapid.
Ulmus integrifolia	Aya ...	Gneissic soils ...	Large, deciduous, growth rapid.
Casuarina equisetifolia.	Chouka ...	Sandy soils and pure sand by sea or river.	Evergreen, very rapid growth.

Minor products.	Woods.	Remarks.
.....	Fairly durable, used in buildings.	.....
Gum	Soft	A handsome tree.
Leaves used for fodder and for manure for wet lands.	Soft, said to be good for cabinet work.	.....
Fruit eaten. Bark used in dyeing and tanning and as an astringent.	Durable, can be used under water.	.....
Fruit is eaten	Light, used for building, but is brittle.	A fine avenue tree.
Flowers are eaten ; a spirit is extracted by distillation. Fruit is eaten. Kernel yields an oil	Heavy and durable ; lasts well under water.	A very remunerative tree. In North India a single tree realises up to Rs. 2 per annum.
.....	Light, soft, useless ...	An ornamental tree, but brittle and useless as timber and has not a spreading head.
Leaves used as plates ...	Wood useless as timber except under water. The aerial roots give the best wood and can be used for cartpoles.	The best shade tree for avenues, but its long branches are very liable to be broken by heavy winds.
Bark gives a fibre used for ropes. Young shoots are eaten in curry.	Gives fair charcoal ...	.. ...
Might yield rubber ...	Gives fair charcoal and is used for packing cases.	.....
Yields rubber ...	.....	Not indigenous in South India. A very remunerative tree if it can be successfully introduced.
Fruit is edible. Might yield rubber.	Soft, durable under water.	.....
.....	Light ; used for buildings and carving.	.....
.....	Hard, used for rafters and verandah posts.	Not a good shade tree but most useful in belts for stopping drifting sand.

Alstonia scholaris (Pala), a tall evergreen tree, liking a moist climate.

Strychnos potatorum Thettankottai), a small evergreen tree ; its fruit is the well-known clearing nut.

Strychnos nux-vomica (Yetti), a small evergreen tree, the seeds of which are exported for medicinal purposes. Both the above grow best along sandy stream beds.

Tectona grandis (Tekku), the teak tree, very valuable for its timber but not very suitable for avenues on account of the mess of dry dead leaves under it.

Vitex altissima (Maila), a large tree of fairly rapid growth, giving good timber.

Artocarpus integrifolia (Pilla), the jack fruit tree, giving excellent shade, a fruit in much demand, useful timber, and possibly rubber ; it likes rich soil, high elevation, and a rainfall of not less than 40 inches ; most, if not all, of the plains of Salem are too dry for it.

4. Having decided on the species to be planted, the next step is to procure plants. There are several ways of doing this ; where natural seedlings exist they can be dug up and transplanted ; with many species all that is necessary is to take cuttings and plant them where the trees are wanted, but, as a rule, it is advisable to form nurseries in which to *grow the young plants from seed.*

5 In order to obtain good trees good seed must first be obtained. Seed should be collected only from well-grown healthy trees and the seeds must be quite ripe. The method of collection varies according to the nature of the seed Dry heavy seeds such as teak can be collected on the ground *as soon as they fall ;* they should not be left on the ground for any length of time as insects may attack them ; seeds with a fleshy envelope like the mango and the hog plum must be taken from ripe fruits, cleaned and dried. Leguminous seeds can generally be collected by gathering ripe pods and splitting them open, but in the case of some dehiscent pods which scatter the seed as soon as they are ripe it is sometimes necessary to tie the pods up in muslin bags into which the seed falls when ripe ; the same method may be adopted for the collection of casuarina and other light seeds. For fig seeds collect ripe fruit, open it and dissipate it in the sun.

As seeds are generally collected some months before they have to be sown, they must be carefully preserved from weather and insects until they are wanted. To begin with they must be thoroughly dried in the sun ; all seeds with any signs of insect borings on them must be picked out, and the good seeds must be carefully stored in a dry place. Most seeds keep well tied up in gunny bags or packed in tins carefully covered to exclude insects or in brown paper packets. In order to exclude air and insects from thoroughly dried seeds sterilise some river sand by heating it on an iron plate, fill a tin an old kerosine oil tin will do) three-quarters full of seed and then fill up to the top with sterilised sand.

The Nursery.

6. The site for a nursery should be sheltered but not shaded ; a perennial stream or a well in the vicinity is a necessity. The amount of preparation the nursery site will require must depend on the system of sowing to be adopted. If seeds are to be sown in the ground, the whole area should first be ploughed up, stones, roots, etc..

removed and narrow seed beds prepared to grow the young plants from seed, with narrow paths between ; the paths should be just wide enough for the gardener to walk along, with the exception of one or more main paths which should be four feet wide, or (if the seedlings are eventually to be removed on carts) wide enough to allow a cart to pass along them.

The seed beds should be quite level and should not, as a rule, exceed 3 feet in width ; if made wider than this, the gardener cannot weed them or break up caked soil without stepping on the beds. The beds must be raised slightly above the level of the paths, so that they may not become water-logged during the rains. If it is intended to irrigate the nursery the width of the seed beds should be decreased to 2 feet, and a channel should run round each bed so that water can be kept standing in it when necessary.

The soil of a nursery should be fairly light and sandy ; seeds do not require a heavy soil for germination and it is easier to transplant in sandy than in clayey soils.

7. Seeds should be sown in September or October ; they can be sown earlier, but if sown in June an extra three months' expenditure on the nursery is required, and owing to the increased size of the seedlings in the following June the expenses of carriage and planting out are increased.

Small seeds may be sown broadcast over the seed beds, which should be previously watered and raked, to give a moist and soft surface ; dry soil or sand should be sprinkled lightly over the seed beds as soon as the seeds are sown ; for very light and small seeds it is a good plan to mix them thoroughly with sand before sowing and then sprinkle the mixture lightly over the seed beds. For hard seeds which do not germinate easily, such as teak, dig a pit about one foot deep, put on a one inch layer of seed and a one inch layer of sand alternately, till the pit is full, the top layer must of course be of sand, not seed ; water thoroughly morning and evening for two days ; then turn over the mixture with a spade and again water thoroughly for two days ; repeat a fortnight by which time the seeds will have softened and be ready to put out in the seed beds ; another good plan is to put the seeds in a gunny bag and leave the bag on the edge of a pool or tank, half in, half out of water, turn the bag daily for a fortnight and then the seeds are ready to germinate. In sowing large seeds such as teak, mango, gold mohur, etc., a small hole from one to three inches deep must be made for each seed with a pointed peg. In order to ensure regular sowing and to be able to check the percentage of germination, the gardener should be provided with a piece of string slightly longer than the seed beds, with a knot at every three or four or six inches (according to the distance at which it is intended to sow). To each end of the string a peg is tied and the pegs are stuck into the ground at each end of, and two or three inches from, the edge of the seed bed ; the knots then show the gardener exactly where to sow each seed ; when the first row is completed the pegs are moved one knot's distance across the bed in order to fix the second line of seeds, and so on till the whole bed is sown.

For medium sized seeds, too small to sow as above and too large to sow broadcast, parallel furrows from a quarter to half an inch deep are made along the seed beds with a pointed stick and the seeds are sprinkled along the furrows by hand, the raised edges of the furrows being then turned back over the seeds.

8. It will be seen from the preceding paragraph that the depth at which seeds are sown varies according to the nature of the seed ; small light seeds lie almost on the surface, slightly heavier ones are buried a little deeper, while heavy solid seeds are covered with at least an inch of soil. Fig seeds deserve special mention ; they lose vitality. quickly and should when possible be collected only a short time previous to sowing The figs can be crumbled up by hand and sown broadcast on a layer of broken brick ; the seed bed must be kept moist, and is best done by a ditch full of water round the bed ; germination is slow and may not occur for a month after sowing, so the gardener must not be allowed to neglect the seed bed because no results are visible in the first few days ; this applies to all seed beds, as many seeds do not germinate till they have been in the ground for some time.

9. The amount of shade and moisture which seeds require varies according to species ; as a general rule heavy seeds which naturally fall beneath the shade of the parent trees require more shade than winged and light seed which in a state of nature are blown away from the shade of the parent trees ; the best results are obtained by copying as near as possible the conditions in which the seeds germinate and the seedlings grow in their wild state. The teak seed, for instance, is covered with a thick layer of dead leaves half rotted by rain and keeping the seeds moist and warm; in fact nature provides a regular forcing bed for these seeds, and the same may be said of the mango ; lighter seeds under similar conditions would rot. Therefore give heavy seeds heavy shade and light seeds light shade : for heavy seeds, put low pandals, for light seeds high pandals. It is a good plan to have movable pandals, *i.e.*, rough frames filled with leafy branches or cocoanut leaves supported on forked sticks so that the pandals can be taken off on cloudy days during rains to prevent drip, or after rains to counteract excessive moisture.

10. Watering prior to germination should be done with a watering can with a fine rose, should be sufficient to keep the soil moist, but not heavy enough to wash the seeds or soil away ; on cloudy days watering can be done at any time, but on sunny days as much of the watering as possible should be done before sunrise, and under no circumstances should watering between 9 A.M. and 4 P.M. be allowed. Reference has been made to watering by irrigation ; when sufficient water is available, this is the best way of watering seedlings, and may also be used for watering seed beds containing heavy seeds. In irrigating seed beds no water should be allowed to flow over the beds ; the channel round each bed (*vide* paragraph 6) should be filled with water which should be allowed to stand for one or two hours until it has percolated to the centre of the bed ; the time required varies according to the nature of the soil ; a peg pushed into the middle of the bed to a depth of six inches and pulled out every half hour will show when the moisture has reached the centre of the bed ; the surplus water in the channel should then be drained off. The advantages of this system of watering are that the surface soil is neither caked nor washed away, that the seedlings are not beaten down by excessive surface watering and that the sub-soil moisture, so necessary for the roots, is maintained ; the dangers are that water does not percolate far enough to reach seedlings in the middle of the bed (remedy=decreased width of beds) and that the sub-soil becomes too moist and the seedlings rot away ; in this connection it must be remembered that the sub-soil moisture does not evaporate

nearly so fast as surface moisture and irrigation once every 3, 4 or 5 days (according to the weather) is sufficient ; the testing peg in the middle of each bed will show the condition of the sub-soil as regards moisture.

11. To guard against the attacks of insects the seed beds and seedlings may be sprinkled with wood-ash. The surface of the beds should not, as a rule, be disturbed until the seeds have germinated ; it should then be pricked or scratched with a pointed stick to keep the surface soft and break up the cake which often results from surface watering ; weeds must be pulled up as soon as they appear, provided the gardener knows weeds from seedlings; if in doubt it is better to let them grow up together till all possibility of mistakes on the part of the gardener disappears.

Transplanting.

12. However carefully this is done it nearly always retards the growth of seedlings; it should be carried out as soon as the seedlings are old enough to stand it ; this is generally about six weeks after germination; it must not be deferred after the roots have attained a length of six inches.

Transplanting is necessary in the following cases : (1) when seeds have been sown broadcast or in furrows, in order to give each seedling room to develop its crown and root system without in erfering with its neighbours ; (2) when seedlings are to be basketed before being planted out in avenues ; and (3) sometimes when it is not intended to use baskets, in order to retard the growth of the root system, which would otherwise become too extensive before time for the final transplant to the avenue pit by the road side.

To transplant, first drive a spade into the side of the seed-bed, below the level which the roots have reached, lever up a spadeful of the seed-bed, plants and all ; with the hands crumble the earth carefully till you can pick out a seedling without pulling at its stem or roots.

To prick out in beds, prepare a soft bed in the same way as for seeds, put the knotted string (*vide* paragraph 6) in position, drive a pointed stick about one inch in diameter, into the soil to a depth exceeding the length of root of the seedling, hold the seedling by the stem between finger and thumb and lower it into the hole, taking care to see that the root goes straight down and is not doubled up, then either press the soil firmly round the seedling with the hand, or better run dry soil into the hole until it is full ; avoid exposing roots of seedlings awaiting transplant to the sun and give the bed of transplants a good watering as soon as it is finished.

To transplant into baskets, have a supply of dry soil handy ; hold the seedling by the stem over the middle of the basket and with the other hand pour in dry soil till the basket is quite full ; stack the baskets close together in batches three feet wide on stones if possible and water the day's transplants well as soon as work is finished.

13. As stated above, transplanting always retards the growth of a seedling ; therefore when possible I recommend sowing the seeds in baskets instead of in seed beds ; the baskets should be rather larger than those used in coffee nurseries ; not less than 4 inches diameter and 12 inches depth ; they should be filled with light soil and one seed sown in each ; they should if possible be stacked on stones to prevent the roots

penetrating the baskets and entering the ground, and the stacks should be long and narrow like nursery beds, divided into thousands or hundreds by sticks or bamboos. Basketed seeds and seedlings require more shade than seed beds.

14. The next step is planting out, and the first thing to be done is to prepare good pits. The pits should be at least six feet clear of the edge of the road, so as to allow room for the young branches to spread without being damaged by passing carts, etc. Subject to this minimum, the pits should be placed where possible half way between the centre of the road and the edge of the land belonging to the road, so that when grown up they may not overhang adjoining occupied lands. This rule is of course subject to the exception that the pits should not be placed so far from the road that branches of adult trees cannot meet across it. Generally speaking, the road margin is a narrow strip and the rule will apply, but when adjoining lands have been taken up for quarries or for stacking metal the exception will come into force.

The distance from pit to pit must depend on the manner and rate of growth of the trees to be planted, and as these items in their turn depend partly on climate, soil, water-supply, etc., it is impossible to define the different distances required under different combinations of circumstances. Local observation is the best guide ; the pits should be so spaced that when the trees are three-quarter grown say 50 to 70 years old) their crowns should just touch, therefore, the distance from pit to pit should equal the spread of a three-quarter grown tree of the required species in the same locality. For figs this may be from 80 to 120 feet, for tamarind from 30 to 60 feet, and so on according to species, locality, etc. But this spacing is so great that if adhered to from the beginning, the avenues would consist of isolated trees for about 40 years. In order to produce continuous avenues more rapidly and to compel the trees to throw their branches more *across* the road than parallel to it, the spacing finally required should be halved ; this will double the number of trees to be planted at the commencement, but will also return value on the outlay after 30 to 50 years when the alternate trees should be cut out.

The size of pits must vary according to soil ; even in the best soil no pit should be smaller than 4 feet cube while in poor, hard or stony soils the size should be increased to 6 feet cube.

When water is very close to the surface, pits should only be dug two feet deep, then refilled the digging is merely to loosen the soil, and mounds two feet high should be piled over the pits, the trees being planted in the mounds.

Except in laterite soils, it is a good thing to leave the pits open for a few months before planting. About a fortnight before planting out, the pits should be three-quarters filled up. When possible the bottom foot of filling should consist of extra rich soil, or leaf mould, or old stable manure, or even a layer of green prickly pear which makes excellent manure ; this layer of rich soil is especially advisable in very poor and rocky soils.

15. The best time for planting out is shortly after the burst of the south-west monsoon when sufficient rain has fallen to penetrate well into the ground ; this will generally be about the end of June.

There are three conditions of plants to consider,—(1) seedlings in baskets, (2) unbasketed seedlings, (3) cuttings.

(1) *Seedlings in baskets.*—When it comes to removing these from the nursery it may be found that some of the baskets have rotted and either fall to pieces when moved or evidently will fall to pieces before reaching their destination. A stock of baskets slightly broader than those originally used should be ready at the nursery so that each unsound old basket can be carefully slipped (without disturbing the seedlings or its roots) bodily into the larger basket, and the space between the two baskets then filled with dry soil. The cost of these protective baskets is more than covered by the number of seedlings they save from death or damage. The seedlings in baskets can easily be removed either in head loads or on carts to the roadside pits; if on carts they must tight to prevent be packed unnecessary shaking. In the centre of each pit place one basket at such an elevation that the collar of the plant, *i.e.*, the junction of root and crown) is a few inches above the level of the adjoining ground; fill in the pit and *up to the level of the collar*; if this is neglected the plant will be in a depression when the earth has settled and is liable to become water-logged during the rains. Plants should not be removed from the nursery until the day on which they are to be planted out: they should be protected from the sun until planted out and be watered in the evening of the same day.

(2) *Unbasketed seedlings.*—An excavation should be made starting from a corner of a nursery bed and running a foot or more along each side and to a depth slightly exceeding that reached by the roots; then a spade should be driven in below the roots and a block of earth with plants in it levered up; each block should be put in a basket (ordinary earthwork basket will do for transport by cart or coolie to the avenue pits; if the earth is friable or the transport long, it is a advisable to wrap up the block in green leaves, a mat or old gunny, being careful not to damage the young plants. On arrival at the pits the block should be put in the shade and the seedlings removed one by one, as they are wanted, care being taken to avoid all possible damage to the root; only so much earth should be removed as is necessary to separate each seedling from the block; the more earth remaining attached to the roots the better. The seedling should be held over the centre of the pit with its collar about four inches above ground level (a stick laid across the pit gives a usual guide to the correct height); when much earth is attached to the roots it must be supported by hand to prevent its weight tearing the roots off. Earth should be shovelled in round the edges of the pit and worked into the centre by hand; as the earth rises the roots should be carefully arranged, the central root being allowed to go straight down and the lateral roots being spread in their natural directions over the soil. Fill right up to the collar consolidating *lightly* with the hand as the earth rises

(3) *Cuttings.*—Cuttings from trees grow more rapidly than seedlings but it is doubtful whether trees thus formed are ever as healthy, large or long lived as trees grown from seed. Cuttings should be taken at the beginning of the growing season (generally the end of June or beginning of July) and used quite fresh; they may be from 4 to 8 feet in length and up to 6 inches in

diameter. The lower end should be kept clean, at right angles to the length. All leaves and small branches should be removed and the cutting placed upright in the centre of the pit, earth shovelled round it and consolidated. On no account should the cutting be driven or pushed into soil; if the pit is not deep enough, it should either be dug out, or a hole large enough for the cutting to drop into should be made with a stick or crow-bar and well filled in with soil as soon as the cutting is inserted. Not less than two feet of the cutting should be below ground level and the pit should be over-filled to allow for settling. The upper cut end of the cutting and the cuts whence branches have been removed should be either tarred or plastered with cowdung paste

16. *Watering.*—More young plants die from drowning than from insufficient watering. The ordinary gardener has only one idea, and that is water and water applied at the surface in a pit round the seedling, generally poured from a height of three or four feet from a chatty, so as to wash the soil away from the collar of the plant. Now seedlings do not want surface water half as much as they need moisture in the vicinity of the roots and this can easily be supplied in the following manner: Take a piece of hollow bamboo either free from nodes, or with a hole driven through the nodes with a crowbar) about 18 inches long and plant it vertically beside and about right inches to a foot away from the seedling, so that its upper end projects an inch or two above the ground; this can best be done at the time the seedling is planted. Now instead of pouring a chatty of water once a day *over* the ground round the seedling fill the bamboo with water once every two days in the hot weather; the water goes straight down to the level of the roots, where evaporation is much slower than at the surface, there is great saving in the quantity of water required, and the surface soil is neither caked nor washed away. If bamboos are not available a couple of pot tiles or any other form of pipe can be used. During the rains no watering is as a rule necessary; plants should however be carefully watched when they are first put out and watered if they show any signs of drooping or losing their leaves. They will require watering for from four to six months according to locality during their first year, from two to four months during their second, and from one to two months during their third year. Except in extremely dry localities watering is unnecessary after the third year.

17. It is necessary to protect seedlings and saplings from damage by man and beast, otherwise their heads get eaten off or the bark is stripped and the normal development of the young tree is hindered. Mud walls built round seedlings as a protection are not an uncommon sight; these walls are very convenient for goats which stand on them and nibble off the heads of seedlings within. The walls also cut off the wind and are regular sun furnaces; they are the worst form of protection that can be devised. The best all-round form of protective fence is a fence of dry thorns about 5 feet high, firmly planted in the ground at a distance of not less than 2 feet from the young tree; two or three half tiles laid on the surface of the ground will form a channel from outside the hedge to the top of the water pipe referred to in the preceding paragraph, so that the plants can be watered without damaging the fence. The fence must be carefully maintained until the heads of the plants are out of the reach of

goats and cattle ; even after this a low fence is useful to keep animals from damaging the bark of the young tree.

18. *Pruning.*—Avenue trees should have straight stems for at least 10 feet from the ground ; the development of the young plants must be carefully watched ; each plant should have only one head and if more than one head form, all except the straight and strongest one should be nipped off ; if taken in time this can be done with the nails of thumb and finger, but if wood has begun to form a clean cut with a sharp knife is necessary. Side branches should be kept back in the same way but should not be entirely removed unless they show an abnormal development in which case their removal is necessary in order to keep the tree symmetrical. Low small side branches shade the ground round the roots of the tree and should be retained until the branches above are sufficiently developed to replace them when they should be cut off close to the stem with a sharp knife so as to leave a clean cut and not tear the bark

If however a young tree is growing very long and weedy, the removal of the lower branches should be postponed until the stem has thickened and weediness disappeared.

19. To keep the soil fresh round the base of young plants a layer of dead leaves may be spread inside the protective fence and renewed from time to time ; this is especially beneficial during the hot weather, a few stones and twigs may be put over the leaves to prevent them being blown away.

20. After the 3rd year the tree should require very little attention ; for the next two or three years the pruning knife should be kept ready and any branches which start low down on the stem should be removed, as soon as they are seen, and this will help to make the trees grow tall and well formed. in very windy localities it may be necessary to train the saplings by tying them to sticks fixed in the ground in order to overcome the bending action of the wind. The stick should be placed to windward of the sapling and so far away that it cannot touch it ; the tie should be a lose one of coir or other lose fibre, or of common cloth so as to prevent the bark being rubbed.

21. The above paragraphs deal with the formation of avenues ; a few words on the renewal of avenues are necessary for there are several instances of avenues in a state of decay gradually falling to pieces without any effort being made to renew them.

Trees have many enemies and their presence is generally visible by signs of unhealthiness in the tree or portion affected. A healthy tree should have no dead wood on it except in its youth when it is dropping its lower branches. It is best to allow these branches to come away naturally as the bark soon closes over the sore and the life of the trees is not affected; but as villagers will break off dying branches and damage the trees, where this cannot be guarded against, the dying lower branches should be cut off every now and then close to stem, a hand saw being used and care being taken not to damage the bark of the stem. To prevent tearing the bark, the saw should first be applied *underneath* the branch to be removed ; the bark is thus cut through ; the saw is then applied above the branch which breaks off clean when nearly cut through. After the branch has fallen the small jagged tear which will remain below the saw-cut should be sawn through or cut smooth with an axe, so as to prevent rot getting into the tree. The sawn surface may also be tarred over.

When an upper branch shows signs of decay it is generally a sign of local disease, but may be caused by the excavation of earth too near the roots, the remedy for which is obvious. If local disease is the cause, amputate the diseased member.

Parasites should not be allowed to establish themselves on any tree, specially on young ones; if they cannot be pulled off so as to leave no portion of a root attached, it is necessary to cut off the branch on which they are growing. Parasites should be either burnt or buried soon after removal.

Branches broken by the wind leave jagged ends; these should be cut smooth with a vertical saw-cut as described for the removal of branches.

22. When old trees with spreading crowns begin to show signs of decay, such as dead branchlets in the crown, it is time to think of renewing the avenue. For this, all that is required is to plant a new avenue placing the plants half way between the existing trees the branches of which, if they meet over the young plants, must be cut back to allow light and air for the coming avenue trees. If this precaution is taken, the old and new avenues will grow together for eight or ten years by which time the new trees will require more room. The old avenue must then be cut down and harvested and if it consists of timber species, the harvest should bring in a considerable amount of revenue, for the stems will not have decayed and will yield sound timber, whereas if left to decay standing they would be fit for nothing but fuel. Care must be taken in removing the old avenue not to damage the young one; the side branches of the old trees should be removed before the stems are felled, and the stems should then be cut so as to fall at right angles to the road.

MISCELLANEA.

WILLOWS FOR BASKET MAKING.

Preferential railway and boat rates, aided by keen foreign competition, have well-nigh rendered the time-honoured industry of basket making a thing of the past in this country. The best classes of osiers cleaned and ready for manipulation are now delivered to our principal markets from Continental sources at so low a price that competition on our part is almost out of the question. There are still, however, a few stations—such as in Bedfordshire, the fen districts of Lincoln and Cambridge, and along certain reaches of the Thames—where willow culture is engaged in, though not in the same energetic way as was the case some half a century ago

It is perhaps difficult to estimate correctly, but about 7,000 acres, producing roughly 20,000 tons of osiers, are cultivated in

this country at the present time, many small plantations having been grubbed out and the land laid down to other crops during the past five-and-twenty years. This falling off is much to be regretted, as the sorting and harvesting of osiers and basket making gave light and remunerative employment to a large number of residents, both young and old, of the districts in which the willow beds were situated; while rather damp land that could not well be brought under other cultivation, at least without the expense of drainage, gave a good return under a crop of osiers. Taking everything into consideration, and judging from talks that I have had recently with those who are interested in the osier industry, the formation of willow beds, under the plea that considerable profits attend the undertaking, is not to be recommended. No doubt in some favoured districts where carriage is reduced to a minimum and local demand is considerable, osier cultivation gives a fair return for capital invested; but until we can get back the once lucrative trade in baskets for fruit and other similar commodities from the hands of our Continental rivals, profits to any great extent are quite precluded.

No doubt, too, on soil that is unsuited for farming purposes, willow culture can be made fairly profitable, but it is a mistake to suppose that any marshy piece of stiff ground will grow osiers and that the planting and tending are matters of small import. It is quite the reverse. The willow will not thrive for long in water-logged soils, though periodical inundations, particularly during winter and early spring, are highly beneficial. The soil, too, must be well worked, the cutting of rods carefully and systematically carried out, and the clearing of the ground paid strict attention to, else deterioration of the crop will quickly ensue. Previous to planting the cuttings or sets, the ground should be ploughed, harrowed and consolidated, all objectionable weeds being destroyed.

The best willows to plant are Salix purpurea (the purple osier), S. viminalis, and S. triandra; but there are many hybrids, as willows cross freely. Probably the most valuable is S. viminalis, the rods being produced freely while they are remarkably thin and flexible, but those of the others named are very good for basket

making. They produce exceedingly lithe and tough wands. After the soil has been got into good tilth, planting the sets or cuttings should take place. These should be from 12 inches to 15 inches long, and formed of well-ripened rods of one year's growth, the cleanest and straightest portions only being used. In planting the cuttings great caution should be exercised to prevent the bark becoming loosened or removed from the wood. The rows of cuttings may be 50 inches from each other, and individually about 15 inches apart. Much depends upon the kind of willow and the quality of soil. The cuttings may be inserted about 9 inches into the ground, leaving about 3 inches exposed for the future stool. Cutting may begin after the second or third year, and should take place when the crop is dormant, or not later than the middle of February. The following short rules might be observed in willow culture for basket making :—

1. Willows will not succeed well in peaty, sandy, or water-logged soil, rich, well-drained loam that can be flooded at will being most suitable.

2. Prepare the ground by trenching or ploughing, and thoroughly cleanse it from weeds.

3. Plant only the best kinds, avoiding a mixed crop.

4. Insert the cuttings from November to March, avoiding such as are bark-chafed, and make the soil firm.

5. Keep the beds clean and free from weeds.

6. Cut the crop close to the ground with a sharp knife, as pollard willows soon decay, and harbour injurious insects.

7. The cost of forming osier beds varies from £15 to £20 per acre. The crop matures in about four years, and yields on an average £15 per acre.

A. D. WEBSTER
in the Timber Trade Journal.

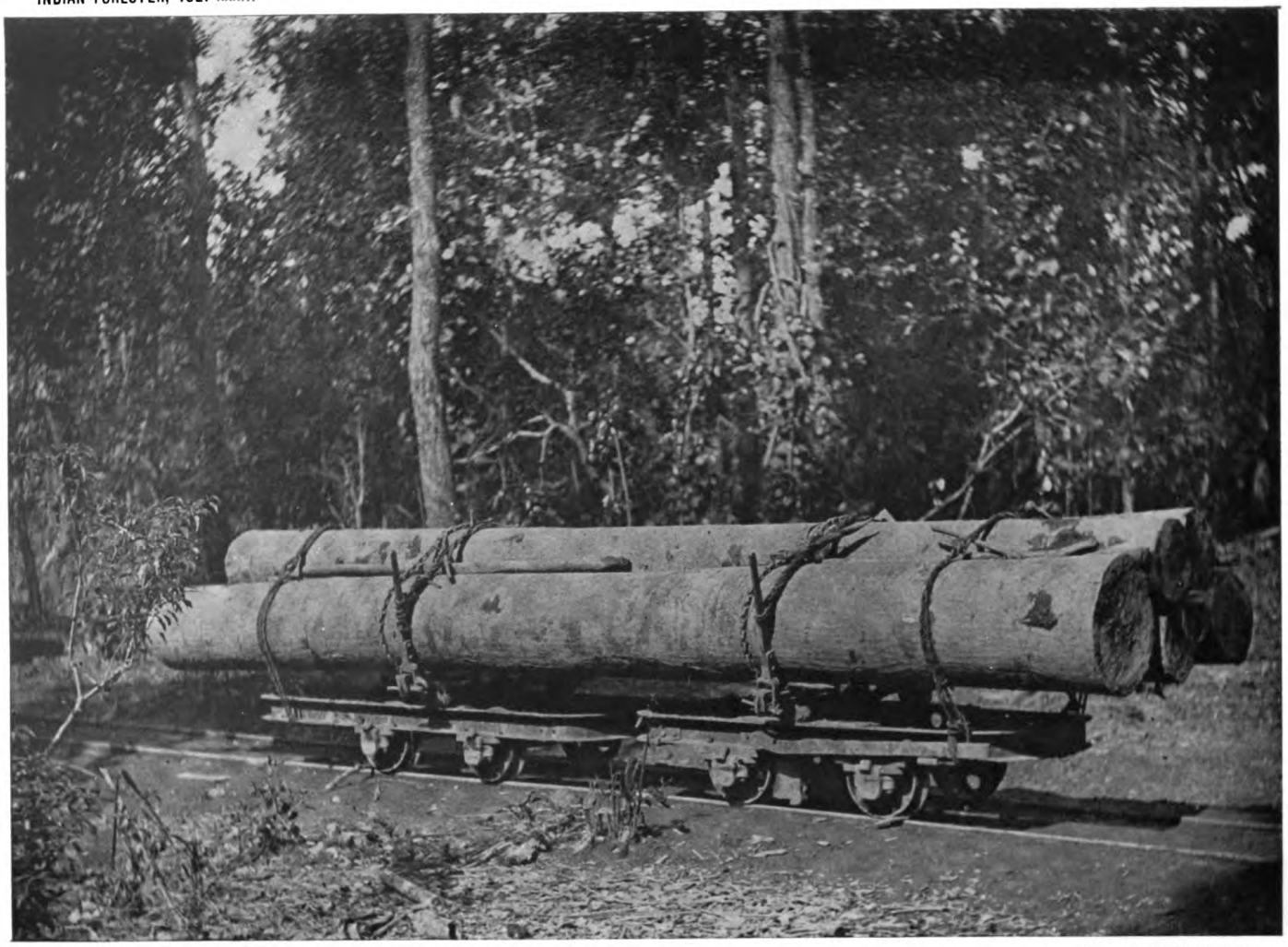


Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by R. N. Mukerji.

LOGS LOADED ON BOGIE,

VOLUME XXXII NUMBER 10

INDIAN FORESTER

OCTOBER, 1906.

RECRUITMENT FOR THE INDIAN FOREST SERVICE.

In a leader written last year on the subject of the future training of the controlling staff of the Indian Forest Service, we described the new qualifying examination for the admission of probationers to the Department introduced at the time of the transfer of the Forestry College from Cooper's Hill to Oxford. It will be unnecessary to recapitulate details. The subjects, although the standard was a childishly low one, were Mechanics and Physics, Chemistry, Zoology and Botany—a good selection. Unfortunately neither the small amount of knowledge required by the examination, the course of instruction to be followed subsequently by the successful competitor nor the prospects offered him in the Forest Service, appealed to the University undergraduate, and the effort to obtain probationers in this way proved a failure. There were several reasons attributable for this non-success—the recent transfer of the College to Oxford, inadequate knowledge on the part of the public at Home as to the nature of the Department or what forestry meant, etc. Towards the close of the year therefore a fresh attempt was made to secure candidates for the present

year. A circular was issued from which we published extracts last February. In this paper not less than ten appointments were offered to be competed for at an examination to be held in London by the Civil Service Commissioners on August 28th, 1906. The age limit was fixed between 18 and 21 years and an alteration was made in the entrance examination by the omission of Zoology —only the elements of the other three subjects being demanded ; the qualifying examination in German was still, however, insisted upon. What was the result? Candidates still failed to come forward, and this certainly through no fear of the difficulties of the examination test: for an averagely sharp boy of fifteen on the Science side of a public school could have faced it with composure. As a consequence we have read recently in the English daily press a circular, issued by the Secretary of State for India and dated August 16th, 1906, in which the following amazing offer appears :—

1. The Secretary of State for India in Council gives notice that he is prepared to receive applications for appointment, otherwise than by examination, of probationers for the Indian Forest Service. In choosing candidates he will be guided by a Selection Committee.
2. Candidates must be between 18 and 21, but the Selection Committee will be empowered to recommend the relaxation of the higher limit in any case in which they may think fit.
3. Candidates will be required to have a knowledge (amount not stated) of Chemistry, Physics and Mechanics. A knowledge of Botany and German will not be insisted upon.

We cannot but feel that we are expressing the opinion of the Service when we say that it stands aghast at the above advertisement. No qualifying examination and therefore recruitment from the ranks of the brainless men who were at the bottom of the forms at public schools ; no age limit and therefore all the failures who have tried for the Army, Police and every other examination possible and have been plucked for deficient education or, worse still, lack of brains. No knowledge of Botany—the foundation of

the future work of the Forester. No knowledge of German insisted upon and yet the candidate has to spend a year at work in Germany: work the successful assimilation of which depends entirely on a thorough colloquial knowledge of the language. To acquire such, many valuable hours during the two years' course at Oxford will have to be devoted to tuition in a subject in which the probationer should have been educated during boyhood. How can such men be expected to carry on the work of a progressive department, built up by men who entered it by competition and in whose ranks have been found men who have proved themselves to occupy, intellectually, a high plane.

We would wish it to be understood that our criticisms on the circular and on the present position of affairs are made entirely in the interests of the Service and the Government whom that Service will endeavour, with many disadvantages to contend with, to serve as devotedly in the future, we feel we can confidently state, as it has served it loyally in the past. We deprecate any other interpretation being read into this attempt to review the present position. In the remarks which follow we trust to be able to aid in the solution of a difficult problem, not to strew stumbling blocks in an already arduous path.*

In weighing the present position of affairs we would first put for consideration the following point: Why, we would ask, was it possible, with the far more expensive education at Cooper's Hill (for the three years' tuition cost the student £1,000), to obtain candidates to sit at the examination year after year in sufficient numbers to ensure a selection; though this selection fell off considerably, as all are aware, from the date of the amalgamation of the Forest and Police examinations? We consider the answer is to be sought in one direction only. It is but recently that the British public have really understood what the Forest Department in India really is, and this knowledge owes, we think, its origin to the publicity given to the closure of Cooper's Hill, the transfer of the Forest probationers to Oxford and the struggle which took

* In this connection we would invite attention to the article which appeared on this subject in the *Indian Forester*, Vol. XX, pp. 10-12.

place between Oxford and Cambridge before the new course was established at the former University. The course is cheaper now than in the old days, but public attention having been drawn to the matter, the emoluments and prospects of the Department have been found so little attractive, when the long and unavoidably expensive course of tuition the profession of a Forester necessarily entails (and upon the necessity of such a course we are all agreed) is taken into account, that the fiat has gone forth that the Service must for the present be tabooed.

Now this is a most serious position of affairs and one which we are fully aware has been receiving the earnest consideration of all those responsible for the management of the Department in India. Dr Schlich has, in a recent letter, pointed out that the Department cannot expect to get really good men under present conditions of pay and service, and we fully endorse an opinion coming from such an eminent authority. A careful consideration of the matter would seem to leave but two courses open if the Department is to be maintained at a high level. Our suggestions are as follows: first improve the prospects of the Service in India and then stiffen up, and stiffen up very considerably, the entrance examination at Home

We believe the Department would be content, and we have little doubt that if the Service in India is content candidates will soon be forthcoming at Home, if the Secretary of State would reorganise it on the following generous lines :—

1. If he would be disposed to re-consider the terms lately granted to Conservators, accepting in lieu those proposed by the Government of India to Local Governments in their circular of last year.
2. Accept the terms that may be proposed by the Government of India for increasing the emoluments of Deputy Conservators and Assistant Conservators.
3. Grant the extra pension of Rs. 1,000 to all Conservators.
4. Cancel the petty but obnoxious restriction that Conservators are not allowed to officiate in a higher grade in privilege leave vacancies.

We would venture to hope that the above suggestions will be received in the spirit in which they are written—the one aim being the improvement of the conditions of service in order to ensure high efficiency; for on this alone depends future effective administration and increased economic and financial possibilities.

Our second point is the stiffening up of the entrance examination. It is beyond dispute that the stiffer an examination is made, of course within certain limits, the greater the fascination it is likely to have for the majority of candidates; and, *ipse facto*, the higher the value they will attach to the Department to gain admission into which it has been prescribed. An easy entrance examination is *not* an advantage to any Department.

The Army has often been looked at askance by good men owing to the relaxation of the competitive tests and to the many other backdoor ways of entering it. We cannot but think that the lowering of the standard of the Forest entrance examination in the past has perhaps been regrettable. With improved prospects in the Department itself, we would strongly recommend this standard being so raised as to attract first class men. On the assurance of the supply of such the future of the Department depends—a future which is, at present, trembling in the balance.

SCIENTIFIC PAPERS.

SHRUBS AND TREES OF THE EVERGREEN SHOLAS OF NORTH COIMBATORE.

BY C. E. C. FISCHER, I.F.S.

The main mass of the forests of the North Coimbatore Division are deciduous and generally very dry. On the higher hills, however, patches of evergreen forests are met with surrounded by large areas of grass lands. Such forests known as "sholas" are met with principally on the north-western boundary adjoining the Mysore Province along the ridges of the Billigiri Rangan hills. There are, however, three or four detached ones further east, and

one in the easternmost reserve on the Palamalai hills overlooking the Kaveri river which here divides the Coimbatore and Salem districts. At one point a small section of the Nilgiri hills with two small sholas is included. These sholas are found at elevations above 4,000 feet and usually over 5,000 feet. The highest point in the Division is Kuttari Leetta in the Billigiri Rangans which is 5,973 feet.

There is some difference of opinion as to what area was formerly covered by shola in these localities. Did they once cover all the hills about 4,500 feet where now tall grasses practically monopolise the soil? The local sholagas deny this and say that the evergreen forest never extended beyond its present limits. There is, however, ample evidence that they are wrong, detached bits of shola appearing here and there at short distances from larger ones, which are no doubt vestiges of former continuous tracts of evergreen. There seems no reason why wherever there is sufficient depth of soil there shola should not grow. Constant firing has, it is certain, considerably diminished the area of evergreen forest. Fires usually do not run through a shola, but gradually wear away the edges, the dense high grass of course facilitating the process. Occasionally a natural protection in the shape of a dense protective belt of a stout shrubby species of strobilanthes is found along the margin. Once shola has been replaced by grass, its re-establishment must be a lengthy and difficult matter. Where, however, grass has not occupied the soil cleared of evergreen (as in clearings for cultivation subsequently abandoned), the latter frequently springs up again from seed or from the pollarded stumps. The sholas may be said roughly to be of two kinds, which may be termed "wet" and "dry" sholas respectively, and are characterised by the presence or absence of Calamus Rotang which is found in wet sholas only. The sholas have been comparatively little explored and their components are not generally known. They are somewhat inaccessible, and, further, the number of useful kinds of timber trees is small, the trees being mostly soft-wooded, so that they have received little notice from foresters except as a protection for water sources. With the small material available,

it is too early yet to make a botanical survey of this flora, but enough is known to trace its affinity with the flora of the Malabar Province or India Agnosa (Prain's Bengal Plants) and to show that it is an eastern incursion of that province.

The appended list is of course anything but complete, but as no list is available for reference, I have ventured to prepare a preliminary one as a commencement and it can be amplified later.

The sholas occur on all aspects, the largest and also the best representative of the "wet sholas" occupying the head of a fine perennial stream running almost due north. This fine patch of some 3,000 or 4,000 acres is very densely stocked. A recent valuation gave 240 trees over one foot in girth per acre, many stems being from 8 to 12 feet. Mr. Talbot's description of the "Kans" in Kanara in a recent issue of the *Indian Forester* would fit this area equally well.

The vernacular names quoted, unless otherwise stated, are those used by the local hillmen, sholagas, who speak a Kanarese dialect. The species marked with an asterisk are those quoted by Mr. Talbot as appearing in the North Kanara Kans :—

Anonaceæ.

1. Goniothalamus Wightii. H. f. and T.: flowers March ; small tree.
2. Miliusa indica. Leschen : flowers from June to December ; small tree.

Menispermaceæ.

3. Cocculus laurifolius. D. C. flowers March, fruit : October ; small tree.

Bixaceæ.

4. Scoiopia crenata. Clos.: flowers June ; a tree not confined to sholas. Tamil *Chekkata.*

Polygalaceæ.

5. Polygala arillata Hamilt.: a shrub with bright yellow flowers.

Sterculiaceæ.

6. * Sterculia guttata. Roxb. *Mata* : fruit March ; a tree.

Tiliaceae.

7. * Elæocarpus serratus. L.: flowers and fruit August and September; a tree.
8. * Elæocarpus tuberculatus. Roxb. *Kumai.* flowers March; a large tree.

Rutaceae.

9. Toddalia aculeata. Pers: a scandent prickly shrub, only in dry sholas and not confined to evergreen forest; flowers during rains.
10. Murraya Konigü. Spring: flowers May, fruit September; a shrub.
11. * Atalantia racemosa. W. and A.; flowers May; a shrub.
12. Atalantia ceylanica. Oliv.: flowers May and June; a shrub.

Meliaceae.

13. Cedrela microcarpa. C. DC.: flowers March, fruit June; a very large tree producing valuable timber.

Olacaceae.

14. * Mappia fœtida. Miers. *Moragadi*: a tree usually small; flowers April and May, fruit May and June; the flowers have a putrid smell which has called forth the name of "dead dog tree" in the Nilgiris.

Celastraceae.

15. * Salacia oblonga. Wall.; flowers April; a shrub.

Rhamnaceæ.

16. Rhamnus dahuricus. Pall. flo. Ross; shrub in dry sholas, flowers May.

Sabiaceae.

17. Meliosma Wightii. Planch. *Meorai*: a tree; flowers July to December.
18. Meliosma Arnottiana. W. *Mushitaka*: a tree; flowers May.

Leguminoseae.

19. Acrocarpus fraxinifolius. W.; flowers February, fruit June; a large tree.
20. Albizzia stipulata. Boiv.: flowers April; a large tree.

Rosaceae.

21. Rubus moluccanus. Linn.
22. Rubus ellipticus. Smith.
23. Rubus lasiocarpus. Smith. *Ollakuduannu.*

} Thorny scandent shrubs at the edges of sholas and in clearings.

Myrtaceae.

24. Eugenia spicata. Laurk.: a small tree; flowers April.
25. Eugenia Gardneri. Thwaites: a small tree; flowers March.

Araliaceae.

26. Heptapleurum racemosum. Bedd.: a tree; flowers June.

Caprifoliaceae.

27. Viburnum punctàtum. Ham.
28. Viburnum coriaceum. Blum.

} Small trees, not confined to shola.

Rubiaceae.

29. Plectronia Wightii. I. Cooke. *Ambai*: a small tree.
30. Ixora elongata. Heyne: flowers March to May; a shrub.
31. Psychotria truncata. Wall.: flowers March to May; a shrub.
32. Psychotria elongata. Wight: flowers March; a shrub.
33. Lasianthus ciliatus Wight: flowers May and June; a shrub:

Compositaceae.

34. Vernonia arborea. Ham. *Kanakarugulu*: a tree usually small.

Myrsinaceae.

35. Mæsa indica. Wall: flowering and fruiting most of the year. Small shrub in dry sholas and not confined to sholas.
36. Embelia Ribes. Burm.: flowers April: scandent shrub.
37. Ardisia pauciflora. Heyne: flowers May; shrub.
38. Ardisia solanacea. Roxb. (A. humilis, Vhl.): flowers May to September; shrub.

Sapotaceae.

39. Sideroxylon tomentosum. Roxb. *Kappali*: flowers May; a large tree

40. Isonandra Candolleana. Wight. *Thirigalla* : flowers May ; a shrub or small tree.

Styraceae.

41. Symplocos spicata. Roxb. *Manasigga* : flowers rains, fruit May ; a small tree.

Oleaceae.

42. Olea glandulifera. Wall. *Naruvelu* : flowers May ; a large tree.

43. * Olea dioica. Roxb. *Kundai* : flowers March ; not confined to sholas ; a tree.

44. Ligustrum robustum. Blume. *Gandunevavilleau* : flowers May, on the edges of sholas and in grass land ; a small tree.

Loganiaceae.

45. Fagræa obovata. Wall. *Agina* : flowers May ; a large tree with large handsome white fleshy flowers.

Solanaceae.

46. Solanum giganteum. Jacq.: flowers March to June, fruit August ; an unbranched thorny shrub.

47. Solanum ferox. Linn.: a thorny shrub.

Acanthaceae.

48. * Strobilanthes barbatus. Nees. } Small shrubs which
49. Strobilanthes luridus. Wight. } spring up rapidly wherever light penetrates through the canopy and forming dense thickets.

Verbenaceae.

50. * Callicarpa lanata. Linn. *Karavelu* : flowers May to September; not confined to sholas ; a small tree.

Laurineae.

51. Cinnamomum Perrottetii. Meissn. : flowers March ; a small tree.

52. Machilus macrantha. Nees. *Karavedi* : flowers March, fruit April ; a fair sized tree not confined to sholas.

53. Alseodaphne semicarpifolia. Nees : flowers December to March ; a middle-sized tree.

54. Litsaea tomentosa. Heyne. *Massaipavatai* : flowers June to December ; a small tree not confined to sholas.

55. * Litsaea zeylanica. Nees : flowers June to November ; a shrub or small tree not confined to sholas.

Elaeagnaceae.

56. Elaeagnus latifolia. Linn. Tamil *Pulau* : flowers nearly throughout the year ; a shrub often scandent, readily recognisable by the silvery scales on leaves, flowers and fruit ; not confined to sholas.

Euphorbiaceae.

57. Phyllanthus longipes Muell. Arg.: flowers March, fruit August ; a shrub.

58. Glochidion neilgherrense. Wight : flowers March ; a small tree.

59. Bischofia Javanica. Blume. *Nirallu* : flowers March ; a small tree not confined to sholas.

60. Croton aromaticus. Linn.: flowers and fruit March ; a small tree.

61. Mallotus walkeræ. Hook. f.: flowers May ; a medium-sized tree.

62. Mallotus barbatus. Muell. Arg. *Heraku* : flowers May and June; a fair sized tree.

Urticaceae.

63. Ficus glomerata. Roxb. *Atti* : a fair sized tree.

64. Artocarpus integrifolia. Linn. *Alasa* : flowers January, fruit May and June; a large tree.

65. * Debregeasia velutina. Gaud.: flowers January, fruit March ; a small tree.

Palmaceae.

66. * Caryota urens. Linn. not common ; a tree.

67. Calamus Rotang. *Betta* : flowers March, fruit August ; a scandent, very thorny shrub forming dense thicket in the wet sholas only.

Graminaceae.

68. * Oxytenanthera Thwaitesii. Munro : a shrubby slender semi-scandent bamboo.

Filices.

69. Alsophila latebrosa. Hook.: a shrubby tree-fern along streams in wet sholas.

These notes are penned from a forester's point of view, and so I have not included herbs and ferns in the list. In order, however, to enable comparison to a certain extent with the Malabar flora the number of species so far identified in each natural order (including trees, shrubs and herbs) are tabulated below.

1. Ranunculaceæ	... 2	25. Styraceæ	... 1
2. Anonaceæ	... 2	26. Oleaceæ	... 4
3. Menispermaceæ	... 1	27. Asclepiadaceæ	... 1
4. Bixaceæ	... 1	28. Loganiaceæ	... 2
5. Polygolaceæ	... 1	29. Solanaceæ	... 3
6. Sterculiaceæ	... 1	30. Gesneraceæ	... 1
7. Tiliaceæ	... 2	31. Acanthaceæ	... 5
8. Rutaceæ	... 5	32. Verbenaceæ	... 1
9. Meliaceæ	... 1	33. Labiateæ	... 3
10. Olacaceæ	... 1	34. Piperaceæ	... 6
11. Celastraceæ	... 1	35 Lauraceæ	... 5
12. Rhamnaceæ	... 1	36. Elæagnaceæ	... 1
13. Vitaseæ	... 1	37. Laranthaceæ	... 1
14. Sabiaceæ	... 2	38. Euphorbiaceæ	... 7
15. Leguminoseæ	... 3	39. Urticaceæ	... 7
16. Rosaceæ	... 4	40. Orchidaceæ	.. 6
17. Myrtaceæ	... 3	41. Scitaminaceæ	... 1
Cucurbitaceæ	... 1	42. Haemodoraceæ	... 1
18. Begoniaceæ	... 1	43. Dioscoriaceæ	... 1
19. Araliaceæ	... 1	44. Liliaceæ	... 2
20. Caprifoliaceæ	... 2	45. Palmaceæ	... 2
21. Rubiaceæ	... 6	46. Aroideæ	... 3
22. Compositaceæ	... 4	47. Graminaceæ	... 1
23. Myrsinaceæ	... 4	48. Filices	... 26
24. Sapotaceæ	.. 2		
		Total	... 144

COIMBATORE:
14th August 1906.

Photo.-Mechl. Dept., Thomason College, Roorkee. Photo. by W. F. Perrée.

WATER TANKS.

ORIGINAL ARTICLES.

THE GOALPARA FOREST TRAMWAY.

BY W. F. PERRÉE, I.F.S.

PART II.

In purchasing rolling stock it was necessary to arrange for trucks which would be suitable for use as bogies for long timber or singly for the transport of short logs and sleepers. It was therefore decided to purchase iron trucks with a removeable bolster. Figure 3 illustrates this type.

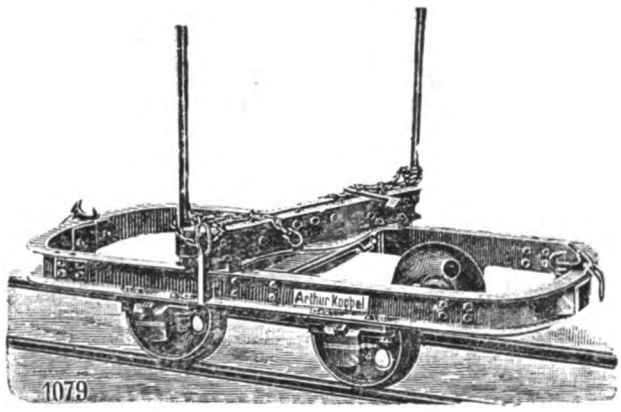


FIG. 3.—TRUCK FITTED WITH REVOLVING STEEL BOLSTER AND CHAINS AND HOOKS, FOR THE CARRIAGE OF LONG TIMBER.—Usually made for loads of from 1½ tons to 3 tons per bogie.

The frames are 6 ft. in length and 2 ft. 10 inches in width, outside measurements. The upper surface of the frame is 1 foot above the top of the rail, and the distance between centres of the wheels is 2 ft. The axle-boxes are of cast iron and the bearings are of white antifriction metal. There is great economy in oil and traction by the use of closed axle-boxes with white metal bearings.

The latter have been found to last over five years and can be renewed at a cost of one rupee apiece.

Recently an experiment has been made in introducing roller-bearings, a modification of the well-known ball-bearings, on the trucks used to carry water, the frames of which were made locally. Figures 4 and 5 illustrate the axle-box mounted and unmounted.

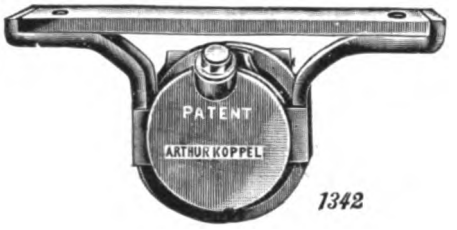


FIG. 4.—AXLE-BOX—MOUNTED.

FIG. 5.—AXLE-BOX—UNMOUNTED.

The makers claim a saving in traction of up to 50 per cent by their use, and although this statement has not been tested, the saving in traction is very marked. Plate XXXVI illustrates the locally made trucks fitted with roller-bearings in use for the carriage of water. Each truck carries 48 c.ft. of water = 31 cwt. Three men easily propel this load and make two trips daily, or a total journey of 22 to 24 miles. Of course on the return journey when the gradient is mainly with the load, the trucks run two-thirds of the way without assistance. The same work could not, however, be accomplished with ordinary bearings.

It was thought at first that brakes would be necessary, and half the trucks were provided with a powerful screw brake, the handle of which was vertical and was soon found to interfere with the loading of round timber and sleepers. Recently-acquired

Photo.-Mechl. Dept., Thomason College, Roorkee. Photo by W. F. Perrée.

LOADING SHORT TIMBER ON SINGLE TRUCK.

trucks have been fitted with a lever brake which works at the side and can be actuated by a man standing on the load. Gradual improvements of gradients and the regulation of traffic have practically enabled the brakes to be dispensed with. Slight undulations of the surface prevent trucks from running any distance at a high speed. It is obvious that curves should, whenever possible, be on the level, so that trucks which may be travelling in opposite directions may not meet at high speed. On the other hand, gradients which admit of high speeds should be on straight lengths, so that trucks travelling in opposite directions can be seen a long way off.

Sleepers and logs form the bulk of the material transported by the tramway. Plate XXXV shows the loading of long timber on bogies with the use of bolsters which are necessary to enable the load to pass round curves. For short logs the bolster is dispensed with and the timber rests on the angle-iron frame, requiring only to be securely tied down. Plate XXXVII illustrates the loading of short logs. The simplest method of loading is to roll the logs along sloping pieces on to the truck as illustrated. Where a large quantity of timber has to be dealt with, a sloping platform is erected and the logs placed in position by elephants. Of recent years the yield of the coupes has principally been converted into sleepers. Plate XXXVIII shows the process of transport. Each truck is fitted with a wooden frame enabling five M. G. sleepers to be laid side by side ; the load per truck consists generally of 25 sleepers = 37 c.ft. or 24 cwt. Two men can easily push this load as the gradients are easy and generally with the load.

The total charges to date on the Goalpara tramway of 9½ miles have been Rs. 50,976 or Rs. 5,997 per mile. This includes the initial cost of the line and rolling stock of 18 trucks, with transport from Calcutta to the forests, also laying and maintenance. Part of the work of laying and maintenance was done by labour paid in kind, the value of which is not included ; on the other hand, the first five miles of line were bought when steel rails were at an abnormally high figure during 1901-02. It may safely be stated that inclusive of all charges and all labour paid in cash, the present cost of the same plant laid in the forest would not exceed Rs. 6,000 per mile,

and that this figure may be taken as the maximum cost of a similar tramway in a remote forest. The following are recent quotations of the cost of plant delivered f.o.b. rail or steamer at Calcutta :—

	Rs.
14lb plant with fish-plates, nuts and dog-spikes for wooden sleepers at 33 inches interval	2,600
14lb plant with fish-plates, nuts and steel sleepers at 33 inches interval	3,700
Iron truck with bolster and side brake	100
A set of wheels and four axle-boxes with roller-bearing bolts, &c.	54

(The wooden frame costs Rs. 5 to manufacture locally.)

The Goalpara tramway has never been used to its utmost capacity; the yield of the coupe has occasionally not been fully exploited while the difficulty of procuring labour has always been an obstacle to utilization. The labour difficulty is, however, gradually disappearing, and a complete enumeration of the mature stock affords reliable information in making arrangements well in advance.

The following statement compares the actual cost of transporting the outturn of the coupe of 1905-06, with the estimated cost by other means :—

Quantity and kind of produce.	Actual cost of transport by tram.			Estimated cost of transport by cart.		
	Rs.	a.	p.	Rs.	a.	p.
23,527 M. G. sleepers (*a*)	1,102	13	2	4,411	5	0
3 sal logs, a distance of 9½ miles	1	0	0	3	0	0
1,124 scantlings, &c	17	9	0	35	0	0
51,840 c ft of water=46,650 mds. (*b*) a distance of 6 miles	571	14	0	4 665	0	0
Total ...	1,693	4	2	9,114	7	0

(*a*) Sleepers actually cost annas 3 each to cart 9 or 10 miles; the contract rate for carriage by the tramway is 3 pice each.

(*b*) Assuming that a cart will carry 10 mds. a distance of 6 miles for Re. 1.

Photo.-Mechl. Dept., Thomason College, Roorkee.

Photo. by R. N. Mukerji.

TRANSPORT OF SLEEPERS.

This gives a profit on the tramway of Rs. 7,421-2-10 to which should be added the hire of rolling stock to purchasers = Rs. 136-8-0, making a total of Rs. 7,557-10-10, equivalent to 14·8 per cent on the gross outlay. Interest charges and deterioration are not included, but the margin is substantial enough to show a saving on the use of a tramway in the Goalpara forests. It must also be remembered that carts are not procurable in sufficient numbers to work out the entire yield of the forests. In the Eastern Range, with a good road and a lead of 8 or 9 miles, 4 and even 5 annas are being paid per sleeper, yet it is impossible to procure enough carts to extract 20,000 sleepers annually. The advantage derived from the tramway chiefly lies in the fact that it has enabled the mature stock to be systematically worked in the dry zone at a distance of 6 miles from water. Without its aid this would have been at the present time quite impossible. Sawyers from Nepal and an ample number of coolies can be imported: transport alone is wanting. The expediency of extending the existing line can scarcely be disputed. The question of laying a tramway in the Eastern Range to connect with the E. B. S. Railway is under consideration.

The life of the line is uncertain, but rails laid in 1901 show no appreciable sign of wear. It is, however, clear that rails which are frequently shifted and relaid temporarily, generally on a loose soil, show distinctly more wear than the permanent sections.

I am indebted to Mr. Ram Nath Mukerjee, Officiating Extra Assistant Conservator of Forests, for allowing me to use the photographs shown in Plates XXXV and XXXVIII.

SHILLONG:
30th July 1906.

CONDITION OF THE FORESTS IN THE GODHRA RANGE OF THE PANCHMAHALS DISTRICT AFTER THE DROUGHT OF 1899—1900.

BY AMBALAL K. DESAI, RANGE FOREST OFFICER.

Owing to the drought of 1899 and 1900 the condition of the forests in the Godhra Range, which extends over an area of 600 square miles, has been altogether changed, as it has resulted in

killing out to a very great extent one of the most important and predominant species, namely, the teak. Other species of the *injaili* kinds are also dead. Mention of this destruction has already been published in this magazine under the signature of Mr. Pearson, the Divisional Forest Officer, Panchmahals. The forests having been thus ruined, Government took in hand the clearing off of the dead stuff in 1901 with the object of their regeneration. The work has lasted up till now. The result of the working has been that for the first two years, that is 1902 and 1903, the stumps of the dead and dying trees cut out gave new shoots copiously, the underground roots being green. During the cuttings of 1904, however, the regeneration by new shoots was about 50 per cent and in the cuttings of 1905 it was reduced to only 15 per cent. This shows that the drought did its work although there was a rainfall of 36, 35·6, 22·3, 45·3 inches in the years 1902, 1903, 1904 and 1905 respectively, the average rainfall of the district being 38 inches. Not only did the roots of the dead and dying trees begin to dry up, but some of the trees which were found green and consequently were reserved at the time of the last four years' marking have now also begun to succumb to the effects of the drought. From this it will appear that the drought of 1899 and 1900 was so severe that its effects have lasted even up till now. Can any one give me an idea of how long they are likely to last?

GODHRA :
8th August 1906.

SUPARI GARDENS AND THEIR EFFECT ON FOREST IN KANARA.

BY RANGER G. S. DANGI

Out of the whole of the Bombay Presidency it is the Kanara District alone which produces "supari" or betelnut in great quantities. This cultivation is for the most part carried on by the Havigs, who are perhaps the hardest working class of cultivators in Kanara. The supari gardens are most common in the Siri, Siddapur, and Yellapur talukas, and to some extent in the Supa Petha.

The supari tree, *Areca catechu*, requires a fairly temperate climate, a good deal of moisture in the soil, and good shelter from the prevailing winds. Supari gardens are therefore situated in valleys where, as a rule, the above requirements are met. They prosper best on laterite soils.

Ripe betelnuts are plucked from the palms and put out into nurseries, with the husks on, at the commencement of the monsoon and allowed to sprout and remain there for one year, at the end of which period they are put out in the gardens, planted about 5 feet by 4 feet in regular rows, each row alternating with an irrigation trench. These palms are grown in several storeys. This arrangement of plantation maintains a thoroughly complete leaf canopy and keeps the soil always cool and moist.

The system of irrigation requires an ample supply of water at the upper end of the garden to feed the canals. Here it may be mentioned that it is the "kans" evergreens, situated on the slopes of the valley or higher up, which maintain the constant water-supply so very important to the very existence of the gardens.

Every year leaf manure, obtained from lopping forest trees, is used for the gardens, the method of application being as follows :—

In the month of June trees are lopped and the lopping is put in cattle-sheds where it gets well trodden down by cattle and mixed up with their refuse. The next morning it is removed to the collecting pit in which some water has been allowed to stagnate and left to rot there until it can be used.

Besides this lopping another kind of leaf manure, locally known as "Nelasoppu," and which is nothing but young herbaceous undergrowth, is used. In some parts this latter kind is applied at the commencement of the monsoon, and the former during the "Magha" rains, *i.e.*, in August. Before applying any manure the earth at the foot of the tree is lightly dug up to form a hold for the manure which is then applied and allowed to continue exposed to rain till September, when it is covered up by earth. This covering of earth is renewed every four or five years, fresh earth being used.

It is a fact that if no manure is applied every year the yield of betelnuts will fall off for some years and then completely fail. The leaf manure obtained from Hirda and Matti is about the best, probably because the tannin-producing elements, removed from the soil by the yearly production of betelnuts, is best replaced by the foliage of the two species named above which contain a good proportion of tannin.

In former years the garden cultivators used to lop forest trees as they liked, and as a result all the forests excepting the kans in the Siddapur and Siri talukas, which must have been in a splendid condition before they were meddled with by the gardeners, have now assumed a dilapidated condition and become an ill-managed scrub jungle, while the kans have either entirely disappeared or have greatly diminished in area. To remedy this evil and to facilitate proper management Government ordered the assignment of certain forest areas, outside kans, for lopping and made it penal to lop outside these prescribed areas, which were also suitably demarcated. The forest areas thus allotted are locally known as "Bettas." The proportion of such assignment to garden land was something like 4 to 1. The gardeners found, however, that these assignments did not yield sufficient "soppu" or loppings and the number of offences of illicitly lopping in closed forests has consequently steadily increased and the gardeners also raised a cry for more "Betta." So Government recently were obliged to order a fresh assignment, bringing the total areas of "Betta" and garden land to the proportion of 9 to 1.

The supari crop cannot stand heavy rain when it is young and hundreds of bunches are seen dropping down under heavy rain in the month of August. In serious cases the year's crop may entirely fail. In order to mitigate this, the gardeners have devised a new device of sheltering the branches of young betelnuts from rain by covering them over. Experience has shown this to be effective. But the work involves a lot of expense and trouble and sometimes proves fatal to the person doing it, as he has to remain for hours together on the palms moving from one to another, which he does by drawing the neighbouring tree towards him by means of a hook

till it comes within reach when he runs a rope round it and the one on which he is resting and fastens them together. Then he moves on to the other one and removes the rope. For resting on the trees he has a simple contrivance consisting of a small wooden seat to which is fastened a string at both ends. Whenever he wants to rest on a tree he runs the doubled strings round it and passes the seat through the strings at their doubled end and pulls it out till the tree is firmly held in the noose. He can now safely rest on the seat.

SAPA:
17*th August* 1906.

CORRESPONDENCE.

TO THE HONORARY EDITOR OF THE INDIAN FORESTER.

FIRE-PROTECTION AND FOREST REST-HOUSES IN BURMA.

SIR,—Some eight years ago I sent a paper to the *Indian Forester* which was returned to me by the then Editor with a polite note saying that my ideas were too heterodox for publication, and, although easy of refutation, yet would be misunderstood by non-foresters. These ideas were based on long experience in the forests of Coorg, Malabar, Coimbatore, Burma and Siam and urged the ill-effects in many forests of over fire-protection, advocated early burnings of broad strips through areas where reproduction was poor, and generally the more liberal treatment of forests according to their special requirements, and were against the laying down of a hard-and-fast rule that practically every reserve *must* be fire-protected without regard to predominant species, canopy and presence or absence of advance growth and reproduction.

Fortunately, or unfortunately, I tore up the paper and fear I have now forgotten the precise facts I gave of instances which were, and would be now, could I quote them, well known to many foresters serving in the above-named districts and

provinces. It is, however, interesting to me to note the gradual change of opinion, in the matter of the tendency to over fire-protect, and against a judicious use of fire to promote reproduction, especially in countries and over large areas, where the proper and extensive use of the "axe, dah and saw" is prohibitive owing to expense, labour difficulty, and absence of a market for the fellings resulting from the use of those instruments.

I have also to join issue with Mr. Leete as regards the remarks he has seen fit to make in your last issue about the rest-houses and "*tès*" in the Minbu District. As to the good taste of his remarks upon his predecessor's work and opinions in a public print I leave this to your readers to judge, but I absolutely object to his picturing as he does the Baw *hut* as a "forest house." It was, is not, and never was intended to be such nor was it even in my time, nor at any other time, as far as I know, dignified with such a name. It cost Rs. 45 to Rs. 50 or less to erect, and was built purely as a *temporary* shelter and half way breakfast *hut* between two very comfortable little forest rest-houses at Shwebau and Myebintha (neither of these are pictured I notice). The march between these two places is 12 miles, and is a particularly trying one in the hot weather for elephants, the usual mode of transport in Burma, and was also half way between Shwebau and another comfortable little house, the name of which I now forget, on the Sadon Chaung. The forest round Baw is of the poorest description, *indaign*, sparse cutch, and scrub, and it was quite unnecessary at any time to *camp* at Baw. It was purely and simply a *hut* and a temporary shelter for a few hours in the day in the hot weather. As to the other "tè" pictured at Pa-aing it would have been well to explain to your readers that "tè" is the Burmese for a hut and not for a house. Mr. Leete seems to me to have gone out of his way to send you photographs of the very worst *huts* he could find and thus lead your readers to imagine that these were typical. Let him send photographs of Shwebau, Myebintha and the rest-houses on the Sadon (2) among others. I do not say that these are palaces, but they are quite comfortable enough for the ordinary individual, built as they are of teak, raised 10 feet or so

from the ground with two large rooms, two bath rooms and a wide verandah in front and a smaller one behind with latrine, a small cook house and servants' quarters attached. Again I would ask Mr. Leete to remember that that part of Burma was not pacified for more than 12 years at the time his predecessor wrote the remarks he animadverts on and the reserves not constituted until comparatively recently, as well as I can remember certainly not more than 8 or 9 years. One can hardly expect to find in Burma houses anything approaching those in the Punjab, United Provinces and Oudh for instance, many of the forests of which provinces have been reserved for 40 and 50 years and more and are practically all under sanctioned working plans, and are the centres from which extensive sylvicultural works are carried out and supervised. There is no such thing in the Minbu Division yet. Owing to scarcity of officers working plans have not even yet been begun. It would be interesting to know too for instance the number of times in any one year any Divisional Forest Officer visited any of the numerous "tès" or rest-houses in the Taungdwingyi Sub-Division of the Minbu Division and the duration of his stay each visit. I am prepared to lay a small wager that on an average not more than, if so many as, one visit per annum was paid with a duration of possibly an average of 1½ days. Is it necessary then to build a rest-house costing Rs. 2,000 to Rs. 3,000 for such visits? Again it must be remembered that none of our rest-houses or "tès" had durwans; they were in nearly every case remote from any village or habitation, hence, together with the fact that they were and are never required for long periods, it was determined, and with all due deference to Mr. Leete, I think rightly, to build comfortable small rest "tès" chiefly to do away with expense and worry and discomfort of tents.

I trust when Mr. Leete comes back from leave, he will, if re-posted to Minbu, do his best to improve matters, but first of all he would have to obtain sanction to build expensive rest-houses in remote dry forests where durwans would be unobtainable, then he would have to get them built. A possibly small matter in India, but in Burma, in situations far away in the forest, those

who have served a few years in this delectable country will know whether I am far wrong if I say that a rest-house costing Rs. 3,000 or so would probably take three years to build and even then workmanship would be bad.

I hope to send you soon a few photographs of rest-houses as built in the Tharrawaddy Division with the cost of each. If any Forest Officer wants anything much better than these he must be a Sybarite indeed.

"BURMA."

In justice to Mr. Leete we would point out to our correspondent that the articles on rest-houses have not been written with the object of depicting the show places of any particular division or circle. Our wish is to pictorially demonstrate that the *average* is in many parts of India far below what it should be and has been directly responsible for the general bad health of the Department in those localities.—HON. ED.

PROSPECTS OF A FOREST GUARD IN THE BOMBAY PRESIDENCY.

SIR,—I think every superior officer in the Forest Department will agree that the work of forest conservancy is greatly impeded by the indifferent work done by the lower subordinates, especially the guards. Instances will be readily recalled to mind of the guards' superficial or perfunctory manner of work in spite of detailed orders. The guard has been thorough, not in the proper discharge of duty, but in finding excuses to avoid it. His want of honesty is proverbial, though nowhere expressly admitted.

The causes that have contributed to this result are not far to seek. Apart from a too low standard of education and morality which it has been his lot to possess, he is confirmed in his low character by his meagre pay and poor prospects of promotion and of pension. The average guard starts on Rs. 7 and ends his service at Rs. 9. When he is young and but newly married (a bachelor guard being a rarity in India) he pulls on tolerably well with his duty; but with advancing years, comes an increasing family, out of all proportion to his pay, mainly dependent on him for support. Then it becomes impossible for him to give more attention to his duty than to his family, or to show any marked

degree of honesty in preserving the valuable estate he is entrusted with. And when he looks to his future prospects of pension, what does he find? that he must serve for a full period of thirty years to be entitled to a pension of Rs. 4 per mensem. A few months, deficiency to make up the said period disqualifies him for any pension whatsoever; and his long services are rewarded with a paltry gratuity equal to a few months' pay. Government certainly forsakes him in his old age when he should be looked upon with sympathy.

The more fortunate few among the guards who rise to Rs. 15 at the end of their service look forward in their old age to no better treatment with respect to pension, for both the seven-rupee and fifteen-rupee guards are equally dealt with, getting a four-rupee pension after a full period of thirty years' service or a paltry gratuity, as the case may be.

The following remarks by Mr. Gleadow (Bombay Government Resolution No. 8593, dated 21st October 1905), will speak for themselves, and with due modifications will apply to the whole of the Bombay Presidency:—

"The pay of guards in Thana is really not enough to tempt recruits of any class, much less of the class desired, consequently our worst men when dismissed get better pay elsewhere and can only be replaced with great difficulty. Others do their work very badly, having been reduced to the lowest pay and knowing that they cannot be dismissed for want of candidates. The prospective pension, which is said to make bad pay under Government preferable to good pay outside, is in our case no inducement, for it is notorious that guards who live to draw pensions are in about the proportion of 1 to 500 at a rough guess."

Under these disheartening circumstances, it is no wonder that a guard is not what he should be. It is no wonder that superior officers have always to complain of the guard's work, his inefficiency, his shirking duty, his dishonesty, his half-heartedness, etc. Howsoever able and energetic the supervising staff, it is impossible to expect satisfactory work of the guard, when he—the backbone of the Department—is apathetic. However fine and strong the

superstructure, a building is sure to collapse for want of a sound foundation.

To remedy this undesirable state of affairs, the only alternative would seem to be to improve the status of the guard—by increasing his initial pay and improving his prospects of promotion and pension. In fact he must have something too valuable at stake to be trifled with or easily changed for any menial work outside.

How much increase in the existing pay of a guard is necessary to ensure efficient work, I leave to experts to decide, only observing that the data upon which his pay was originally based have vastly changed since then. As for pension it is quite reasonable that he should be placed on an equal footing with his brother servants in the Police Department who are not tied down to the uniform scale of four rupees, but get their due just as members of the superior service, the duties of a guard being equally, if not more, arduous than that of a Police constable.

In view of the importance of this matter, I hope you will kindly ventilate it in the *Indian Forester*, and I beg to invite opinions on the same.

S. S. NEUE,
Ranger, Sangamner,
Ahmednagar District.

CAMP SAKUR:
27th May 1906.

A CURE FOR WHITE LEPROSY

SIR,—With reference to the commentary note, in your issue for April last, on the use of the seed of *Psoralea corylifolia* as a cure for leucoderma, will Mr. Bhuttacharji kindly let the public know, through the medium of your esteemed journal, whether he used the seed in question in combination with cow-urine and *Eclipta* leaves as advised in my note published in your issue for February last? Will he also forgive me for asking whether he or any of his forefathers had, knowingly or unknowingly, to take mercury as a treatment for any disease. In such cases, I should add that the *Psoralea corylifolia* would not act fully as a

remedy for leucoderma unless the patient takes beforehand, continually for 45 days on an empty stomach in the morning, about ¼ *chittak* of the juice of the root of *Amarantus spinosus* (vern. *Kanta-nate, Kantaauntia* Beng.) which is said to remove partially or completely the mercurial poison from the system.

Although I have not yet had an opportunity to treat a case personally, I should inform the public again that I have seen a few cases of the successful treatment of this hateful disease with *Psoralea.* seed, but in no case have I witnessed such negative results as Mr. Bhuttacharji describes, and hence my above enquiry as to whether the adjuncts mentioned were then known to him and used in conjunction. If not, I shall be glad if Mr. Bhuttacharji now gives a trial to *Psoralea* seed strictly following the prescription given by me.

As my note on the subject was written more with a view to elicit discussion than to express an opinion, I shall be glad if Mr. Bhuttacharji will kindly reply to my enquiries to enable me to arrive at a decisive conclusion regarding the efficacy or otherwise of *Psoralea* seed in curing white leprosy.

K. BANERJEE,
Office of the Director of Agriculture,
Punjab.

LAHORE:
5th July 1906.

A CURIOUS TEAK COPPICE SHOOT.

SIR,—I came the other day across a curious specimen of a teak coppice shoot with whorls of three leaves at each node. This is the first time I have ever met an instance like this, and it would be interesting to know if others who have been in teak regions have ever done so before. I was on the top of a hill in the Nallamalais marching from one camp to another and saw the specimen from a distance and took it for a Gardenia latifolia, which often on these hills has leaves of the size and shape of teak but of a glossy brighter green and in whorls of three. I was attracted to it by the woolly, warty, brownish excrescences seen on the leaves, which are usually associated with teak leaves

only, they being covered with them at this time of the year. A nearer inspection of course settled my doubts and I have secured the specimen as a rarity. The shoot stood a little more than 2 feet high and was from the shoot of a seedling, being the only shoot on it.

G. W. THOMPSON,
Extra Assistant Conservator,
East Kurnool.

CAMP MADDIPENTA:
25th July 1906.

The excrescences on the leaves, alluded to by Mr. Thompson, are the galls of an insect, I think one of the *Hymenoptera*. I have never yet been able to obtain anything but small orange legless grubs from them. If *Hymenoptera* they will at some time or other contain a four-winged fly. I fancy this will be between September and the close of the year. As the galls dry up (killing the grubs if they are picked before the insect is mature the only method of determining this pest, which is common throughout the teak areas of Bombay, the Central Provinces and Southern India, is to cut open specimens of the galls as soon as they commence to turn brown once a week until success is met with. I should be much obliged if Mr. Thompson and other officers serving in teak areas would help me to solve this problem. It is one upon which Forest Officers have been instituting enquiries for some years past.—E. P. S.

REVIEWS AND TRANSLATIONS.

FOREST ADMINISTRATION IN BENGAL, 1905-06.

The area of the forests in the province underwent a considerable change in the year under review owing to the partition scheme. Under this the Forest Divisions of Jalpaiguri, Buxa-Duars and Chittagong were made over to the new province of Eastern Bengal and Assam, whilst Bengal acquired the Forest Division of Sambalpur, formerly in the Southern Circle of the Central Provinces. This effect of the partition has resulted in favour of the Department in Bengal, the Conservator's charge being now far more controlable than was previously the case. The circle now comprises ten divisions instead of the original twelve, and the report under review deals only with these ten. The area of reserves has dropped from 6,049 square miles to 4,260 square miles and of protected forests

from 3,428 to 3,423 square miles. There are now no unclassed forests in Bengal, the total area of 3,753 square miles having been transferred with the Chittagong Division to Eastern Bengal and Assam.

Under survey work we notice that the four-inch maps were published during the year for Singbhum (9), Palamau (5), Darjeeling Kurseong and Tista (27) and Angul (4), the publication of these sets being complete for all save Angul.

The most important survey work remaining is that of the Sundarbans reserved forests; this is considered urgent as it may well be, since we fail to see how it will be possible, without a map, to carry out the prescriptions of the provisional working plan or to collect data for the preparation of the future plan.

Work on working plans seems to be in a favourable state in the Circle. Data are being collected for a plan covering 251 square miles of forests in Angul of which 100 square miles are to be worked on the selection system and the balance by improvement fellings. The compilation of the Sambalpur plan has been postponed, but stock maps are being prepared and sample plots demarcated.

The Darjeeling, Puri, and the Sundarbans provisional plans have all been revised and are now awaiting the sanction of the local Government. In addition the plan for the Tista Valley Range forests (Darjeeling Division) and the Tista Division Plan (which is to absorb the Mal Block Plan) are in progress.

In addition to the above work two draft plans, prepared by the circle officers for Jalpaiguri and Buxa Duars, were transferred with those divisions to the new Eastern Bengal and Assam Province.

Most of the work in connection with the preparation of these plans has been carried out by officers in addition to their ordinary duties, a fact which emphasises the short-handedness of the Department at the present juncture.

A most satisfactory progress is being made in connection with the opening out of the forests by good roads, the expenditure on roads having risen from Rs. 23,707 in 1903-04 to Rs. 40,237 in

1905-06. As in last year (when Rs. 36,990 was spent) the principal expenditure has been incurred in Singbhum where Mr. Grieve spent Rs. 25,178 on extension of cart roads. This important work has been needed for the last decade (if not two) and it has already resulted in increased receipts of revenue owing to the opening out of previously inaccessible forests. Similar work, but on a smaller scale, is also being undertaken in the Angul, Puri and Tista Divisions.

A sum of Rs. 24,025 was spent on buildings, Rs. 13,559 of which, we are glad to note, were expended on new works amongst which were six, or parts of six, new rest houses. As the report states these figures "show that the important work of opening out inaccessible areas and the comfortable housing of the establishment are receiving the attention they deserve." We would draw the attention of circles in India which are by no means in such a satisfactory position to the paragraphs of this report on communications and buildings.

Offences and their prosecution would still seem to be in an unsatisfactory condition in Darjeeling. In view of the enormous importance and small size of the forests round the summer headquarters of the Provincial Government that this state of affairs should continue to drag on year after year is little short of a scandal. The Conservator writes "Compounding has not a sufficiently deterrent effect, but when cases are taken into court, punishments are so light that they are probably not deterrent." Surely in a case of such grave importance as the maintenance of the Darjeeling forests undoubtedly is, if the Commissioner has not found it possible to ensure satisfactory sentences on offenders against the forest law, and the type of offender is one on whom only prompt and severe punishment will have any effect, it would seem that the time has arrived for the local Government themselves to take steps in the matter. It is of interest to note that at last the regular alternation of good and bard seasons in fire conservancy in Singbhum has been broken, and that during the past year, although the season was a dry one and it was the year for bad fires, only 3·5 per cent of the protected area was burnt. To any one with a knowledge of

the Singbhum Division in a dry year this speaks volumes for the management.

We notice that the severe frosts of the winter of 1905 are said to have affected about 20 per cent of the sal in Palamau.

Amongst animals, wild elephants in the Mal Block and barking deer in the Darjeeling nurseries are reported to have committed considerable damage. In the Mal Block, provided the plantations are worth the expense, it might be suggested that a deep ditch dug round the area would serve as a protection, after the manner the rest houses in the Dehra Dun are protected from these brutes during the monsoon season.

The Officiating Conservator, Mr. Lovegrove, has some remarks to make on the natural reproduction of sal, his contention being that although fire protection is an excellent thing in the dry sal forests of Chota Nagpur and Orissa, it is the reverse in the damp sal forests of the eastern part of the Circle such as the lower parts of Kurseong and the Jalpaiguri and Buxa Divisions.

A total amount of 5,969,932 c.ft. of timber, 28,151,305 c.ft. of fuel and 11,002,932 bamboos, in addition to Rs. 2,99,963 of minor forest produce, were removed from the forests in the year under review, the revenue being Rs. 9,90,281 as compared with Rs. 9,70,904 in the previous year; expenditure incurred was Rs. 5,21,622 as compared with Rs. 5,44,867 and the surplus Rs. 4,68,669 as against Rs. 4,26,037.

Mr. Lovegrove, with his experience of the United Provinces where conditions are far different, comments upon the paucity of Dehra Dun trained rangers in the Province. There are 78 ranges in the Circle, and out of the officers managing them only 11 have passed through the Dehra School! In Bengal a want of knowledge of the English language is not the difficulty and the paucity of recruits from the sources the Department wishes to recruit rangers from can only be attributed to the poor prospects in the past and to the dislike of the Bengali to forest life. The answer is that the Province should recruit elsewhere.

The report, written by Mr. Lovegrove, Officiating Conservator, is one full of interest.

CURRENT LITERATURE.

We have received the first three numbers of the *Botanical Series* of the MEMOIRS of THE DEPARTMENT of AGRICULTURE of INDIA.

No. 1 is devoted to 'Studies in Root-Parasitism—The Haustorium of Santalum album' by C. A. Barber, a subject which the talented author has already treated of in the *Indian Forester* and which would perhaps more fittingly find a place in Memoirs of the Forest Department than in those devoted to Agriculture. The subject is, however, of too great an economic interest to cavil at the department which gives it to the world.

In this paper Mr. Barber confines himself to a consideration of the early stages and penetration of the parasite. Attention was first drawn to the matter owing to the occurrence of the serious disease known as "spike" which is devastating the sandal areas in Coorg and Mysore and whose origin remains at present undiscovered. In this connection Mr. Barber has taken up a careful study of the root system of the tree, there being considerable doubt as to the extent of its root-parasitism, many points in the diagnosis of the disease appearing to indicate a root trouble. The paper deals with the distribution of the sandal, a description of the haustoria and their penetration into the host plant. The monograph is illustrated by some excellent plates.

The second number of the series by E. J. Butler and J. M. Hayman treats of "Indian Wheat Rusts" and includes a note on the Relation of Weather to rusts on cereals by W. H. Moreland. The paper opens with the remark that the rusts on Indian cereals form the most important of the many diseases due to the attacks of parasitic fungi which damage the crops of this country. Not only on account of the actual loss annually produced, but also because of the importance of the grain as an article of food, no other diseases approach in their consequences to these. Writing in 1892, the late Dr. Barclay said: "It is astonishing how little attention has been paid in India to this source, sometimes of enormous loss, and always, as appears probable, of considerable loss." We read that the same authority estimated that the annual loss

occasioned by this pest in India may be set down with comparative certainty at Rs. 40,00,000. Sir George Watt held that this figure was much too low. The rusts, which belong to the group of parasitic fungi known as the *Uredinæ*, are remarkable for possessing, when perfectly developed, four distinct phases in the life-history. These four phases are briefly described. The authors then proceed to discuss the various species of rust, black, yellow and orange, some of which are known to occur on wheat in Europe. The propagation of rust from season to season, the varieties of rust in India, experiments in growing wheat in rust-proof cases, the distribution of cereal rusts in India, specialisation of the forms of rust on different host plants, resistance to rust of different varieties of wheat, meteorological considerations and the means of combating rust. The paper is illustrated by coloured plates. Mr. Moreland in his note states that there are two common views held by practical men in the United Provinces regarding the relation of the weather to rust on the rabi cereals: one is that rust follows on an unusually wet seed-bed, the other that it depends on an abnormal amount of damp cloudy weather in January and February. Tables giving the character of the seasons and meteorological records for 1892-93 to 1903 are given to test these views.

The third number by E. J. Butler describes the "Fungus Diseases of Sugarcane in Bengal." It is illustrated by two excellent coloured plates by West Newman and some lithographic plates. This paper deals chiefly with diseases which the author has had facilities during several tours to study himself. He considers it as certain that several of them occur in other parts of India. The disease known as "red smut" is treated of fully, as it is said to be the most serious fungus enemy with which cane-growers have to contend.

"The Vegetation of the Lamao Forest Reserve" in two parts is the title of a valuable pamphlet by H. N. Whitford which has appeared in the PHILIPPINE JOURNAL OF SCIENCE. In describing the different characteristics of the growth of this reserve, the author considers the different climatic belts met with and the plant formations corresponding to these belts. The elements of the climate,

he says, which leave their imprint on the type of vegetation are distinctly those of moisture. High up on the mountain a forest more nearly evergreen is found, whilst nearer the foot the deciduous and bamboo elements are more pronounced. We note that such well-known Indian genera as Dipterocarpus, Shorea and Eugenia are to be found, whilst near the sea level *Nepenthes*, *Myrmecodia* and *Decaspermum* are encountered. The monograph is illustrated by a number of plates which are of better quality than those we have yet seen from the Philippines.

The fourth number of LE BAMBOU opens with an article on the use of the bamboo in Belgium and a second on the industrial and commercial usages of the bamboo. The writer of this article states that appearances indicate that the bamboo will in the future replace wood as an article for the manufacture of paper. This opinion should prove of interest to us in India. There is also an interesting list of the bamboos cultivated in Europe.

No. 18 of Volume IV of the CIRCULARS and AGRICULTURAL JOURNAL of the *Royal Botanic Gardens* of *Ceylon* deals with that much debated subject of late--cotton. Ceylon, we note, has turned its attention to the growth of this product. Great irrigation works have been opened in the north of the Island, and it has become necessary to find some profitable crops to grow upon the land instead of leaving it to be wasted by the villagers in growing crops of rice at long intervals. With their customary go-aheadness the experts on the Island have turned their attention to this question and have determined that cotton is the crop to introduce upon this land. An experiment station has now been opened in the irrigable districts. The following figures would appear to show that the Sea Islands and Egyptian varieties of the plant are the best and most profitable to grow :—

Sea Island ... 116lb at 12*d.*, £5-16*s.* or Rs. 87 per acre.
Egyptian ... 120lb at 9½*d.*, £4-15*s.* or Rs. 71·25 „

SHIKAR, TRAVEL, AND NATURAL HISTORY NOTES.

IMPORTATION OF RIFLES.

FRESH RESTRICTIONS.

Simla, 25th September.

The following letter has been issued by the Home Department of the Government of India to all local Governments and Administrations :—

SIR,—In continuation of the Home Department letter, dated 20th November 1902, I am directed to forward for information a copy of a notification, dated the 11th September 1906, making certain amendments in the rules issued under the Indian Arms Act, XI of 1878, from which it will be seen that the Government of India have now decided, in supersession of all previous orders on the subject, to prohibit, subject to narrowly-defined exceptions, the importation of all rifles of ·450 and ·303 bores, irrespective of the size of their chamber and action, and consequently of all ammunition which can be fired from such weapons. These exceptions are (*a*) in the case of ·303 rifles, single-barrelled weapons sighted to over 1,000 yards imported *bonâ fide* for match-shooting purposes, and brought on to the equipment list of the regiment or corps to which the importer belongs by the persons mentioned, and subject to the conditions laid down in Home Department notification No. 1982, dated the 14th May 1903 ; and (*b*) in the case of ammunition, such reasonable amount as is required for use with weapons of the prohibited bores which are already in the lawful possession of persons in this country. I am to request that this change in the rules may be made widely known to the public and to dealers in arms and ammunition. The change now made in the rules will be embodied in the revised rules under the Arms Act which will shortly be issued.

The notification runs : -In the exercise of the powers conferred by sections 17 and 27 of the Indian Arms Act (XI of 1878)

the Governor-General in Council is pleased to direct that the following further amendments shall be made in the Home Department, dated the 6th March 1879, as amended by subsequent notifications :—Paragraph 1 : For the words " Rifles of ·303 bore or rifles of ·450 bore of the Martini-Henry pattern, if such rifles have been imported into British India subsequently to the 20th February 1901, without the special sanction of the Government of India, balled ammunition which can be fired from rifles of the bores and pattern aforesaid," subsititute the words " rifles of ·303 or ·450 bore and balled ammunition which can be fired from such rifles." At the end of the first clause of paragraph 1, after the words " carry or possess," add the following proviso " provided also that no prohibition or direction contained in sections 13, 14, 15, or 16 of the Indian Arms Act, 1878, shall apply to persons in possession of rifles of ·303 bore or ·450 bore which have been lawfully imported into British India before the date of this notification."

Paragraph 6, note to rule 5.— For the words " any rifles of ·303 bore or rifles of ·450 bore of the Martini-Henry pattern" substitute the words " rifles of ·303 or ·450 bore."

EXTRACTS FROM OFFICIAL PAPERS.

SOME JAPANESE FOREST LAWS AND ORDINANCES.

REGULATION FOR ENFORCEMENT OF THE LAW OF THE FOREST.

[Our acknowledgments are due to Mr. K. Kita for his courtesy in forwarding us the following interesting papers on Japanese Forest Laws and Ordinances.]

Art. 1.—When a prefectural governor deems it necessary for public forests, forests belonging to Shinto or Buddhist temples, or private forests, to issue the orders provided in Arts. 3, 4 and 55 of the Law of the Forest, he shall inform the circumstances to the Minister of Agriculture and Commerce, after having dealt with the matters.

When a prefectural governor deems it necessary for forests not mentioned in the preceding paragraph to issue the order provided

in Art. 55 of the Law of the Forest, or when it is thought necessary by him to issue the orders provided in Arts. 7, 21—23 of the same Law he shall report the circumstances to the Minister of Agriculture and Commerce for further instruction.

When a prefectural governor deems it necessary to have a forest afforested by the Government according to Arts. 5, 24 and 55 of the Law of the Forest, he shall prepare, after an actual investigation, a memorandum of estimates for afforestation, following the form hereafter shown and forward the same to the Minister of Agriculture and Commerce for further instruction.

In the case of the preceding paragraph, his own view as to the collection of the expenses incurred for the works, or on making the forest semi-State forest, shall be also stated to the Minister.

Art. 2.—Any application for conversion of protection forest or a notification thereof issued by a governmental office shall have the account of the investigation relating to the conversion and a plan annexed.

The form of the account of investigation relating to the conversion shall be prepared by the prefectural governor.

Art. 3*A*.—In an application for release of protection forest, or in a notification thereof issued by a governmental office, the reasons necessitating the release shall be stated. But in case a portion of a forest is to be released of protection forest, a plan of the whole and the portion to be released of the forest shall be annexed to the application or notification. On the plan the total area of the forest in question shall be stated.

Art. 3*B*.—When an application has been made for release of protection forest, while, in case it is thought that the reason of conversion has disappeared, an application for conversion has been newly made according to another reason, or the conversion is thought necessary, the prefectural governor shall submit both the conversion and release to the Local Forestry Council.

Art. 4.—When a conversion or release of protection forest which may affect the interests of two or more prefectures is thought necessary by a prefectural governor, the matter shall be notified to the governors of prefectures interested. When a similar

conversion or release has been applied for or notified, the same rule shall be applied.

Art. 5.—When a prefectural governor has received the Local Forest Council's reply as to a conversion or release of protection forest, he shall forward the same, stating his own view thereon, to the Minister of Agriculture and Commerce within thirty days, together with all the records pertaining to the matter.

Art. 6.—When the Minister of Agriculture and Commerce has given a decision on a conversion or release of protection forests, he shall notify it to the prefectural governor interested in the decision. Within ten days after the receipt of the decision by the governor, it shall be published in the prefectural gazette, made public by a notification on the bulletin board at the front of the City, Town or Village Office in whose jurisdiction the forest is situated, and the owner of the forest shall also be notified.

But as to conversion, the outline of works in the account of investigation relating to the conversion shall be annexed to the information.

Art. 8.—If there be non-consent as to the price of the protection forest to be purchased by the Government or in regard to the sum of compensation mentioned in Art. 26 of the Law of the Forest, the prefectural governor shall submit the matter to the Local Forest Council and notify the price or sum of compensation voted by the Council to the parties concerned.

Art. 9.—Whosoever asks for the compensation or the subsidy mentioned in Art. 26 of the Law of the Forest shall forward a bill stating the sum to be claimed with particulars of calculation to the Minister of Agriculture and Commerce through the prefectural governor.

Art. 10.—The information mentioned in Art. 31 of the Law of the Forest shall be made to the police court governing the locality where such work or business is to be carried on, with a written statement together with the shape of sign and impression of seal.

The local police court shall notify such information as mentioned in the preceding paragraph to the Minor Local Forest Office.

Art. 11.—Any person who desires to obtain the permission to set fire in a forest shall apply to the forest officials or police officials, appointing the date for setting fire.

When, however, the whole or a portion of the forest where fire is to be set belongs to another person, a document proving the consent of the owner or his agent shall be annexed to the application.

When permission has been given to set fire the permission note hereafter shown shall be handed to the applicant.

Art. 12.—The applicant must bring the permission note with him to the scene on the day when the area is fired.

Art. 13.—Any person who desires to set fire in a forest or a plain connecting with a forest shall previously give notice of his intention to the owner or manager of the land adjoining the place where fire is to be set.

Art. 14.—When it is likely that fire may spread beyond the tract, the forestry officials or police officials shall order the applicant to stop the firing, to change the method and date of firing and to make proper works and preparations against the spreading of the flames.

ORDER OF THE DEPARTMENT OF AGRICULTURE AND COMMERCE.

Art. 1.—The term "manufacturers of principal manufactures" in the Imperial Ordinance No. 363 denotes the persons engaging in the manufacturing business of the following articles:—

1. Paper, its materials.
2. Matches, their materials.
3. Wood shavings, their materials.
4. Camphor, camphor oil, and other similar fluids.
5. Sleepers.
6. Shiitake (a kind of mushroom).
7. Tannin, its materials.
8. Bird lime, its materials.
9. Lacquer-ware, its materials.
10. Timbers, various boards, cask and barrel materials, for export.

11. Package-case, its board.

12. Bamboo, and bamboo-ware for export.

13. Charcoal for export.

Art. 2.—Manufacturers of principal manufactures who have either of the qualifications under-mentioned and are full of confidence or trustworthy are entitled to purchase, by an ordinary contract, the products of State forests and plains for the materials for their manufactures.

1. Any company which has carried on for over one year, the manufacturing business of the principal manufacture requiring the materials which it desires to purchase from the Government, and whose capital exceeds thirty thousand yen.

2. Whoever, not a company, has carried on for over one year, the manufacturing business of the principal manufacture requiring the materials which he desires to purchase from the Government, and receives an annual gross profit exceeding two thousand yen.

3. Any person who has carried on the manufacturing business of articles for export requiring the materials which he desires to purchase from the Government, and whose capital exceeds thirty thousand yen.

Art. 3.—Timber traders who have either of the qualifications under-mentioned and are full of confidence or trustworthy are entitled to purchase, by an ordinary contract, the principal products of State forests.

1. Any company which has carried on the timber trade for over two years and whose capital exceeds fifty thousand yen.

2. Whoever, not a company, has carried on the timber trade for over ten years and pays the business tax to the amount of more than five yen.

IMPERIAL ORDINANCE NO. 363.

Products of State forests and plains may be sold by an ordinary contract in the following cases only :—

1. When necessary for public use or for works of public interest.

2. When the materials for building or fuel are sold for the sake of the sufferers by an extraordinary calamity.

3. When the materials for fuel and secondary products are sold to the residents in the vicinity of the forest or plain, in accordance with the customs and usages.

4. When the products of a forest or plain entrusted are sold to the trustee.

5. When the products of a semi-State forest are sold to the forest-planter.

6. When the products of a forest once belonged to a Shinto or Buddhist temple, but confiscated to the State, are sold to the temple as building materials.

7. When the products are sold to the contractors of works in State forests and plains, or to the purchasers of the products of them, for the necessity of carrying on their business or works.

8. When season products of secondary importance are sold.

9. When the products necessary for mining are sold to miners.

10A. When the products of the forests and plains converted, sold, leased or transferred without compensation, according to the provisions of Arts. 3, 8, 11, and 15 of the Law for Administering State Forests and Plains are sold to the manager of the land converted, purchaser, lease-holder or transferee.

10B. When the products are sold as materials to the manufacturers of principal manufactures who have the qualifications fixed by the Minister of Agriculture and Commerce.

10C. When, in case it is likely to impede the improvement of a forest if the scheme of felling derived from the Working Plan is to be executed by means of a competitive contract the principal products of the forest are sold to the timber traders who have the qualifications fixed by the Minister of Agriculture and Commerce.

11. When the products of a forest are owned by a private person but the trees thereon belonging to the State are sold to the owner of the land.

12. When the stones for the use of building or other purposes are sold to their discoverer.

13. When the products whose estimated price shall not exceed three hundred yen are sold.

IMPERIAL ORDINANCE NO. 32.

Only for the purpose of export, the sale, by an ordinary contract, of the products of State forests under the control of the Department of Agriculture and Commerce may be entrusted to a wholesale merchant.

Wholesale merchants to whom the sale mentioned in the preceding paragraph may be entrusted must have either of the following qualifications :—

1. Those who pay the business tax to the annual amount of more than two hundred and fifty yen.

2. Any company or partnership for which the contributions consisting of capital and money have been paid up to the total amount of more than fifty thousand yen.

3. As to the residents abroad, those who are considered by the Imperial Consul residing in the locality where they must have a property of more than fifty thousand yen and be full of confidence.

MISCELLANEA.

IMPENDING DANGER TO DEODAR FORESTS IN THE KULU FOREST DIVISION (PUNJAB).

The cultural operations regarding the artificial reproduction of deodar were begun in Kulu as early as 1875 or 1876 during the time of Mr. Duff Dunbar, Deputy Conservator of Forests. In those days four reserves were constituted near Manoli in Kulu Range, and special attention was given to stock them artificially with deodar. Big nurseries were started and the transplanting was done in lines 10 feet apart. All these four plantations are on the bank of the River Bloo and almost on level ground which is full of big boulders. Their joint area is 189 acres, and they are now more or less fully stocked, with blanks here and there. The total cost on these plantations has been up to date about Rs. 9,457 or Rs. 50 per acre,

which is somewhat high. The trees are now 3 to 4 feet girth where planted, and comparatively thin where left in the nursery. Almost all of them require thinning.

These plantations would have been of considerable value had not a peculiar disease sprung up in two of the above forests on account of which all of the trees are now dying. The disease appears first of all in the upper part of the tree, where the top leaves begin to thin out, until the top dries. Then the disease travels downwards until the tree dies altogther.

In 1903 when the writer first came into the Division, the disease was only limited to one of the forests (Sial Bihal Reserve No. 4) in which a few of the trees were infected. But now in the space of three years the whole of this forest is infected, while the disease has spread into Dana Bihal Reserve No. 3 as well.

Mr. B. O. Coventry, Deputy Conservator of Forests, took photographs of some of the dead trees in November last in the above-mentioned two forests, but he could not find any good samples, as the infected trees were scattered over the whole area and no good compact groups could be found.

It was first of all thought that as the trees were growing on the river banks on a level undrained soil, they die as soon as their roots reach the water level of the river. But this theory is falsified by the presence of a good number of old trees 10 to 15 feet girth in these forests, which are yet thriving well.

Some diseased trees were felled in the forests to find out the cause. The heart-wood was found to be of a peculiar colour like *kaisar*, and emitted a mild unpleasant smell. From this I conclude that this is owing to some fungus getting hold of the roots, thus causing the death of the tree.

We also dug out some infected trees in the hope of being able to detect the presence of any insects or fungi, but with no success. But whatever be the cause, the effect is quite clear that the disease is fast spreading thus killing back valuable deodar forests. Up to this the disease has spread into artificial forests only, but there is no certainty of its not proceeding to natural ones, of which there are any number in the locality.

Therefore it is highly necessary that endeavours should be made to check the disease, otherwise there is a danger of all the valuable forests of the locality being infected.*

BANJAR :
12th August 1906.

GURAN DATTA MAL,
Forest Ranger, Kulu Division.

LEGAL INTELLIGENCE.

A CURIOUS JUDGMENT—THEFT OF A SAMBHUR.

At the Calcutta High Court recently before Justices Mitter and Holmwood, Babu Dasarathi Sanyal moved on behalf of one Baidnath Giri and Paran Rai for a rule on the Deputy Commissioner of Darjeeling to show cause why the conviction and sentence passed on them should not be set aside. The case for the prosecution was that on the 6th April last Mr. G. E. Davys, Manager of the Terihana Tea Estate, Captain C. E. Lawder, of the 19th Battery, Royal Field Artillery, Allahabad, and Mr. Rorison, went with a Government permit for a shoot in the Dulka forest. Their coolie told them that a *sambhur* had been killed by a tiger. They went to the place, found the body of the deer, erected *machans* and waited till dark, when they left. On returning next morning they found that the deer had been removed. A search was made and seven men were found near by. Many of them had *kukris* which Mr. Davys examined, and on all of which he found blood. These seven men were charged under Section 379, I. P. Code with theft, and tried before Mr. Spray, Sub-divisional Magistrate of Kurseong, who acquitted them of the charge and discharged three of the accused. The other four were found guilty under Section 25 (*g*) of the Forest Act (Act VII of 1878), of having removed forest produce without permission, and were sentenced to one month's rigorous imprisonment each. The vakil contended that the facts found did not warrant the conviction, and that the Sub-Divisional Magistrate had no jurisdiction to take cognizance

* It would be perhaps advisable that our correspondent should send some specimens of parts of the diseased trees to the Forest Research Institute at Dehra Dun. — HON. ED.

of the case. Their lordships issued a rule on the Deputy Commissioner of Darjeeling to show cause why the conviction and sentence should not be set aside, and directed that in the meantime the petitioners be released on bail.

BRITISH FORESTRY.

ACTION BY THE GOVERNMENT.

Mr. Herbert Roberts having, in the House of Commons, asked what steps had been taken to carry into effect the recommendation of the Departmental Committee of 1902 on British Forestry, and whether any communication had been addressed to corporations and municipalities relative to the Committee's recommendation as to the desirability of planting with trees the catchment areas of their water supply,

Sir E. Strachey says in a written answer: —

1. The Departmental Committee recommended that the Alice Holt Woods, in Hampshire, should be made available as soon as possible to serve as a demonstration area in England. This has been done. A full report as to the past history, present position and future management of these woods has been prepared by Dr. Schlich at the request of the Commissioner of Woods and Forests, and the recommendations made therein are being systematically carried out. A certain amount of experimental planting has already taken place. It was also recommended that a suitable estate should be purchased in Scotland to serve as another demonstration area. Several properties have been brought to the notice of the Commissioners of Woods and Forests, but for various reasons they did not appear suitable for the purpose. Two additional properties are now under consideration, and as soon as a suitable estate has been found the Treasury will be approached with a view to purchase.

2. The recommendation of the Departmental Committee that lecturers should be appointed at Oxford and Cambridge has to some extent been met by the augmentation of the salary of the

Sibthorpian Professor of Rural Economy at Oxford, who is now Professor of Forest Botany. It is understood that an estate will be placed at his disposal for demonstration purposes.

3. A sum of five hundred pounds a year which was placed by the Treasury at the disposal of the Board for the establishment of lectureships in forestry has been allocated to the University College of North Wales at Bangor, and the Armstrong College at Newcastle-on-Tyne. The results have been most encouraging. A considerable number of students have been found desirous of taking a full collegiate course of study, good classes of practical foresters and others have been conducted at selected local centres, while there has been a constant demand on the part of landowners for expert advice from the lecturer.

4. A school for working woodmen has been established by the Commissioners of Woods and Forests in the Forest of Dean, and is now in the third year of its existence. From 18 to 20 youths are receiving instruction.

5. Legislation would be necessary to remove the inequality in the levy of the estate duty on timber, and it has not been possible hitherto to take any steps in this direction. The matter has, however, not been lost sight of.

6. The Railway Fires Act, 1905, which comes into force on January 1, 1908, will give some protection to owners of woods against loss by fire caused by sparks from locomotives.

7. Special inquiries were made in 1905, with a view of ascertaining the extent of land now occupied by woods in Great Britain, and the results have been published in the agricultural returns for that year. The three categories suggested by the Departmental Committee were adopted.

8. With the object of ascertaining the districts in which local authorities have developed the catchment area of their water supplies by afforestation, the Board communicated with the Local Government Boards for England and Scotland, who sent out a circular letter to all local authorities asking for a return. The results were tabulated and published in the journal of the Board of Agriculture for November 1904.

It is reported that the Armstrong College have taken over the management of Chopwell Woods, in the country of Durham, 900 acres in extent, which carry crops of larch, spruce, Scotch pine, oak, ash, and other trees, planted about fifty years ago. The woods will be gradually brought under a proper rotation of cropping by the clearing and replanting of the more mature portions from time to time, and the carrying out of this work will afford favourable opportunities for demonstrating the various operations relating to forestry.

GROWING AUSTRALIAN TIMBER IN INDIA.—Mr. F. J. E. Spring, C.I.E., Chairman of the Madras Harbour Trust, addressed the Governor of Madras regarding the advisability of growing certain valuable species of *Eucalyptus* on the Nilgiris, with the view of eventually making India independent of Australia for her supply of railway sleepers. The Curator of the Government Gardens was directed to obtain, from the Under Secretary for Lands and Forests, Sydney, the species referred to by Mr. Spring, which are detailed by Mr. J. Adam in his Reports on the subject. The question is a wide and highly important one and is well worth being taken in hand in a thorough manner.

STILTS FOR HIGH RUBBER TAPPING.—A practice in the turpentine producing regions of France, described in the New Orleans *Times-Democrat*, might possibly be adopted with advantage in the tapping of rubber trees, in some circumstances. It is walking on stilts.

It appears that young pine trees are tapped low, but with each year's passage the incision is made higher up, so that it is not long before most of the trees are tapped 20 or 30 feet from the ground. Hence the huge stilts of the workmen. On these stilts they traverse the flat country, covering five or six yards with each stride, and quickly and easily collect the turpentine that overflows the little buckets hanging high up in the trees.

The stilt wearers carry a 15 foot staff with a round, flat top like a dinner plate. When it is lunch time or when they are tired, they plant upright under them the staff and sit down on its

round, flat top. Then in comfort seated so dizzily high, they eat and rest and chatter—a strange sight to behold.

Where rubber trees are to be tapped at a considerable height from the ground, as not infrequently happens, the use of stilts might prove more convenient some times than any means now employed by the rubber gatherers for reaching their work. *Indian Rubber World.*

IRISH FORESTRY STATION.—The family seat of the late Mr. Parnell, at Rathdrum, purchased by the Department of Agriculture recently, is now being used as a training ground for foresters. At the present time there are thirteen students, most of whom have previously been engaged in forest work or gardening. Special lectures are given them in one of the rooms of Mr. Parnell's house, principally in the evenings and at odd times. During the remainder of the day they are engaged in cutting down timber, dressing it or planting, according to the season of the year. Besides their instruction, these men receive a wage of 16s. per week, during the first year, 18s. during the second, and 20s. during the third year.

FORESTRY INSTRUCTION AT ARMSTRONG COLLEGE.—An important advance in the development of the forestry branch of Armstrong College, Newcastle-on-Tyne, has been made by an agreement effected between H. M. Office of Woods and the college authorities, by which the latter take over the local management of Chopwell Woods, in the county of Durham. These woods are within a few miles of the college, extend over an area of nearly 900 acres, and carry crops of larch, spruce, Scotch pine, oak, ash, and other trees, most of which were planted about 50 years ago. The woods will be gradually brought under a proper rotation of cropping by the clearing and replanting of the more mature portions from time to time, and the carrying out of this work will afford favourable opportunities for demonstrating the various operations relating to practical forestry.

H. M. Commissioner of Woods, Mr. J. F. F. Horner, has obtained the consent of the Treasury to a house being provided in

the woods as a residence for the college lecturer in forestry, Mr. A. C. Forbes, and to continue to pay as heretofore the ordinary working expenses of the woods. The arrangement will facilitate the holding of short courses for practical foresters and others desirous of acquiring a knowledge of the subject, while as a practical demonstration area for the students attending the college forestry class, the woods will be invaluable, and should render Newcastle one of the most favourable centres for forestry instruction in the United Kingdom.

Throughout the negotiations the college authorities have been met by the Office of Woods in a sympathetic manner, and Mr. Horner has shown every desire that the Chopwell Woods shall, so far as circumstances will admit, be so managed as to render increased facilities for instructional purposes.

Bemrose, Collo., Derby.

Photo., G. S. Hart.

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RECRUITMENT AND TRAINING OF CANDIDATES FOR THE PROVINCIAL AND SUBORDINATE FOREST SERVICES.

We have devoted some attention in the pages of this Magazine to the training of probationers for the Imperial ranks of the Service, a matter which cannot as yet be considered as finally disposed of. We now propose to turn our attention to the Provincial and Subordinate ranks. In a recent Resolution of the Government of India, published elsewhere in this number, the revised rules for the training of these latter officers are issued, and we would congratulate the Government on the extremely enlightened and progressive character of the new departure—a departure which, we feel assured, will be received with the greatest satisfaction by the Department at large.

There can be little doubt that the constitution of the Provincial Service and even that of the Ranger class has scarcely attained that success which its initiation some years ago was hoped to secure. The reasons are not far to seek. In many circles seniority quite as much as professional attainments and merit, was taken

into account in promoting men both in the Ranger class and, more invidious still, from the Ranger class into the Provincial Services. The results of this policy soon became apparent. Divisional Officers found themselves saddled with assistants in the Provincial grades who had little real professional knowledge and who were consequently, in spite of their rank, only fit or scarcely fit to hold charge of a range. Conservators, on the other hand, were forced to place these men, owing to the short-handedness of the Imperial Service, either in temporary charge of divisions during the absence of the incumbents on leave or in permanent charge of the smaller divisions of their circles; a proceeding which practically saddled the Conservator with the administrative charge of divisions. This state of affairs has entailed upon the officers concerned a large amount of work quite outside their respective provinces. This fact had become well known, and we read in the Resolution that from the reports submitted by Local Governments the Government of India had learned that "there is a general feeling of dissatisfaction with the existing standard of qualifications of the members of the Provincial Service."

The method of filling the lower grades of the Provincial Service also resulted in grave dissatisfaction in the ranks of that Service. The promotion of men of long service in the Ranger class meant the filling up of the ranks of that Service with men who could never hope to reach the higher grades and considerably retarded the promotion of younger men whose qualifications and attainments were such as warranted their being assured of an equable flow of promotion. To attain this latter object and to ensure that the Provincial Service shall be manned in the future by men of good education and good social standing, the following system has been introduced, and it is one which is sure to meet with the entire approbation of both the Conservator and the Divisional Officer.

Local Governments are now empowered to select candidates for direct appointment to the Provincial Service, and in order that such specially selected candidates may acquire the higher qualifications necessary to fit them for the duties of that Service, it has been arranged that a third year's course, both theoretical and

practical, shall be inaugurated at the Forest College. The candidates may be selected either before or after completion of the ordinary two years' curriculum, but they must have obtained the Higher Standard certificate of the College for the two years' course; and before appointment to the Provincial Service they must have obtained a certificate from the Principal of the College to the effect that they have satisfactorily completed the third year's training. A candidate selected by the Local Governments for direct appointment to the Provincial Service may be granted a stipend not exceeding Rs. 100 per mensem during the three years' course of training, and when he has satisfactorily completed the course he may be posted to the Service either as a Ranger or (and we hope that this latter will be the usual procedure in the cases of direct appointment, since we think candidates trained in this way should never serve in the subordinate ranks) as a probationary Extra-Assistant Conservator; he will however be required to serve for at least three years' satisfactory service before being appointed permanently to the Provincial Service. How the probationary period should be passed and whether for a longer period than three years is left to the decision of Local Governments. For the first three years the probationer may be given a salary not exceeding Rs. 150 per mensem and thereafter Rs. 200 per mensem. Further to the Local Governments is left the decision as to whether such probationers should be granted permanent appointments, and also—a most important point—as to whether any proportion of the vacancies in the Provincial Services should be guaranteed to candidates of this class.

This latter question is one which requires the most careful consideration, and we would advocate that a certain proportion of such vacancies should be so set aside. It seems to us that to ensure the success of the scheme a certain assured flow of promotion should be safeguarded in order that there shall be no chance of a block and consequent dissatisfaction creeping into the ranks of what should, in a few years' time, prove the cream of the Provincial Service; for the advent of such will inevitably reclose the ranks of the classes the new proposals aim at opening to the Department.

We turn now to a consideration of the Ranger class. The main object of the ordinary two years' course at the Forest College is to give these men such an education as will fit a candidate for appointment as Ranger. At the close of this period of two years an examination will be held, on the results of which three classes of certificates will be issued, known respectively as the Honours, Higher Standard and Lower Standard certificates. Candidates will be admitted to this course in accordance with the College rules.

We have seen that the new system prescribes a third year's course at the College designed to fit the student for early appointment to the Provincial Forest Service. It has been decided that Local Governments or Native States shall have the power to request that any selected Ranger may be given the third year's course at the College either without having obtained the Higher Standard certificate or some time after he has so passed from the College, the only proviso being that the Principal must be satisfied that the student's qualifications are such as to enable him to benefit from the course of instruction desired and that there is room for him at the College. It may be here remarked that the same applies to private students who are prepared to defray their own expenses. With reference to the appointment to the class of Ranger, Local Governments will in future make their own rules subject to the following conditions. The rules should provide for the appointment as Rangers of subordinate officials of long service and tried ability and probity in order to encourage efficiency among Deputy Rangers and Foresters. In such cases promotion will be made without reference to the special training such officers have undergone or to any educational certificates they may have obtained; but subordinates selected for this promotion may be required to undergo a special course of training or to pass specified examinations before being made permanent in the Ranger class. Direct appointments to the Ranger class will, however, in future be only given to trained candidates who have obtained the Higher Standard certificate at the end of the two years' course at the College. Local Governments are empowered to give a stipend not exceeding

Rs. 50 per mensem to all candidates selected by them for the two years' course, whether already in the service or not.

In order to ensure high efficiency in the Ranger class, the Government of India think it of great importance that officers of that class should remain eligible for promotion to the Provincial Service, and have accordingly ruled that Local Governments may in future appoint to the lowest grade of Extra-Assistant Conservator any selected Ranger of long service and tried ability and probity irrespective of the educational certificates he may hold, but subject to any special training the Local Government may decide on.

In this connection the Government of India ask Local Governments to consider whether in their opinion the introduction of the new class of selected candidates for direct appointments to the Provincial Service will diminish the prospects of promotion of the existing staff of Rangers, and that, should this prove to be the case, they will be prepared to consider any definite proposals on the subject which Local Governments may be prepared to submit. We would suggest that a separate cadre be introduced on which should be borne Rangers of long service promoted to the lowest grade of Extra-Assistant Conservators, and also, and more important still perhaps, those who have already been promoted into the Provincial Service and whose promotion has been made more on seniority lines than with reference to their professional ability. This cadre would be kept in force until all the old untrained or inadequately trained Rangers had left the Service, when it would be possible to assign a certain number of the lowest grade Extra-Assistant Conservatorships in the Provincial Services of the various provinces to be filled by Rangers of long service who had risen from the Deputy Ranger and Forester grades. The introduction of a separate cadre would entail an extra expenditure for a few years, but it would assure the prospects of the highly trained members of the Provincial Service leaving Dehra Dun under the new regime and avoid blocking their promotion. In our opinion the whole future of the scheme depends upon this latter. The men who successfully pass the three years' course are the men who will and should fill the upper

ranks of the Provincial Service, and we think that all Conservators and Divisional Officers will wish to see them filling them within a reasonable time.

To meet the peculiar circumstances of Burma, which already possesses a Vernacular Forest School of its own, the Government of India have decided that, pending the establishment of an English course at that school, Conservators may make direct appointments as probationary Rangers of natives of Burma with a knowledge of English on a pay of Rs. 75 per mensem. Men so appointed will be on probation for two years, after which period they may be confirmed by the Local Government, but will not be eligible for an appointment on more than Rs. 100 per mensem until they have obtained a Higher Standard certificate in the English course at the Burma Forest School or at the Forest College. Candidates selected for direct appointment to the Burma Provincial Service may undergo their first two years' training at the Burma Forest School, but must complete the third year's course at the Forest College and must thereafter remain on probation for three years during which they may be given a salary not exceeding Rs. 175 per mensem and thereafter Rs. 200 per mensem.

It is impossible to minimise the importance of the new departure nor the wide-reaching effects it will have on the efficiency of the Provincial Service. Since the general introduction of Working Plans entailing the more intense and systematic working of the forests of the country year by year the work thrown on the Divisional Officer, and *ipso facto* on the Conservator, has become heavier, whilst the necessary trained assistance he has required from his subordinates has remained almost stationary or has certainly not increased in the ratio required. Throughout the length and breadth of the country the cry has been the same, and it is no secret that the backwardness of many fine and valuable forest divisions is entirely due to this fact. The efficiency, expansion, economic working and financial improvement which are likely to occur when the effects of the new departure have begun to make themselves felt are likely to prove incalculable. To ensure their permanency however it will be necessary to take a further step and improve the

conditions of service and emoluments of the Provincial Service. Men of the stamp required will, after undergoing the three years' training at Dehra, look for better prospects than the Provincial Service at present offers them. We trust therefore that the Government of India will find it possible to supplement their liberal offer of free education by an improvement in the conditions of service and emoluments of the grades whom the higher training is designed to benefit.

The resolution has also some remarks on the efficient training of Deputy Rangers, Foresters and Guards. The Government of India consider that this matter should now be left to Local Governments and has accordingly decided to abolish the Vernacular class hitherto maintained at the Forest School at Dehra Dun. They trust that all Local Governments will make satisfactory arrangements for the training of the Subordinate Executive Service below the rank of Ranger. We have already discussed this question in these papers and its importance cannot be overstated. The best trained and most efficient Imperial and Provincial Services will not yield the results desired if the subordinate executive ranks are allowed to remain in their present condition just as it has been recently discovered that the finest officered army in the world is useless unless attention is paid to the education of the rank and file.

We trust ere long to be able to record in these columns the steps taken by Local Governments to remove the present inefficiency of the subordinate executive staff. The Conservators and Divisional Officers in the various provinces have doubtless already made up their minds as to the amount of training required and the best steps to take to ensure this part of the establishment being brought into line with the general efficiency aimed at throughout the Service as a whole.

SCIENTIFIC PAPERS.

THE EFFECT OF THE MOON'S PHASES ON THE PERIOD OF FELLING BAMBOOS.

BY E. P. STEBBING.

It has been a matter of common knowledge for some decades past amongst those who have had any connection with the cutting and export of bamboos in India, and to a certain extent of poles as well, that the natives have long held a superstition that neither the one nor the other should be felled when the moon is full; they argue that the sap is then very abundant, and unless the bamboos are well soaked in a tank and subsequently preserved with plenty of smoke they will be rapidly destroyed by boring insects (*cootee*). The most serious of these pests are the bostrichid beetles *Dinoderus pilifrons* and *D. minutus*.* This curious theory is held so commonly throughout the country that I have been for some years past endeavouring to ascertain the causes which have given rise to it, the reasons upon which it is based, and whether any scientific facts can be adduced in its favour.

One of the explanations put forward is to the effect that the *cootee*, like many other wood-boring insects, prefers to lay its eggs in wood which has commenced to wither and which consequently no longer has a healthy flow of sap to interfere with the insect in its burrow. This being so, the time immediately after the bamboo is cut down would be the most likely one for it to be attacked.

It seems to be a generally received idea that soaking bamboos, as also other timber, in water for a considerable time immediately after it has been felled, makes it less liable than it would otherwise be to suffer from boring beetles of all kinds. It is supposed that not only does the water prevent the beetles laying their eggs during the time the wood is immersed in it but that it also drowns insects already at work and dissolves much of the nutritive matter on which they otherwise feed.

* *Vide* my Notes on the Preservation of Bamboos from the attacks of the Bamboo Beetles or Shot Borer. *Indian Forester*, App. Series (1903). *Ibid* XXXI. 249.

That bamboos, once sickly and dying or dead, suffer largely from the attacks of beetles must be obvious to the most superficial observer who glances over a bamboo clump or examines furniture, houses, fences, etc., built entirely or partially of bamboos. We are not here concerned, however, with this aspect of the question; our purpose being to discuss the information at present available as to the effect the felling of bamboos and posts at different phases of the moon has upon their subsequent immunity or otherwise from the attacks of boring pests.

In their Forest Proceedings * the Madras Board suggested in 1898 that investigations should be carried out in this subject and the experiments initiated as a result, although made in a few divisions in Madras only and in a manner which leaves room for improvement, are of very considerable interest as serving to show that the so-termed superstition of the natives of the country has perhaps some substratum of solid fact to rest upon.

Before detailing the various experiments made in this country I will first refer to a paper read by Ernest R. Woakes before the American Institute of Mining Engineers † in which the author stated that in South America (Columbia) *not only bamboos but all trees* are felled during the waning moon only and not during its increasing phases. It would appear that in that country the effect of the moon's phases is treated as an accepted fact. Mr. Woake states from his own experience that he has often seen the sap running out of stumps during the increasing moon which were absolutely dry during the waning moon.

In a letter ‡ on the subject Mr. A. W. Peet, Acting Conservator of Forests, Central Circle, Madras Presidency, made the following remarks in 1899 :—

"As regards bamboos I expect that the question of durability depends to a great extent on the question of sap, but the problem seems to be complicated by the doubt whether we are to reckon

* Board's Resolution, Forest No. 255, dated 24th June 1898.

† This paper was reprinted in the *Tropical Agriculturist* for October 1899.

‡ No. 454, dated Madras, 25th October 1899, to the Commissioners of Land Revenue, Madras.

with the effect of the moon's phases, as well as with the period of the year at which they are felled. I doubt if even the borer can subsist without the elements of the sap on which to feed, and the principle of soaking bamboos is, I think, useful, chiefly because it tends to dissolve the fermenting constituents. Heating and smoking bamboos are additional precautions generally adopted.

"The point, however, which I wish to emphasise here is whether we should not primarily consider the period of the year at which bamboos are felled, and only secondarily the period of the month. There seem good grounds for paying attention to the latter, if we can only determine definitely the number of days in a month in which bamboos can be felled with confidence, and I will revert to this point. However, I think that unless strong evidence is adduced to the contrary, we shall treat bamboos like other vegetation and assume that the period when the sap is most vigorous, and therefore the fear of fermentation most pronounced, is in the spring, and that this season should be avoided for felling if durability is of importance; and it may even be a question whether the root stocks will not be more injured during this period.

"In order to test this presumption I lately questioned a bamboo contractor, without giving him any leading questions, and he told me that he believed that there was something in the waning moon theory, but that he had come to the clear conclusion that bamboos felled during March and up to the end of July had less durability than those felled during the other months of the year.

"As regards the phases of the moon a hill man told me that he considered that bamboos might be felled safely during the seven days before new moon, and the seven days after; but on being pressed as to what he considered absolutely as the best period he said during the seven days before. His theory of the seven days after would seem to conflict with Mr. Woakes' theory."

The experiments carried out in Madras, although they cannot be considered to have been as definite as is desirable, are still of very considerable interest. They were initiated in four separate localities, *viz.*, the Nilgiris, North Coimbatore, South Coimbatore

and South Malabar, and the following summarises the observations made.

NILGIRIS:

30th June 1899:

Bamboos were cut in all the Ranges except Ootacamund a few days before and a few days after new moon and full moon and kept separate from each other. Some were smoked and others were soaked in water. It was found that bamboos cut on dark nights and immediately soaked or smoked for a period of two months were not attacked by the borers. From the experiments conducted in the various ranges it was observed that bamboos felled during moonlight nights were more severely attacked than those felled during dark ones. That soaked bamboos fared much better than unsoaked ones. As a result of the experiments the recommendation was made that as soon as felled the bamboos should be fully immersed in water for some time or properly smoked in a shed, or otherwise they were liable to be attacked by the borers.

As I have shown, however, in my previous papers on the preservation of bamboos from the borers, neither immersion in water nor smoking are to be depended upon as safe preventives.

NORTH COIMBATORE:

24th August 1899.

A series of experiments were conducted in the Satyamangalam Depôt at the foot of the Ootacamund Hills. During each week of the month one head load of 25 bamboos of two kinds (dry solid bamboos known as 'Karanai' and green hollow bamboos known as 'Varar') were set aside and marked. It was observed that dry bamboos appeared to withstand the attacks of the borers better than the green. In every case the insects attacked the bamboos in the inside of the bundle first, *i.e.*, those not exposed to light. This is a general rule amongst these boring beetles who very generally, although by no means always, attack in the shade in preference to strong light.

As a result of the experiments conducted here it was held that the phases of the moon had no effect on the felling season.

It was noted, however, that bamboos exposed to light and air are less liable to attack than those not so exposed.

SOUTH COIMBATORE:

18th February 1899 *and 1st November* 1899.

A series of experiments were made on two occasions at Mount Stuart, one from the 2nd August to 1st September 1898, and the second from the 10th March to 12th April. On each occasion 10 large bamboos *(Bambusa arundinacea)* and 10 small *(Dendrocalamus strictus)* were cut daily. Each bundle of 10 was labelled and the bundles were all laid out in a row. Those cut on the first occasion were examined one by one on 2nd February 1899 with the result that the influence of the different phases of the moon did not appear to have any bearing upon the presence or absence of the borers. On the second occasion one-half of the length of each bundle was covered with mats, the other being left uncovered. This was done in order to observe the effects of shade as a protective influence or otherwise to the bamboos. The bamboos so treated were examined at the beginning of October. It was found that the portions of the bamboos covered over by the mats had double the number of boring insects at work in them than were to be found in the uncovered portions. Thus the insects attack bamboos stacked in the shade twice as heavily as those stacked under the full rays of the sun.

The following were the percentages of attack observed in the case of the two species of bamboos experimented with :—

Bamboo.	Percentage attacked by borers on the first occasion.	Percentage attacked by borers on the second occasion.
Bambusa arundinacea	50·53	34·33
Dendrocalamus strictus	39·47	41·66

It will be noted from the above that the percentage of attack in the case of *Bambusa arundinacea* varies considerably, being much higher in the case of the bamboos cut in August than in the case of those cut in March-April. In the case of *Dendrocalamus strictus*, however, the percentage of attack differs but little, the

increase inclining to those cut in the spring months of the year. To be conclusive, further experiments with a larger number of bamboos should be carried out in this Division.

SOUTH MALABAR:
4th October 1899.

A series of experiments were made from 2nd August 1898 to 7th April 1899, both at the full moon and new moon periods. On each occasion a bundle of 25 bamboos was soaked in mud and water whilst a second bundle was merely stacked. The experiments seemed to show that neither the soaking nor felling at any particular phase of the moon had any marked effect in preserving the bamboos from the attacks of the borers. It was noted, however, that the bamboos felled during the months of January, February and March were not attacked by the borers, stacked bamboos felled at other periods being invariably attacked.

The above summarises the experiments as far as they appear to have been carried in Madras. They support and confirm observations of my own on two points :—

(*a*) That the cold weather months are the best ones in which to fell, although felling at this season does not guarantee immunity to the bamboos from the attacks of the borers.

(*b*) That bamboos stacked in the shade or covered up in such a manner as still to allow of the beetles getting at them will be more severely attacked than those stacked in the open.

The question as to the best time in the month to fell requires a more detailed series of experiments to be carried out before we can finally say that the belief so commonly held in India is a mere superstition. It will be noted that in the Madras experiments the bamboos kept under observation were either *stacked together* or the bundles were placed in rows *adjacent to one another*. Now this procedure greatly detracted from the value of the experiments carried out, since it is possible, if not probable, that the bamboos cut at a certain period of the moon's phases first attracted the beetles which, appearing in numbers too great to find accommodation in the bamboos in the condition they preferred, overflowed on to and attacked neighbouring bundles which otherwise might have

escaped. If the experiments are to be reliable, it is necessary to cut bamboos at different periods in the month from the same clump or forest and to stack the lots cut on different dates at considerable distances apart so that the danger of the lot in the condition preferred by the beetles attracting the insects to the others will cease to exist.

A study of my note on the life-history of these insects will show that the beetles do not appear on the wing in December and January at least, in the more southern portion of the Continent, and for an even longer interval in the northern portions. This therefore accounts to some extent for the immunity of bamboos from attack at this period.

In order to settle the question of the effect of the phases of the moon on the period of felling, I would ask those interested in the subject to initiate a series of experiments as follows :—

(*a*) Bundles of bamboos to be cut weekly, each week's felling to be numbered and stacked *separately* as far apart as possible (at least a mile).

(*b*) The phase of the moon at the period of felling to be accurately noted.

(*c*) Particulars as to locality, elevation, etc., to be noted for each bundle cut.

(*d*) The bundles to be inspected *weekly* and rough notes as to the percentage of each bamboo attacked to be noted down for each week.

(*e*) The species of bamboo experimented with to be accurately noted.

(*f*) My own theory at present is that bamboos felled *during November and the first half of December* and *immediately piled* or *stacked in the sun* will not be attacked by the borers. I should like a verification of this by experiments carried out in different parts of the country.

It would lay me under a deep obligation if all who institute such experiments would forward me* a copy of their notes and observations together with the deductions they draw therefrom.

* To Dehra Dun, United Provinces.

ORIGINAL ARTICLES.

IMPROVEMENT FELLINGS AS A METHOD OF TREATMENT IN IRREGULAR FORESTS.

"At the close of 1903-04 the areas for which Working Plans had been compiled and sanctioned amounted in Bengal to 24,407 square miles, in Madras 5,103 square miles, and in Bombay 4,170 square miles, or a total of 33,680 square miles".*

The different sylvicultural systems or methods of treatment prescribed in the Working Plans for the systematic working of these forest areas do not cover a very large or varied field. Indeed, in high forests, with the exception of the Selection system, the only other method of treatment which appears to have received a strong measure of support is that described as the method of "Improvement Fellings". This method is applied over no less than 10,927 square miles of systematically worked forests. In other words, about one-half of the total area under Working Plans in the Bengal Presidency is at present subjected to a regulated system of management, somewhat varied, but brought under the common designation of "Improvement Fellings". The method of Improvement Fellings thus occupies an important position in indigenous Indian Forestry. Nevertheless, the term remains undefined; and as a method of treatment in irregular forests, no attempt has been made to give it a recognised place in British forest terminology. Dr. Schlich in his Manual of Forestry appears to make no mention of Improvement Fellings, either in connection with cleanings and thinnings and other works of improvement, or as a sylvicultural system. In France, on the other hand, "coupes d'amélioration" and "travaux d'amélioration" are recognised technical terms frequently employed in forestry to denote particular supplementary forest operations. By "coupe d'amélioration" is understood cleanings (coupe de nettoiement) and thinnings (éclaircies périodiques) †;

* Review of Forest Administration in British India for 1903-04, with a Quinquennial Summary, by S. Eardley Wilmot.

† Culture des bois. B. Lorentz and A. Parade.

whilst under the designation of "travaux d'amélioration" are included all works necessary for the improvement of the forest, consisting "soit en repeuplements artificiels, soit en fossés d'assainissement, soit en création ou reparation des voies de vidanges sans lesquelles les produits de certains peuplements resteraient indubitablement invendus"*.

The term "Improvement Felling" was undoubtedly introduced into British India by Foresters who had received their early training at the Nancy School of Forestry; and when first adopted as an Indian technical forest term its signification appears to have been that given by French Foresters to "coupe d'amélioration". In Bagneris' Manual of Sylviculture†, translated in 1876 by two distinguished Indian Forest Officers, and prescribed as the Indian text-book, Improvement Cuttings are defined as cleanings and thinnings. Again, in the published list of Forest Technical Terms, adopted by the Forest Conference held at Dehra Dun in 1886, the Improvement Felling is defined as a "coupe d'amélioration" or "verbesserungsschlag". In the form prescribed in the Forest Code to be used in drafting Working Plans,‡ after describing the method of treatment to be applied to the principal fellings, the supplementary regulations are dealt with; and these include "cleanings, thinnings and other improvement fellings" as well as "improvements common to the whole area", clearly indicating that these Improvement Fellings were merely to be subsidiary or supplementary operations, that is "coupes d'amélioration", and "travaux d'amélioration". So far there appears to have existed a considerable and powerful concensus of opinion in favour of defining and restricting the application of the term Improvement Fellings to minor cultural operations.

This interpretation is still further brought out in Mr D'Arcy's handbook on the preparation of Forest Working Plans, issued from the Office of the Inspector-General of Forests to the Government of India. "When it is sought to improve or restore the condition

* Cours d'aménagement des Forêts. Henri Nanquette.

† Manual of Sylviculture by B. Bagneris, translated from the French by Fernandez and Smythies, Asst. Conservators of Forests, Central Provinces.

‡ Forest Department Code, 6th Edition, Article 89 (1).

or constitution of an existing crop, by thinning or weeding, the operation is called an Improvement Felling"*. Again, "it is frequently necessary to improve the condition of the existing crop, or reconstitute the former capital, by carefully respecting the main crop and by limiting operations to the cutting out of ill-grown or injured species, injurious climbers, etc., without altering the method of treatment or the mode of reproduction. The treatment temporarily applied in such cases may be called a restoration, and the fellings restoration fellings"†.

It would be easy to amass further evidence to show that on the formation of a British Indian forest terminology the term Improvement Fellings was merely applied to denote thinnings, cleanings, or weedings; subsidiary or supplementary operations undertaken with a view to the proper tending of the forest. The same interpretation with perhaps a slight addition appears to have been accepted by the Bureau of Forestry of the United State of America, where the science of forestry is of even more recent origin, the terms of forestry having doubtlessly been largely derived from British sources. In a recently published bulletin of "Terms used in Forestry and Logging"‡ "Improvement Cutting or Thinning" is described as "usually being the first thinning made when a forest is put under management, to prepare it for the application of a regular system"; and the reader is further referred to "Thinning" which is defined as "the removal of a portion of the trees with the object of improving the stand without inviting natural reproduction. The following kinds of thinnings being distinguished: cleaning, improvement thinning, accretion thinning".

In 1891 the second edition of Mr. Fernandez's Manual of Indian Sylviculture was published. In it the author first makes an attempt to describe "Improvement Fellings" as a systematic or regular method of treatment to be applied to irregular woods. Mr. Fernandez, however, does so in a somewhat uncertain spirit, the

* Preparation of Forest Working Plans, by W. E. D'Arcy.

† "The term 'improvement' applied to such fellings is also too vague." *Idem* The reader's attention is invited to Mr. D'Arcy's description of the Selection system "limited by cultural rules"; pages 82 and 83 of his text book.

‡ United States Department of Agriculture Bureau of Forestry Bulletin No. 61.

method being dealt with under the head of works for the "Maintenance and Treatment of Forests," in connection with fire-protection, cleanings, and thinnings. In defining the term "Improvement Fellings", Mr. Fernandez does not appear to transgress any previously accepted teachings. An improvement felling is defined as "an operation made in heavily damaged forest with the object of removing from them, as quickly as practicable, all unsound, deteriorating, knotty, inferior or harmful trees, while at the same time making the most of existing material, in order to obtain as full a crop as possible composed principally of healthy, vigorous growing trees of valuable species". Nevertheless, the manner in which Mr. Fernandez proceeds to elaborate his thesis is not as happily conceived. It is laid down that "an improvement felling is not an elementary operation of a special kind not yet described in this Manual, but is essentially a composite one combining in itself the attributes and objects of every kind of felling already treated of. At points where utilisable advance growth exists, it will assume the character of an after-felling or of a jardinage cutting. Where the crop is too dense it will become a preparatory felling or a thinning or a cleaning according to the age of the component individuals. In other places it may partake of the nature of a seed-felling. Where frost and other dangerous atmospheric influences are not to be feared and the soil cannot suffer from exposure, there a more or less large clearing may be made if the whole of the standing stock is unsound or deteriorating and early regeneration is certain"*. An element of uncertainty is thus at once introduced. Whilst Mr. Fernandez undoubtedly prescribes the removal merely of "unsound, unhealthy, deteriorating or harmful stuff", either at once or gradually according to the sylvicultural requirements of the forest; to the uninitiated the term "Improvement Felling" as above defined would appear to justify the removal of any stem, sound or unsound, as long as early regeneration is certain. In other words, preparatory, seed, or final fellings may be carried out in the oldest age classes with cleanings and thinnings in the younger classes. Thus in a step the "Improvement Felling" from a simple

* A Manual of Indian Sylviculture by F. G. Fernandez, Indian Forest Service.

cleaning or thinning supplementary operation, a "coupe d'amélioration", has come to signify the application of "every kind of felling (system) treated of" in a Manual of Sylviculture. Whether this interpretation can be rightfully fathered on Mr. Fernandez,* the fact remains, as will be clearly proved from a perusal of existing sanctioned Working Plans, that two schools of Indian Sylviculturists have been formed. The one school accepts Mr. Fernandez's proposition *in toto*. The removal of all trees of the exploitable size (arbitrarily fixed) is permissible, as well as the carrying out of preparatory and seed fellings, and thinnings, cleanings, and weedings. The second school, on the other hand, restricts the term "Improvement Fellings" to thinnings and weedings. "The weedings to consist in cutting out unsound trees, or trees of inferior species standing over good sapling growth or flourishing reproduction. Low shrubs may also be cut to help existing seedlings; but this must not be done with a view of obtaining reproduction, but only to help that already established, for the time for the reproduction of the forest has not come"†. Herein lies the crux of the whole question. It has been said that the aim and object of every sylvicultural system consists in harvesting the crop, whilst at the same time assuring the reproduction or regeneration of the forest—"there is nothing that needs to be more strongly emphasized than that the main business of the Forester is expressed in the one word "reproduction"; his main obligation is the replacement of the crop he has harvested, whether produced by unaided nature or otherwise, by as good if not a better crop of timber than he found"‡. The one school then accepts the so-called method of improvement fellings as a regular sylvicultural system,§ by means of which the harvesting of

* Mr. Fernandez writes in his preface to the second edition of his Manual: "It was my intention to rewrite also the chapter on Improvement Fellings; but, besides that the required leisure would have been wanting to deal with so large and important a branch of indigenous Indian Forestry I had to fix a limit to the already swollen proportions of the book".

† Working Plan for the Rehar and Garibulchand Forests, Naini Tal Division.

‡ Economics of Forestry, B. E. Fernow.

§ "By a sylvicultural system is understood the systematically arranged method according to which the formation, regeneration, tending, and utilization of the woods which compose a forest, are affected." Schlich's Manual of Forestry, Vol. II.

the exploitable tree and the regeneration of the forest is to be brought about. The other school, on the other hand, looks upon improvement fellings merely as a transitory period during which the *existing* crop will be allowed to grow up and develop, this being merely assisted by judicious cultural operations, such as cleanings, thinnings, weedings, and other improvement works (travaux d'amélioration); but the time for the reproduction of the forest, for the introduction of a recognised sylvicultural system has not yet come.*

Nevertheless, though considerable diversity of opinion exists, the fact remains that the method of "Improvement Fellings" has been accepted in Indian Forestry, if not as a regular "sylvicultural system," at all events as a method for the systematic regulation and treatment of irregular crops; and it is essential that the term be defined in a manner acceptable to all Foresters.

A careful study of existing Working Plans† will reveal the fact that, with the exception of a certain want of precision, and a harping around the question of natural seed or coppice regeneration fellings, considerable agreement appears to exist among Indian Foresters as to the definition of the term "Improvement Fellings" and the class of forest to which this method of treatment is applicable. It is only when the scheme of fellings comes to be elaborated that the irreconcilable differences above referred to become manifest. In existing working plans, the term "Improvement Fellings" has been defined as "systematic sylviculture" as "a preparatory period in order properly to constitute the growing stock"; as "the reconstitution of a partially ruined forest," as an operation "to improve the stock": and as an "Improvement (Selection) system."‡ The forest to be so treated is described as

* This appears to be the view accepted by the Government of India. Revenue and Agricultural Department Circular No. 25 F., dated 13th August 1889, prescribes the term to be used in describing Fellings. These are divided into (i) Regeneration fellings, (ii) Amelioration fellings, and (iii) Unclassed fellings. Amelioration fellings are defined as fellings with the view of improving the condition of the existing crop, and these include Improvement Fellings.

† See Appendix giving a list of the principal forest areas systematically worked under the method of Improvement Fellings.

‡ Extracts from existing Working Plans, see Appendix.

"a degraded, overfelled irregular forest in which age classes of the more valuable tree species are very imperfectly represented; sound, mature, and second class stems being almost wholly absent from the crop, which as a whole has suffered greatly from the almost annually recurring fires"*. Or, again, in another place, "the stems of the higher classes are all injured and unsound, reproduction is irregular, owing to variation in the period of protection and consequent variation in quality of soil, and also, doubtless, in places to the excessive density of the cover; there also is no regularity in the proportion of distribution of the age classes. The treatment proposed should be such as will as soon as possible overcome these irregularities and encourage sound and healthy growth in the future."†

In all this there exists a certain degree of unanimity; but in prescribing the fellings the different schools of forestry at once part company. The one school boldly prescribes the harvesting of the exploitable crop, the removal of all mature trees, and the carrying out of regeneration (preparatory, seed, and final) fellings. The removal of "all mature sal sound or otherwise, standing over young growth of that species."† "The removal of mature trees which, on account of their dense shade, either prevent the germination of seed or interfere with the growth of the young crop."‡

The other school restricts the fellings to cleanings, thinnings and weedings. "Improvement Fellings to consist purely of thinnings and weedings"§; "moderate thinnings and cleanings with supplementary operations, such as creeper-cutting and experimental planting, and the construction of such roads and buildings as are still required to make the forests completely and easily accessible"†. "Fellings shall be restricted to purely sylvicultural requirements of the crop. They will embrace only the unsound material; but no stem, however unsound, should be felled in areas where reproduction is wanting and the crop open."† "The improvement

* Working Plan of the Dubari Reserve, Coorg.

† Extracts from existing Working Plans, see Appendix.

‡ Motipiori Working Plan, Oudh.

§ Rehar-Garibulchand Forests Working Plan, Naini Tal.

felling will consist in the removal of unsound stems where reproduction is sufficient, or where a sufficient number of young, sound trees renders their presence unnecessary; and in thinning and cleaning operations where patches of crowded growth exists."*

And, hovering between the two schools is the Forester either uncertain which master to follow, or following the one, whilst excusing his temerity. "It is not proposed to have special exploitation of mature trees, the removal of such trees depending entirely on sylvicultural requirements". "In improvement fellings the exploitable age is never fixed, except when mature trees are allowed to be removed."*

The clear-cutting system, the shelterwood compartment system, the group system, the selection system, the coppice or coppice with standards systems are the principal sylvicultural systems, or systematically arranged methods according to which the formation, regeneration, tending and utilisation of the woods which compose a forest are effected. Each of these systems has been defined and given a recognised place in forest terminology. With each of these systems supplementary regulations, cleanings, thinnings, weedings—(that is "improvement fellings" or "coupes d'amélioration")—are prescribed, in addition to other works of improvement, (travaux d'amélioration). Consequently, whether the method of improvement fellings is to be recognised as a regular sylvicultural system or not, it cannot at all events be made to usurp the place already occupied by one of the accepted sylvicultural systems. When, therefore, as is often the case in India, the method of improvement fellings is prescribed as the principal and sole method of treatment, something different must be meant. It cannot be the removal of the exploitable or so-called mature tree, for this is the "selection method", and the thinnings and cleanings are then required to be entered as supplementary regulations, even though they may form the most important feature of the operations prescribed. This indeed is the view generally accepted in Burma, where in the mixed teak forests worked under the selection system, great stress is laid on the

* Extracts from existing Working Plans, see Appendix.

regulation of the supplementary improvement fellings, operations of the highest importance. For similar reasons regeneration fellings, (preparatory, seed or final fellings), must be vetoed in order to prevent the improvement fellings from trespassing into the domain of the group, or shelterwood compartment systems. Analogically, eliminating all unsustainable interpretations, the conclusion must eventually be arrived at that only one definition of the term Improvement Fellings is possible, namely :—"By improvement fellings whether prescribed as supplementary regulations or as the principal method of treatment, are understood thinnings, cleanings and weedings, prescribed with the object of assisting in the development and improvement of the existing crop and the reconstitution of the forest capital."

Accepting this definition, the rules for fellings must conform to the regulations therein contained, however much the actual wording may in each case vary according to the particular conditions which may be found prevailing in the area to be dealt with. In a word, in prescribing the fellings the object in view must in every case be the same, namely, to foster and improve the existing crop by judiciously executed weedings, cleanings, and thinnings, and other works of improvement. Thus, "the object of improvement fellings shall be the removal of crooked or diseased wood in the crop not required for seed bearers."* Or, "the object in view shall be to restore the crop to its former condition by carefully executed improvement fellings bearing upon over-mature, injured and valueless stems, by favourising the spread of high class timber in suitable situations, and above all by lessening the present causes of injury of which fire is the chief"*. Or again, the improvement fellings are prescribed for "the protection and favouring of the existing crop in the denser portions; and the encouragement of all valuable forest growth in the open places"*; or with a view to "the improvement of the generally unsound crop the forest holds, so that when this has become more normal the most suitable method of working applicable can be determined without difficulty"*; or "to favour the growth of the more valuable and better grown

* Extract from existing Working Plans, see Appendix.

trees at the expense of their less valuable and less well-grown neighbours."*†

The possibility under the method of improvement fellings can only be fixed by areas or, to be more correct, the fellings must be regulated by area. The rest can only be left to the marking officer Consequently, "the marking officer must use his discretion regarding trees which are not shapely, sound, or thriving. He will take into consideration the conditions of the forest crop with which he has to deal and the short time to elapse before the next exploitation."* "The area check by itself will not prevent over-felling, and consequently the only safeguard will be in careful markings to be personally checked by a superior officer. The forest has been degraded by over felling; the timber at present available is mostly of inferior quality; and consequently considerations of revenue must be of secondary importance"* "It must be borne in mind that the improvement of the forest capital, particularly in respect of large trees of the most valuable kinds, must not be sacrificed for the sake of immediate revenue."*

* Extracts from existing Working Plans, see Appendix.

† The following set of sample felling rules may be submitted for criticism:—

(i) Inferior material interfering with superior shall be felled, girdled, or lopped, as may be most suitable.

(*Note* 1.—By "inferior material" is meant inferior by reason of its species or its growth; but this prescription must be intelligently applied, and the operator must use his judgment when dealing with well-grown trees of inferior species, suppressing a badly grown tree of superior species.

(*Note* 2.—This prescription may include the cutting back of bamboo culms for the release of existing seedlings of superior species.)

(ii) Conjestion amongst groups of poles of valuable species shall be relieved.

(iii) All dead trees shall be removed if marketable.

(iv) Obviously over-mature trees, which cannot last to the end of the felling rotations, may be cut, provided seed-bearers exist in the vicinity, even though not standing over young growth of the better species.

(*Note.*—Trees standing along the edges of banks and isolated trees shall not be felled, even on the plea that they are badly grown, over-mature or of inferior species.)

(v) Irretrievably injured poles of superior species of a girth below $1\frac{1}{2}$ feet at breast height shall be coppiced with the object of obtaining a better coppice regrowth.

(*Note.*—Strictly speaking, under the method of improvement fellings the above prescription requires to be justified.

(vi) All creepers shall be cut in the coupe of the year.

(*Note.*—Climbers should as a rule be cut a year in advance of the regular fellings.)

(vii) None but a trained Ranger shall be permitted to carry out the markings, and it is absolutely necessary that the Divisional Officer himself shall exercise strict supervision over the work.

So far an endeavour has been made to define the method of improvement fellings as at present applied in India, so long as such application does not run counter to the accepted teachings of European schools. Thus, while discarding the possibility of prescribing under this method of treatment the removal of sound trees of the valuable species, the term has been taken to include the carrying out of cleanings, weedings and thinnings over defined areas. The fact cannot, however, be overlooked that even a more restricted definition of the term has been suggested, primarily by the late Mr. W. E. D'Arcy of the Indian Forest Service; and the suggestion has with a good show of reason undoubtedly received a fair amount of support. In the method of treatment, applicable to irregular and ruined forests, which has above been described as the "Method of Improvement Fellings", the removal of the ill-grown or injured trees of the valuable species may be said to constitute the principal fellings; the thinnings and weedings, the supplementary operations, or "coupes d'amélioration". Such principal fellings should obviously be designated by some more convenient term, such as "Restoration Fellings"; the term Improvement Fellings then being restricted wholly and in every case to the recognised supplementary operations, that is to "coupes d'amélioration".

Gradually, as the resources at the disposal of the department increase, the forests will be brought under more intense and more carefully systematised working, and the necessity for purely provisional cultural methods of treatment will pass away. Nevertheless whatever the sylvicultural system adopted, "coupes d'amélioration" and "travaux d'amélioration" will ever remain imperative supplementary operations. Moreover, the time appears to have arrived to so define the term "Improvement Felling" as to prevent its being misapplied and even perpetuated as a synonym for a debased selection system where the possibility is fixed by area.

C.

APPENDIX.

Forests under Working Plans prescribing Improvement Fellings, from information supplied by Imperial Superintendent, Forest Working Plans, Dehra Dun, U. P.

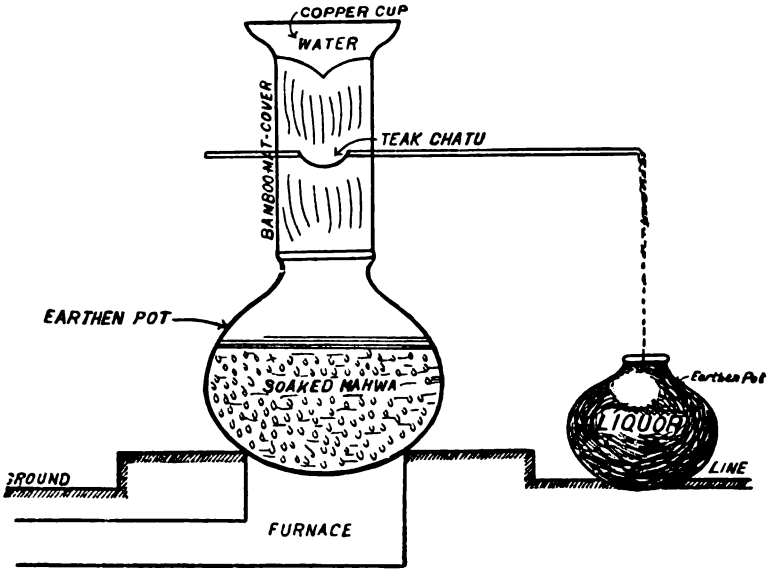
Province.	Working Plan.	Area in acres.
United Provinces ...	Bhinga Range	69,801
Ditto ...	Motipur Range	120,320
Ditto ...	Rehar, Garhibulchand, Makonia and Kilauli Forests.	39,040
Ditto ...	Pilibhit closed forests	45,440
Central Provinces ...	Paoni Range	25,555
Ditto ...	Bawanthari Range	47,784
Ditto ...	Lakhni Range	39,643
Ditto ..	Balode Range	96,887
Ditto ...	Penganga Reserve	12 160
Ditto ...	East Pench Range	144,231
Ditto ...	Billari Ghugwa Reserve	1,606
Ditto ..	Salori and Ainsa Reserves	12,335
Ditto ...	Chita Pandaria Reserve	2,136
Ditto ...	Silliwani Ghat Range	73,885
Ditto ...	Brahmapuri Range	62,068
Ditto ...	Arvi Range	109,613
Ditto ...	Korai Range	123,382
Ditto ...	Ganginala Range	60,795
Ditto ...	Dhansua Range	55,000
Ditto ...	Pandratola Reserve	5,328
Ditto ...	Gunjewahi Range	67,628
Ditto ...	Gaikhuri Range	93,067
Ditto ...	Sank Range	65,299
Ditto ...	Umreth Range	103 762
Ditto ...	Amarwara Range	56,824
Ditto ...	Moharli Range	114,279
Ditto ...	Sirpur Khallari Range	88,582
Ditto ...	Pertabgarh Range...	84,375
Ditto ..	Bari Range	40,320
Ditto ...	Hoshangabad Forest Division... ...	615,040
Ditto ...	Haveli Range	103,834
Ditto ...	Dhamtari Range	113,613
Ditto ...	Barapahar Range	50,215
Ditto ...	Warora Range	46,968
Ditto ...	Laun Range	151,675
Ditto ...	Ugli Range	62,512
Ditto ...	Lormi Range	281,460
Ditto ...	Jubbulpore Forest Division	332,160
Ditto ...	Baihar Range	126,914
Ditto ...	Paraswara Range	73,938
Ditto ...	Ghote Range	183,958
Ditto ...	Chapara, Dhooma and Nerbudda Ranges...	231,887
Ditto ...	Ambara Range	95,867
Punjab ...	Upper Ravi Forests	53,120
Bengal ...	Tista Valley Range	7,680
Ditto ...	Sunderbuns Government Forests ...	2,453,120
Coorg ...	Arkeri Forest	18,262
Ditto ...	Dubare Forests	11,363
Ditto ...	Devamachi Mawkal Forests	17,674

PREPARATION OF BHIL LIQUOR FROM MAHUA FLOWERS.

BY J. D. ST. JOSEPH, CHIEF FOREST OFFICER, MARWAR STATE.

FIRST METHOD.

Sixteen seers of *mahua* (flowers of Bassia latifolia) is steeped in water. In the case of old *mahua*, that is, of two years and over, the soaking lasts for 8 or 10 days, otherwise it is over in 4 or 5 days. The soaked substance is then placed in a large earthen chatty and



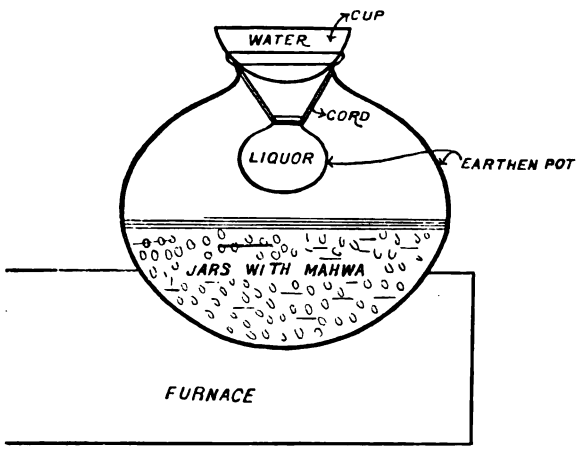
water poured in till it tops the *mahua* by 2 or 3 inches; this renders the chatty about half full and prevents overflow when boiling. A bamboo mat called "*Pergalee*" made in the form of a cylinder about 1¼ feet high and daubed with clay is fitted closely on to the mouth of the chatty, the joint being well plastered with clay. A copper cup with a projecting bottom called "*Batla*" is placed over the opening at the top of the mat cylinder or *Pergalee*—(see sketch)—and firmly fixed with mud plaster. A discharging pipe of teakwood called "*Chatu*" is thrust through the mat cylinder about the middle; the part immediately below the bottom of the cup or "*Batla*" is scooped out like a ladle 1½ inch to 2 inches in diameter, the piping being of ¼ to ½ inch

diameter. A small chatty is placed below the end of the discharge pipe. The copper cup is kept supplied with cold water. During the boiling process the steam rises and, condensing against the cold surface of the cup, trickles into the ladle in the retort from which it is discharged through the pipe into the vessel outside.

The process takes about 3 hours and 8 ordinary sized bottles of liquor are obtained from the quantity mentioned. The liquor is considered to have cooling properties and is not so intoxicating as ordinary distilled liquor. The implements used in the manufacture last a long time.

SECOND METHOD.

A few seers of *mahua* is well boiled in an earthen vessel. The water known as *Ras* is then strained off and kept for 3 or 4 days until it ferments. It is then poured into a large vessel and 6 to 8 seers of *mahua* added. A small earthen pot is now hung



by means of a cord inside the large vessel in such manner that the bottom remains about 6 inches above the boiling fluid. A copper or brass cup containing cold water is placed over the mouth of the chatty, the joint being well plastered with clay. The water in the cup is changed when it becomes tepid. During the boiling process, the steam condenses against the cold surface of the cup and trickles into the pot hung inside. The Bhils know through

Bemrose, Collo., Derby. Photo., G. S. Hart.

OLD FORT, KAMRU STATE, N.W. HIMALAYAS.

experience when the pot fills; it is then removed and about a bottle of liquor obtained.

The liquor obtained by this process is called *Thakia* and is said to have cooling properties and does not cause giddiness or produce vomiting if drunk in excess.

LAND-PRESERVATION IN THE PUNJAB.

BY RANGER GURAN DUTTA MAL.

In the May number of the *Indian Forester* there is a small note about the good progress which is being made by the Punjab Local Government in the land-preservation (chos) in the Punjab. No doubt in the Hoshiarpur district excellent work is being done by the Government, although the people think it a great hardship and do not realise the good results that will follow. All those bare slopes, which gave birth to those dreadful *chos*, have been or are being made Reserves and the rights of the people therein are being compounded. There is every probability that good results will follow and all the remaining valuable cultivation will escape the calamity.

The attention of Government has not yet been drawn towards the hills of the Jhelum district. In the Jhelum district there is a long series of small hills running almost north-east to south-west and parallel to the river. Between the hill series and the Jhelum river there are large tracts of valuable and fertile fields. Now year after year these valuable fields are being encroached upon by the sand brought down from those hills by the ravines locally called *kas*. The writer being an inhabitant of that locality can say that these *kas* are increasing in dimensions year by year. Between Jhelum town and Sanghoi village, a distance of 9 miles only, there are 5 or 6 such *kas*, one of them being about 1½ miles in breadth (this one is specially called *kahan* and is at a distance of 3 miles only from Jhelum). All these *kas* bring down every rains an immense quantity of sand on to the cultivation. During the last 10 years between Jhelum and Sanghoi two new *kas* have been added to the list and I cannot say what has happened lower down.

In last February the big *kahan* leaving its direct course turned its attention to the cultivation of the villages Naugran, Kot and Aryala and covered all those valuable fields with sand, creating also a new *kas* near the village Naugran.

During last winter the writer had a chance of visiting those hills on a shikar excursion and was astonished to see the devastation being done therein. All the hills are absolutely bare or nearly so. They consist of almost pure loose sandstone and there being very little vegetation on the ground, there is nothing to prevent the water carrying with it the sand on its downward journey towards the Jhelum river.

There are none of the executive difficulties in the way as was the case in the Hoshiarpur district, as all these hill tracts are already Reserves and as far as I know the people have got very few rights in them. Therefore I trust that the Government may turn its kind attention towards these tracts and try to restock the hills so as to save the poor inhabitants from the calamity which is staring them in the face.

The Forest Department should make efforts to create plantations all along the hills. In addition to their saving the low-lying cultivation they will constitute a paying property to the Government.

CORRESPONDENCE.

TO THE HONORARY EDITOR OF THE INDIAN FORESTER.

FORESTRY TUITION AT OXFORD AND DEHRA DUN.

SIR,—In the September number of the *Indian Forester* a correspondent signing himself "Observer" writes somewhat disparagingly about the present system of training for the Imperial Forest Service and about the men obtained thereby.

Perhaps you will permit me, as a recent arrival from Coopers Hill, and, therefore, as one particularly concerned in your correspondent's remarks, to make some reply to his strictures and at the

same time to call attention to some features of the Oxford training which do not seem to have occurred to him.

At the beginning of his letter "Observer" writes :—"What the clear-headed business man wants to know is not the details of instruction but the result of it when put to actual practice." He then proceeds to point out that the course of instruction at Dehra Dun is in every way superior for Indian purposes to the course of instruction lately given at Coopers Hill and on the Continent of Europe.

The natural inference is that the modern Dehra Dun man is a much more efficient Forest Officer than the modern Coopers Hill man. Although I have been but a short time in this country I have come into contact with a fairly large number of Forest Rangers and Deputy Rangers educated at Dehra Dun, and, without wishing in any way to blow my own trumpet, I can only say that I have not been able to observe that their knowledge of matters appertaining to forestry is markedly superior to my own and that of others recently educated at Coopers Hill. Naturally this opinion may be considered a biassed one, but I know that, in this province at least, many of the senior men do not consider the production of Dehra Dun superior to that of Coopers Hill. "Observer" thinks that the best possible training ground for Forest Officers is Dehra Dun, and one gathers from his letter that, were it not for outside considerations unconnected with forestry, he would like to see the whole of a Forest Officer's education carried out there.

This would surely be a mistake. It may be that India has overtaken and outrun Europe in the preparation of working-plans and such like matters as "Observer" suggests ; but there can be no doubt that Europe is far ahead of India in certain matters intimately connected with forestry (and of special importance in India) such as forest utilisation, forest industries, etc.

The home-trained Forest Officer enjoys special opportunities, during his nine months practical training on the Continent of Europe, of studying these matters such as cannot be had in India. Every aspect of the economic side of forestry is shown to him, from the arranging for the fuel supply for large cities to the dealing

with timber in mountainous regions far from the sources of demand. Saw mills, wood pulp factories and many such like things can surely be studied better in Europe than in India.

"Observer" is apparently himself one of the old Coopers Hill men of earlier years, and the lapse of time has probably caused him to forget that when he went to Coopers Hill he was painfully ignorant of the most elementary matters connected with forestry (unless he was a great exception to the rule), and that a large proportion of his present general knowledge of forestry was gained there. Though many of us may have been inclined to condemn the long scientific training at Coopers Hill as useless and unnecessary, it must be remembered that it gave a man a thorough grounding in various scientific subjects connected with forestry sufficient to enable him to take up any of these subjects seriously in later life if he chose to. Perhaps some of the appointments at the Research Institute at Dehra Dun might not have been filled so easily but for the knowledge the applicants had acquired at Coopers Hill.

A much stronger argument may be urged in favour of the Oxford training, which "Observer" would do away with altogether.

I think it will be generally admitted that Dr. Schlich has done as much as any man to encourage forestry throughout the British Empire; and if we consider a little it will be seen that not the least thing he has done to this end has been to establish the school of forestry at Oxford. By this means it has been made possible for men, who have no intention of entering the Indian Forest Service, while studying at a great University to learn sufficient of forestry to enable them to manage better their own estates, or to possibly introduce forestry into some of our colonial possessions. Were the only form of instruction in forestry obtainable in the British Empire to be a very specialised one for the Indian Forest Service, there would be a very small chance of others than candidates for that service studying forestry. With a forest school at Oxford we may soon hope to see the Colonies sending men there with a view to their entering Colonial Forest Services.

I would ask "Observer" what is more likely to raise the Forest Officer in the estimation of the Indian Government than to show that he is not a drug in the market in every part of the British Empire but India?

A JUNIOR RECRUIT.

REVIEWS AND TRANSLATIONS.

FOREST ADMINISTRATION IN THE N.-W. FRONTIER PROVINCE, 1905-06.

Survey operations are making good progress in the forests of the N.-W. Frontier Province. Eighteen maps on the 4-inch scale of the forests of the Kagan and Siran Ranges were published during the year. A map of the Siran Range to illustrate the working-plan was also published, whilst good progress was made in the preparation of the maps of the Khanpur and Dungagalli Ranges.

The working-plan for the Siran Range of 47·1 sq. miles of forest has received the Local Government's sanction. The plan prescribes selection fellings of deodar, blue-pine and Pinus longifolia with the ultimate object of substituting the shelter wood compartment system in the pure forests of the latter species. Working-plans for the Dungagalli-Thandiani Range of 61·2 sq. miles and the Khanpur Range 49·6 sq. miles prescribing selection fellings in pine, oak and fir forests of the former and coppice fellings for firewood in the latter have also been prepared and will shortly be submitted for sanction. These plans, with that now in force for the Kagan forests, will cover the whole area under the charge of the Forest Department.

In the last four years the returns show that there has been a gradual increase of forest offences, for which no adequate explanation can be offered. It is hoped, however, that the increase may be ascribed to more efficient protective measures.

To protect the forests from fire 30 ft. wide lines are being or have been cut and paths constructed where necessary. These lines are annually cleared and fire guards are appointed. Government

have approved of the decision that no rights to sheep or goat grazing should be admitted in the reserves.

The Deodar seed crop is stated to have been very poor and that of Pinus longifolia a complete failure, but no reasons are given in the report for this state of affairs. We would suggest that it would be advisable to place on record the reasons of the failure of the seed crops since it is becoming annually more apparent that the seed of the coniferous species is subject to serious depredations by insects and probably also by fungi.

An experiment which may prove of considerable utility was initiated during the year. Some 200 silver fir and spruce in the Upper Kagan Valley were sold standing at practically nominal rates. By careful attention to floating arrangements it is thought that the results may prove a success and thus lead to the utilisation of the produce of the fir and spruce forests remote from hill stations and hitherto untouched. In accordance with the prescriptions of the working-plans the selection system is adopted for the exploitation of deodar, blue pine, fir and oak. In the Khanpur Range coppice fellings were carried out over 679 acres against 535 acres in the previous year. Departmental agency was as usual employed for the exploitation works in the Kagan Range, no purchaser of standing trees having been forthcoming. We trust that it will be found possible to introduce this latter system at an early date since it is undoubtedly the one which is destined to ultimately come into force throughout India at a not distant date.

The following table gives a summary of all outturn removed from the reserved forests :—

Agency.	Timber.	Firewood.	Grass and grazing.	Miscellaneous.
	c.ft. solid.	c.ft. solid.	Rs.	Rs.
Government Agency ...	244,989	165,846	...	480
Purchasers	918,049	241,538	11,440	180
Free grantees	...	8,136	7,024	...
Right holders	...	34,980	626	97
Total ...	1,163,037	450,500	19,109	757
Total 1904-05 ...	1,094,666	326,006	20,253	590

The receipts for the year amounted to Rs. 1,50,760, the expenditure to Rs. 93,730, and the surplus to Rs. 57,030 as against Rs. 99,729, Rs. 82,115 and Rs. 17,614 respectively.

Appendix A to the report contains an interesting account of arboricultural operations, chiefly connected with the planting of roadside trees, in the Tochi Agency. Tamarisk (*Tamarix articulata*), Ber (*Zizyphus nummularia*) and Mulberry appear to do best and considerable assistance was received in this work from the maliks of villages. Some work was also undertaken in planting out fruit trees.

Appendix B records the arboricultural work undertaken in the Wano Agency. This is confined to the gardens of the South Waziristan Militia. Fruit trees are the chief trees planted in this garden, and they appear to be doing well as also are some young deodar brought from Marwatis last autumn. The Political Agent remarks that there is no doubt that the Wano plain situated at an elevation of 4,500 ft. above sea level is very favourably placed for arboriculture, and that the planting of trees whether shade or fruit would in the long run prove advantageous. The Wazirs, he says, however, are a lazy race and will do nothing except when encouraged by rewards from Government. He is of opinion that a sum of Rs. 500 could be usefully employed though no return could be looked for from planting operations until a tonga service on the new road from Murtaza to Wano is established, in which case the export of fruit and vegetables to Dera Ismail Khan would be possible and should prove lucrative.

In the Hazara village waste lands the change brought about by the introduction of the Guzara Rules is said, the Deputy Commissioner writes, to be simply remarkable, though he himself has not been long enough in the district to speak from personal observations.

CURRENT LITERATURE.

IN THE BULLETIN ECONOMIQUE *du Direction de l'Agriculture et du Commerce (L'Indo-Chine)* for July 1906 there is an interesting article on "L'Agave Textile" by M. Hautefeuille. This gentleman

was sent on a mission in 1904 to examine into the question of the cultivation of jute, ramie and agave planting in India and in the paper in question he gives the result of his investigations into the latter product, the object being the introduction of the fibre plant into Indo-China. His investigations showed him that in India we were ourselves only commencing the industry, and he mentions his indebtedness to Colonel Prain, I.M.S., the then Director of the Royal Botanic Gardens, Calcutta, and to Mr. Harold Mann for much information of importance. The author visited and noted upon the garden of Dr. Süter near Bombay and that under the management of Mr. James Hunter at Dauracherra in Assam ; also plantations in Tirhoot.

He summarises his visit in the following words :—" Il n'y a donc a tirer de mon voyage dans l'Inde que cette conclusion générale. La culture de l'agave, plante de terrains pauvres et secs, avantageuse seulement en climat sec, est une culture qui, comme toutes les autres, présente ses difficultés et exige, pour être enterprise avec succés, des connaissances spéciales. Il n'existe pas de traité sur la matiére. Cela ne veut pas dire qu'il n'existe pas de régles que le praticien ne peut ignorer. Ces régles, resultant d'observations rendues publiques, nous ne prétendons pas étre en état de les formuler comme pourraient le faire certains spécialistes ; mais, nous étant adonné à ce subjet pendant plusieurs années, en agriculteur plutôt qu'en botaniste, nous croyons utile de presenter un ensemble d'indications et d'observations susceptibles de rendre des services aux colons de l'Indo-Chine."

In the second part of his report, he undertakes this promise under the title " Observations sur quelques conditions de la culture de l'agave pour la fibre." The paper is illustrated by diagrams of various species of agave, types of leaves, plantations, and decorticating machines.

In the *Vegetable Product Series* of the AGRICULTURAL LEDGER (No. 2, 1906) Mr. D. Hooper discusses in a short interesting paper the uses and value of the root of *Costus speciosus* as a food stuff. The plant has large white flowers with red calices and glossy leaves and is said to be common throughout India in moist

shady places, as in forests, and near water. It is wild and sometimes cultivated and is easily propagated by a sub-division of the roots. It flowers in the months of August and September, fruit in December. The root has long been known as a staple food among the poorer classes. Before being eaten it is boiled like potatoes. In the Central Provinces it is first broken up into a pulp and boiled and eaten as gruel. In some parts of India it is cooked in syrup and made into a preserve. It is also employed as a medicine, being given for colds, pneumonia, etc.

We have received a copy of Mr. Cameron's *Annual Report of Government Gardens and Parks in Mysore* for the year 1905-06. In this report there are some interesting notes on rubber experiments. Ceara rubber appears to have done very well, many thousands of seedlings being annually produced *in situ* wherever the trees are established in quantity. In dry land cultivation the Ceara rubber tree is said to be undoubtedly the best. With regard to the Central American Castilloa elastica experiment has established the fact that young trees do not require as much shade as was at first supposed. The tree is said to require a moister climate than the maidan region of Mysore. All local efforts to propagate Ficus elastica from seed have failed, cuttings too are not very productive of rooted plants. Hevea braziliensis has been propagated to some extent from good seed from Penang. On the approach of the dry season however the seedlings invariably begin to dry off.

In No. 4 of the *Botanical Series* of the Memoirs of the Department of Agriculture in India Mr. I. H. Burkill discusses Gossypium obtusifolium, Roxburg. An examination of Roxburgh's type has satisfied the author that what in India is being called Gossypium obtusifolium is quite justifiably so-called, but that the exact race which Roxburgh grew is not any race that has been grown in the recent experiments in India, nor is it represented in any of the collections to which the author has had access except in the type.

That talented artist and author Mr. E. B. Havell has recently published (Bengal Secretariat Book Depôt) an extremely interesting monograph on STONE-CARVING IN BENGAL, illustrated by

some excellent plates. The geological conditions of Bengal constitute it as essentially a country of brick and terra-cotta buildings. Excluding the sub-Himalayan districts, the area where stone becomes the most convenient and plentiful building material is restricted to a fourth of the Province, comprising roughly the Divisions of Orissa and Chota Nagpur. It is practically only in the former division, under the flourishing native dynasties first established in the early centuries of the Christian era, that a great style of stone-architecture and stone-carving was developed. In the ornamentation of the hundreds of temples, monasteries and other works of stone which were built in the course of many centuries in the districts of Cuttack and Puri, the Orissa carvers acquired the most extraordinary technical skill in architectural decoration Hindu art has known. The author states that there is a pitiful remnant of this splendid art still struggling for existence all over the Orissa Division, but unless Government adopts some more effective measures for preserving it it is not likely to survive many years. We read that these gifted artists can be had to execute the most beautiful work at 4 annas a day! We regret we cannot follow our author more deeply through the pages of his most interesting monograph, but to those who take an interest in archæology we can recommend its perusal as a most fascinating recreation.

SHIKAR, TRAVEL, AND NATURAL HISTORY NOTES.

THE IBEX OF CENTRAL ASIA.

BY W. S. BURKE, EDITOR, THE INDIAN FIELD.

For some at least of the older naturalists an ibex was an ibex whether it came from the Himalayas or from the Alps, and it is therefore not surprising to find Brian Hodgson in his earlier days alluding to the ibex of the Himalayas as *Capra ibex*, or, in other words, as inseparable from the steinbok, or ibex, of the Alps. It happened, however, that long before his time a German naturalist, Meyer by name, had recognised the specific distinctness of the

ibex of Central Asia from its Alpine cousin, and in 1794 he proposed for the former the name of *Capra sibirica*.

Forty-six years later Edward Blyth proposed the title of *Capra sakeen* for the Himalayan ibex; the name being derived from the Ladaki designation *skin*, *iskin* or *sakin*.

That the Central Asian ibex, as a whole, is widely different from its smaller European relative is abundantly clear; so evident indeed is this that it will be quite unnecessary to point out in this place the distinctive characteristics of the two species. It is further evident that all the ibex of Central Asia—from Afghanistan and the Altai in the west to the Thian Shan and Ladak in the east—are referable to a single species, Meyer's *Capra sibirica*. In the case of a species having such an enormous geographical range, and with several of its local representatives more or less completely isolated from one another, it is, however, only natural to expect that great variation would be met with; and as a matter of fact such is actually the case. The recognition of such local races of the Asiatic ibex has been a slow matter, and perhaps all are not yet described, although, on the other hand, some of those which have been named are not really entitled to racial separation.

The late Dr. W. T. Blanford, who was very conservative in such matters, refused to recognize any definite local races of the species contenting himself, in the *Fauna of British India*, with the following remarks:—"A very dark-coloured ibex is said to occur in Baltistan, but is, according to Skully, merely the old mate in winter vesture. Ibex from Siberia and from the Thian Shan mountains north of Kashgar have the abdomen and the back of the carpus and tarsus [fore and hind cannon-bones] white, contrasting strongly with the front of the legs, which is very dark brown. Colonel J. Biddulph, to whom I am indebted for calling my attention to this character, is of opinion that the Thian Shan animal is the true *Capra sibirica* and the Himalayan one distinct, in which case the latter would take the name of *Capra sakin*.

"Mr. R. A. Sterndale has described the head of an ibex purchased in Kashmir. . . In section the horns resemble those

of *C. sibirica*. The horns are 52 inches long, dark-coloured, and remarkably curved round, much more than in ordinary *C. sibirica;* there are no knobs except near the tips. Three specimens are recorded and it is suggested they may come from the country West of Kashmir. Mr. Sterndale proposed to call this wild goat *Capra dauvergnei* if new"

In 1900 Mr. Lydekker proposed the name of *Capra sibirica wardi* for the above-mentioned dark-coloured ibex from Baltistan, while in the same year the Hon'ble Walter Rothschild bestowed the title of *C. sibirica lydekkeri* on the ibex of the Katutay range of the Irtish Altai. Subsequently Mr. Lydekker clearly defined and figured the Himalayan ibex *C. sibirica sakin*, while still later other writers have named additional races. Quite recently Dr. Lorenz von Liburnan, who has visited some of the principal museums of Europe with the object of specially studying Central Asian ibex, has published in one of the serials of the Vienne Academy a review of all that is known on the subject, with the description of yet other new races. This paper is of such importance that a brief *résume* cannot fail to be of interest to sportsmen in India.

As is usual when we have to deal with a large number of local races, a difficulty crops up with regard to English names For the species in general the proper title is the Asiatic or Siberian ibex; and the various sub-species ought to be known as such and such races of that species. The *Capra sibirica wardi* should, for instance, be called the Baltistan race of the Asiatic ibex. This is, however, somewhat cumbersome, and it is consequently generally known as the Baltistan ibex. On the other hand, this makes it appear as a distinct species. A way out of the difficulty would be to call the Asiatic ibex the skin (=skeen), or sakin, and we should then have the Baltistan sakin, the Katutay sakin, etc., which would make everything quite plain and simple.

Contrary to the opinion of Messrs. Biddulph and Blanford, the typical *Capra sibirica* according to Dr. Von Lorenz, is from the northern slope of the Sayansk range, in the neighbourhood of Munku Sardyk to the eastward of Lake Baikal. This Sayansk

ibex, or sakin, is therefore *Capra sibirica typica.* In colour the whole of the upper parts are dirty yellowish white tending to a purer white on the middle of the back: on the belly the hairs are brown, with bluish tips; but the forehead, a ring round each eye, the occiput, the ears, and the sides of the neck are darker. There is a small white line on the upper and a larger one on the lower lip. There is a narrow dark dorsal stripe, and also an indistinct shoulder-stripe. The hind legs are brown in front and whitish on the outer side inferiorly, and there is some white on the hinder side of the forefoot near the lateral hoops. Old bucks sometimes become almost wholly white. The absence of a distinct white saddle is characteristic of this race.

The ibex from the district known to Germans as the Bia Altai, in the neighbourhood of Lake Telezko (neither marked in the *Times Atlas*) has been named *C. sibirica fasciata.* It is said to be yellowish brown above, with a dark spot on the lower lip at the angle of the mouth, and a broad horizontal black band on the lower part of the foreleg; there is a light patch on the hinder surface of the lower portion of the hindleg, and a distinct whorl of hair on the outer side of the same; the ears are large and rounded, lighter inside than out; and the eyes are brownish red, instead of yellowish grey, as in the next race.

The Irtish sakin, *C. sibirica altaica,* is said to be wholly greyish brown in the summer coat, without a white saddle or neck patch. In the latter respect it seems to agree with the typical race, from which it differs somewhat in bodily form, the shape of the horns, and colour; *café au-lait* brown is said to be its general colour with a dark dorsal stripe. The horns are light-coloured, and strongly curved at tips. This ibex occurs at Tarbagatai. In the Katutay ibex, or sakin, *C. sibirica lydekkeri* of the Katutay range of the Irtish Altai, the general colour is umber brown, slightly lighter than that of the Thian Shan race in winter, with the face forehead, neck patch, a dorsal saddle, and the hinder side of the lower part of the legs dirty or creamy white. The light saddle is intermediate in size between that of the Thian Shan and that of the Baltistan race, and is much expanded in the middle

over the flanks. The horns are extraordinarily massive, with very large knots.

The Kobdo ibex, *C. sibirica hagenbecki*, appears to be widely distributed in Northern Mongolia, and is of a pale breadcrust brown colour, without a light saddle, and specially characterised by the presence of a callosity on the knee-joint. The horns have a curvature similar to those of the typical race, but the knots in the middle are larger and more approximated; while there are also differences in their contour.

The Thian Shan ibex, which ranges southward to Lake Issik Kul and Kuldja is named *C. sibirica almasyi;* it is represented in the British Museum by specimens killed at Kuldja by Messrs. Van der Byl and Littledale. It is lighter coloured than *C. sibirica lydekkeri*, with a broader white saddle and much larger horns, which display several peculiarities.

The ibex of the Central Thian Shan, in the neighbourhood of Naryn, has been separated as *C. sibirica merzbackeri.* It is said to differ from the last by the lighter colour of the dark areas, the more distinctly defined dorsal saddle, and the much shorter, more divergent, and more heavily knotted horns.

More information is required with regard to the ibex of Tashkent and the Kara-kul, for the former of which the name of *C. sibirica aliana* and for the latter that of *C. sibirica transaliana* have been proposed. The former is said to be rufous in winter, and in summer to lack the white saddle; but both these features are probably based on error, as rufous is the summer and grey the winter tint of all these ibex. Probably the two are identical; if they indicate a distinct race, the former name stands.

The Baltistan ibex, *C. sibirica wardi*, is a well-defined race, characterised by its dark colour, and the large white saddle, separated only by a narrow dark band from the white neck-patch. In point of size the saddle is in fact intermediate between the relatively small one of *C. sibirica lydekkeri* and the very large one of *C. sibirica sacin.* The horns are not unlike those of the Thian Shan race, but stouter, shorter, and narrower in transverse section.

As to *C. sibirica daubergnei*, of which the horns have been already mentioned, it is impossible to say anything definite at present. The horns are dark-coloured.

The Himalayan ibex, *C. sibirica sacin*, as represented by a male in winter coat from the Zoji-lal (between Kashmir and Dras), is characterised by the whole back and the hinder part of the back of the neck being light brownish white, with only a narrow light brown dorsal stripe, becoming darker and broader near the tail. There is a narrow light greyish brown band along each flank ; the shoulders and thighs are a darker brown ; the under-parts are deep golden brown with a brown spot on the hinder side of the hind-foot above the hoof; and the head is brownish. The horns are relatively slender.

The Ladak ibex cannot, for want of sufficient material, be at present determined.

For the Gilgit ibex, which has very slender horns, Dr. von Lorenz proposes the provisional name of *C. sibirica pedri*, after Prince Pedro of Orleans, but it cannot yet be defined.

The Afghan and Chitral ibex, which (as represented by a male from Chitral in the summer coat) has no distinct light saddle, and small and slender light-coloured horns, Dr. von Lorenz considers it will probably be found to represent yet another race. It may be suggested, however, that (at all events so far as the Chitral animal is concerned) it is not really distinct from the Gilgit race.

Of the ibex found in Northern Sikkim and to the north of Lhasa nothing definite is known, and skins are much wanted.

The foregoing sketch, if it serves no other purpose, will at least enable sportsmen to understand the chief deficiencies in our knowledge of the ibex of Central Asia.—*The Indian Field.*

EXTRACTS FROM OFFICIAL PAPERS.

REVISED RULES FOR THE TRAINING OF CANDIDATES FOR THE PROVINCIAL AND SUBORDINATE FOREST SERVICES.

Circular No. $\frac{31\text{-F.}}{160\text{-}4.}$

GOVERNMENT OF INDIA.

DEPARTMENT OF REVENUE AND AGRICULTURE.

FORESTS.

Simla, the 9th October 1906.

RESOLUTION.

In connection with the raising of the status of the Forest School at Dehra Dun to that of Imperial Forest Research Institute and College, the Government of India have had under consideration the questions of the system of recruitment for the Provincial Forest Service and of the training both for that Service and for the Subordinate Executive Service. After consulting Local Governments, they have arrived at the following conclusions, which are based upon the general principle that it is sufficient for them to prescribe maximum limits of expenditure and minimum limits of qualifications and training and to leave each Local Government within those limits to draw up rules for its own Forest Service.

2. While the Government of India attach great importance to the efficient training of Deputy Rangers, Foresters and Guards, they consider that the training of these subordinate officials should now be left to Local Governments. They have accordingly decided that the Vernacular class hitherto maintained at the Forest School, Dehra Dun, shall be abolished. They trust that all Local Governments will make satisfactory arrangements for the training of the Subordinate Executive Service below the rank of Ranger, and will be glad if each Local Government will in due course inform them as to the system which it has adopted with this object.

3. In future the education to be given at the Imperial Forest College will be conducted entirely in English, and will be designed for the training of candidates for the post of Ranger and for the Provincial Service. The ordinary course will last for two years, its main object being to give such an education as will fit a candidate for appointment as Ranger. At the close of this period of two years an examination will be held, on the results of which three classes of certificate will be issued, known respectively as the Honours, Higher Standard and Lower Standard certificates. Candidates will be admitted to this course in accordance with the College rules.

4. In addition to the ordinary course of two years, arrangements will now be made at the Forest College to give a third year's training, both theoretical and practical, designed to fit the student for early appointment to the Provincial Forest Service. Ordinarily no student will be admitted to this third year course unless he has obtained the Higher Standard certificate at the close of the two years' course, and unless his Local Government or Native State desire that he should remain at the College for a third year. Should however a Local Government or Native State desire that any particular student should undergo only a selected portion of the College training, or that any selected Ranger should be given the third year's course, without having passed by the Higher Standard, or some years after he has so passed, the Principal may arrange to give him the required training, provided that he is satisfied that the student's qualifications are such as to enable him to benefit from the course of instruction desired, and that there is room for him at the College. He may also, on the same conditions, admit any private student who is prepared to defray his own expenses.

5. The Government of India are prepared in future to leave it to Local Governments to draw up their own rules regarding appointments to the post of Ranger, subject to the following conditions. The rules should provide for the appointment as Rangers of subordinate officials of long service and tried ability and probity, in order to encourage efficiency among the Deputy Rangers and

Foresters. In such cases selection may be made by the Local Government without restrictions as to the special training the officers may have undergone or the educational certificates they may have obtained; but it may sometimes be advisable to require a selected subordinate to undergo a special course of training or to pass specified examinations before his permanent appointment to the class of Ranger. Direct appointments to this class however should only be given to trained candidates who have obtained the Higher Standard certificate at the Forest College, and have satisfied such other conditions as the Local Government may think fit to impose. It will in future be left to Local Governments to give what weight they choose to the Honours and Lower Standard certificates of the Forest College. It will also be for them, subject to the rules of the College, to draw up their own rules as to the selection of candidates to be admitted to the ordinary College course; and they may grant to such selected candidates, whether already in the service or not, a stipend not exceeding Rs. 50 per mensem for the two years' course.

6. The Government of India have learned from the reports submitted by Local Governments that there is a general feeling of dissatisfaction with the existing standard of qualifications of the members of the Provincial Service. This inferiority of standard appears to be to some extent due to the present practice of appointing to the lowest grade of Extra-Assistant Conservator men who have served for a considerable period as Rangers, so that a candidate who looks forward to an appointment in the Provincial Service cannot expect to attain to it until he is somewhat advanced in years, and has poor prospects of reaching the higher grades of that Service. The Government of India think it of great importance, in order to maintain a high standard of efficiency among the Ranger class, that officers of that class should remain eligible for promotion to the Provincial Service, and are accordingly pleased to rule that in future a Local Government may appoint to the lowest grade of Extra-Assistant Conservator any selected Ranger of long service and of tried ability and probity irrespective of the educational certificates he may hold, but subject to any

special training or examination which the Local Government may see fit to prescribe in each case. In order however to encourage men of good education and good social standing to enter the Provincial Service, they consider it desirable to introduce a system under which a Local Government may select candidates for direct appointment to that service; and in order that such specially selected candidates may acquire the higher qualifications necessary to fit them for the duties of the Provincial Service, they have, as already explained, resolved to arrange for a third year's course at the Forest College. Such candidates may be selected by the Local Government either before or after completion of the ordinary two years' curriculum, but before being allowed to takeup the third year's course, they must have obtained the Higher Standard certificate of the College; and before appointment to the Provincial Service they must have obtained a certificate from the Principal that they have satisfactorily completed the third year's training. Candidates who are specially selected by the Local Government for direct appointment to the Provincial Service may be granted a stipend not exceeding Rs. 100 per mensem during the course of the three years' training, or such portion of it as the Local Government may prescribe. When such a candidate has satisfactorily completed the tihrd year's training at the College, he may be posted to the Forest Service either as a Ranger or as a probationary Extra-Assistant Conservator, but may not be permanently appointed to the Provincial Service until he has completed at least three years' satisfactory service. It will rest with the Local Government to decide whether the probationary period should be longer than three years, and how the candidate should be employed until he is given a permanent appointment in the Provincial Service; and until he can be absorbed in the permanent staff, he may be given such salary as the Local Government thinks proper, not exceeding Rs. 150 per mensem, for the first three years, or thereafter Rs. 200 per mensem. It will be for the Local Government to decide when such a candidate should be given a permanent appointment, and whether any proportion of vacancies in the Provincial Service should be guaranteed to candidates of this class. If any Local Government

considers it necessary to compensate the existing staff of Rangers for their diminished prospects of promotion owing to the introduction of this new class of selected candidates for direct appointments in the Provincial Service, the Government of India will be prepared to consider any definite proposals which it may desire to make with this object.

7. In order to meet the peculiar circumstances of Burma, which already possesses a Forest School of its own, the Government of India are pleased to approve of the following modifications in the scheme described above in its application to that Province. Pending the establishment of an English course at the Burma Forest School, Conservators may make direct appointments as probationary Rangers of natives of Burma with a knowledge of English on a pay of Rs. 75 per mensem. Men so appointed will be on probation for two years, during which time their removal or dismissal will rest with the Conservator. After two years' approved service they may be confirmed in their appointment by the Local Government, but will not be eligible for an appointment on more than Rs. 100 per mensem until they have obtained a Higher Standard certificate in the English course at the Burma. Forest School or at the Forest College. Candidates selected for direct appointment to the Burma Provincial Service, though they may undergo their first two years' training at the Burma Forest School, must complete the third year's course at the Imperial Forest College, and must thereafter remain on probation for at least three years, during which time they may be given such salary as the Local Government may prescribe, not exceeding Rs. 175 per mensem for the first three years, or thereafter Rs. 200 per mensem.

8. The attention of Local Governments is invited to the changes which have been made in the Forest Department Code and in the rules of the Forest College; and they are desired to submit for the information of the Government of India any rules they may draw up to carry out the objects of this Resolution.

J. WILSON,
Secretary to the Government of India.

MISCELLANEA.

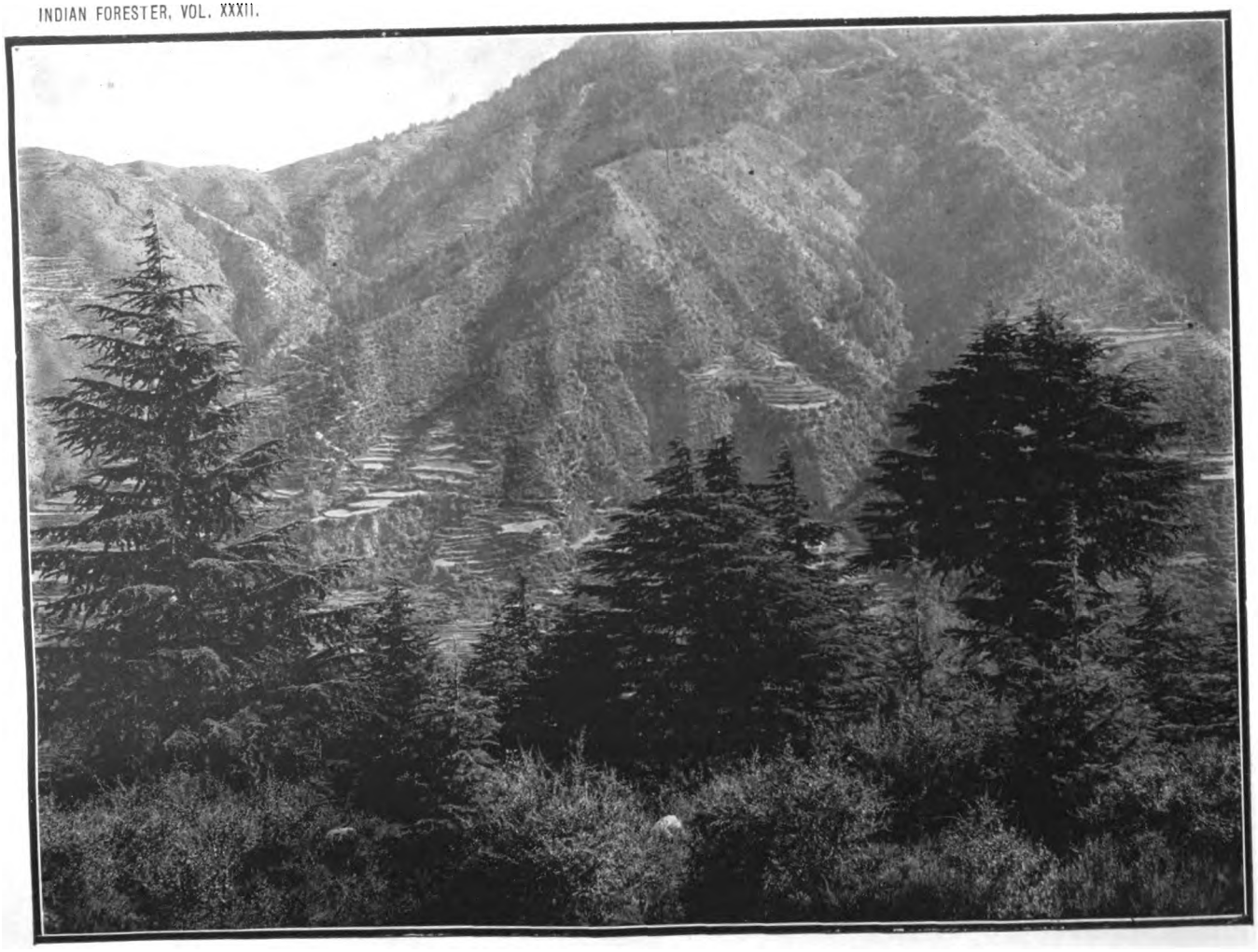
RUBBER IN FISH BAITS.—It is safe to say that there is no article of the sportsman's equipment that has been derived from materials of greater variety and diversity than the fish lures which we designate by the general name of artificial baits, says *The Sporting Goods Gazette.* After discussing the artificial fly, the writer says: Rubber, both soft and vulcanized, is largely used, and the former is also used in the making of artificial worms for bass and trout, the rubber cord being coated with what is known as ox-blood, hued Japalac, a red enamel which is very durable and dries easily in the sun and air. The vulcanized rubber is most useful because it takes the color necessary to imitate the minnow, and if it be well varnished and dried hard, the hard rubber bait is one of the most durable and is the best material ever used for that purpose. Wood is used also, and the hardest wood is the ash. It takes the color well and is easily formed to the right shape. Metal, especially nickel, is the material of some of the best of these baits, and the Devon minnow which is so much used for trout in Devonshire, England and in New England, is silver plated and very brilliant and strong.

TASMANIA'S TIMBER EXPORTS IN 1905.—Last year Tasmanian timber to the value of £90,173 was exported from the island compared with £78,380 in 1904. Of the total, £37,079 was transferred to inter-State ports in Australasia against £30,270 in 1904. The Hobart Chamber of Commerce reports that "prospects for the present year (1906) have improved," and "improved milling plant and existing natural facilities tend to the production of export timber at economical rates." It is also stated: "Tasmania, owing to these facilities, is able to sell long piles, sleepers, and mining timber at lower prices than is possible for the other Australian States."

RATS AS PESTS TO RUBBER TREES.—Rats are now numbered among enemies of the rubber tree. Complaints are made in Ceylon

of the depredations by rats on young rubber trees, the attacks being made apparently on the roots of the tree. It has long been known there that porcupines are also serious depredators in the low country, and damage has been done by monkeys on some low country estates. This is rather a formidable array of enemies for the young rubber tree to face, but the Ceylon Tea Plantations Company are adopting a cheap and efficacious method of meeting such attacks by the use of coarse wire netting round the stems of the young trees, which not only saves them from the living pests above referred to but keeps the trees, when planted among tea, from being damaged by weeders and pluckers.

SYNTHETIC RUBBER AND SUBSTITUTES.—A special London cable to the *Times of Ceylon* says:— Inquiries at the Imperial Institute point to synthetic rubber from isoprene being an interesting chemical experiment, but nothing more. The synthesising of rubber was first discovered in 1873. Since then probably not more than one ounce has been made, so it is impossible to tell how it would stand working tests. Isoprene is derived from turpentine. The process is a long and expensive one and the yield is infinitesimal. Still there appears to be more in the process than in wheat rubber, which experts do not regard seriously. There is nothing in either to alarm growers.



Eardley-Wilmot—Influence of Forests.

DENUDATION OF HILL SLOPES ABOVE CULTIVATION.

Photo. Mech. Dept., Thomason [illegible]

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DECEMBER, 1906.

SELECTION BY AREA.

The article which appeared under this title in the April number of the Magazine* has evoked a certain amount of interesting criticism. Mr. Hobart-Hampden describes a method of calculating the outturn of a forest on which a certain working-plan is based by a method which he terms "selection by area." He claimed for this method that it does not rest on so many assumptions as is the case with the selection method usually adapted in Indian forests; that such assumptions as it does make use of can be easily corrected at short intervals, and that even if its single aim (an approximate equal annual outturn) is not, after all, achieved, the error is of no great importance while sylvicultural errors (from which it is free) are very much so.

Mr. Lovegrove† considers that the allocation of the II class trees is wrong; he calculates that under Mr. Hobart-Hampden's plan, the Working-plans Officer will be out by so many trees, II class at the time of enumeration, as do not become I class by the year in which the coupe is worked.

Mr. Perrée† points out that in the case of the working-plan instanced by Mr. Hobart-Hampden the yield has actually been

* Page 186 in this volume. † *Ibid*, pp. 350 and 352.

fixed by volume (number of stems), and that the question of area only comes in when it is necessary to balance, with more than ordinary accuracy, the year's outturn. The possibility is based on a complete enumeration of three higher classes, and beyond the usual provision to work over the whole forest in a certain period the plan practically rests on volume. It is immaterial, he says, whether our unit is a I class stem or cubic foot, the stem check actually defines a fixed quantity of material and therefore is a volume check. "The particular virtue of the system is wholly dependent on the minuteness of enumeration," says Mr. Perrée, "but the assessment of yield by a simple method of proportion is surely not new."

We would wish here to consider the subject a little further. The whole crux of the thing is that Mr. Hobart-Hampden objects to the felling of II class stems, although this is usually prescribed in order that, in a selection area over the whole of which it is impossible to work *each* year, the full outturn of the area may be utilized instead of being allowed to accumulate. His method requires a "localised" complete enumeration of the first three age or growth classes and a "yearly" definition of the coupe. To justify such an enumeration a full staff and a valuable outturn are required. Further a complete scheme of communications is essential. Roads, railways and tramways cannot be laid out till the felling areas are prescribed in advance for a long period. In the cases where this latter has been possible the Department has induced railway construction and obtained funds for large road and tramway construction.

Coming now to the financial aspect. To fell nothing but stems of the prescribed girth we must have coupes rapidly diminishing in area from No. 1 onwards, as the trees of the II class enter the higher class. Incidentally, it may be mentioned, in a permanent High Forest treatment by the method of selection, it is convenient to have permanent coupe boundaries and not to change them in each felling cycle. This by the way. Now if one has a large coupe No. 1 which will not be revisited for 30 years, surely it is necessary to include also a large number of II

class trees, many of which will be over-mature when you return, although you may try, in locating the coupe, to take advantage of the condition of the forest. In the 30th coupe you will have no II class trees save those which have passed from the III class during the cycle. It is a mathematical problem whether it is not best financially to lay down permanent coupes of approximately equal value and include in your yield a rapidly diminishing number of II class trees, as is done at present, or leave a vast number of such trees to become over-mature as is suggested by Mr. Hobart-Hampden.

Of the practical convenience of our present plan there can be no two opinions, and we believe also that, in the majority of cases, it is financially sound.

In special cases where it is desired to raise the felling girth and where therefore the prescribed details for the coming felling period are dissimilar to those which would be laid down when the forest had arrived at the condition we desire, Mr. Hobart-Hampden's method might perhaps be useful in application, but as a question of universal practise we have grave doubts as to the novelty or suitability of the new departure.

SCIENTIFIC PAPERS.

THE SPRUCE OF SIKKIM AND THE CHUMBI VALLEY.

BY SIR DIETRICH BRANDIS, K.C.I.E., F R S.

Hooker, in his Himalayan Journals II, 32, 45, mentions a spruce in the Lachen valley of Sikkim at an elevation of 8,000 feet (*Seh*, Sikk.) which he calls *Abies Smithiana* (*Picea Morinda*, Link). Gamble in *Indian Timbers*, 717, mentions a specimen sent by Dr. Schlich from the Chumbi valley in Tibet, which he thinks is probably an undescribed species; he adds that the structure of the wood is identical with that of *Morinda*.

In Bhutan Griffith (1838) found a spruce between 8,000 and 10,000 feet, which he called *Abies spinulosa* in Journals 259 and Itinerary Notes 145, and which he figured in Ic. Pl. As. t 363 under the name of *Pinus spinulosa*.

In Indian Trees, 693, I had mentioned the Sikkim and Bhutan spruce under *Picea Morinda*. Subsequently Dr. Augustine Henry drew my attention to the structure of the needles and suggested that the spruce of the Eastern Himalaya might be *Picea morindoides*, Rehder (Sargent, *Trees and Shrubs*, I 95, t. 48). This species has been described from a tree cultivated at Angers in France, the origin of which is not known. The chief character consists in the shape and structure of the needles. In regard to this point, the species of *Picea* may be divided into two sections.

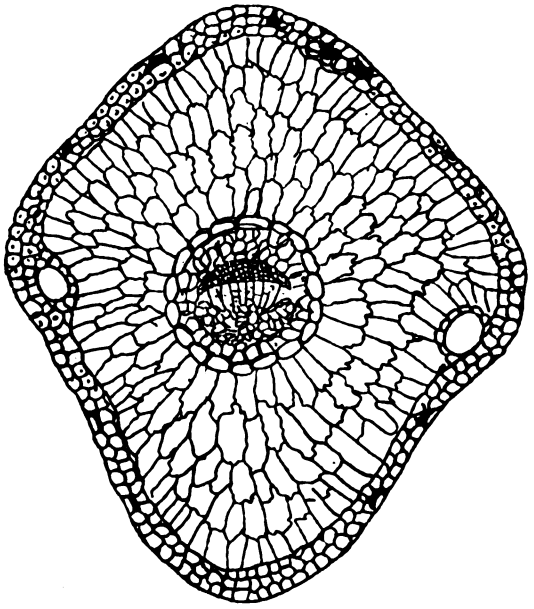
That section to which *Picea excelsa*, the common European spruce, belongs has the transverse section of the needle rhomboid, with stomata on all four sides, the vertical diameter of the transverse section being always greater than half the horizontal diameter. Indeed in many cases the leaves of suppressed trees or of branches in the lower part of the crown are laterally compressed, so that the vertical is much longer than the horizontal diameter. To this section belongs the spruce of the Western Himalaya, *Picea Morinda*.

The leaves of the second section are more or less flat with stomata as a rule only on the upper side and the vertical much shorter than the horizontal diameter. To this section belong *Picea Omorika*, Pancié, the spruce of Servia, Bosnia and Montenegro, *Picea morindoides* Rehder, and the spruce of Sikkim and the Chumbi valley. Whether the spruce found by Griffith in Bhutan belongs to this section has not yet been settled. The structure of needles collected by Hooker in the Lachen valley agrees with that of the Chumbi tree.

The presence or absence of resin canals is not a reliable character in many species of *Picea*. *P. excelsa* has usually two resin canals, but needles with none or only one are not uncom mon. In *P. Morinda* of the North-West Himalaya I always find two, while a specimen grown at Kew has only one.

The Chumbi spruce here figured has none, while some specimens collected by Hooker in the Lachen valley have two resin canals. Finally *P. Omorika* from Servia has two, while a specimen cultivated at Kew has no resin canals.

Fig. 1.



Picea Morinda, Link.

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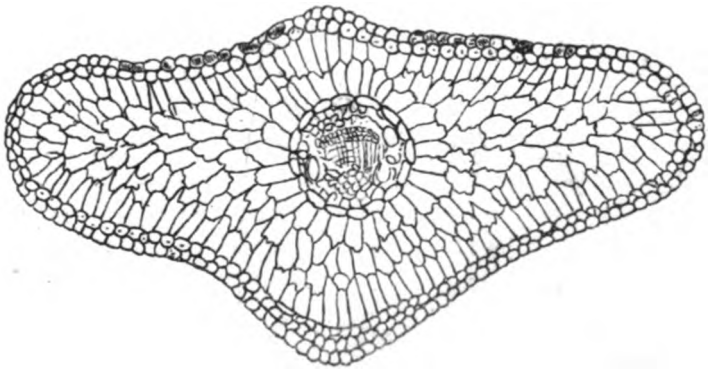
Fig. 2.



The Spruce of the Chumli valley

$\frac{75}{1}$

J. N. F. del.

The specimens which I have been able to examine do not justify my giving the specific character of the spruce of Sikkim and Chumbi. Foresters in the Eastern Himalaya may have opportunities of studying the morphological and biological characters of this tree and perhaps also of that found by Griffith in Bhutan.

The figures which accompany this note (1, *P. Morinda*, 2, The Spruce of the Chumbi Valley) represent transverse sections of the needles and will explain themselves.

Kew, November 1906.

ORIGINAL ARTICLES.

PTEROCARPUS DALBERGIOIDES.

BY F. H. TODD, I.F.S.

The forests of the North Andaman Island contain many important timber trees, the most valuable of which is the *Pterocarpus dalbergioides* (locally called "*Padauk*"), a species of *Pterocarpus* only found in the Andamans.

1. *Distribution and area.*—The area of the North Andaman Island is roughly 510 square miles, but only about a third of this is productive of Padauk; the rest is covered with mangrove swamps and evergreen forest.

As a general rule these classes of forest are distributed as follows :—

On the flat ground, close to the sea-shore, there is usually a belt of mangrove or littoral evergreen forest, which may extend from a few yards to a mile or more in width; beyond this belt, on the lower spurs and undulating ground, is found the Padauk-bearing forest which varies considerably in width, but may be said to vary in inverse proportion to the slope, as Padauk is not generally found at a greater elevation than 300 feet above sea level. Above the Padauk-bearing belt dense evergreen forest occurs covering the tops of the higher spurs and hills.

It is difficult to say why Padauk does not grow at a greater elevation than about 300 feet; the underlying rock shows little variation in any part of the North Andaman, and therefore

cannot be an important factor; nor can the depth of soil have much influence, as Padauk is usually found not on the flat ground where the soil is deep but on well-drained hillsides where the soil is often very shallow. Whilst Padauk is found growing on the flat ground, the finest trees are invariably found on well-drained sheltered slopes.

Altitude, too, need not be considered, as the difference in temperature at sea level and 300 feet is hardly perceptible.

It seems probable that the aspect is the important factor, since all those areas along the coast, which are in any way exposed to the full force of the south-west monsoon, are usually covered with dense evergreen forest unproductive of Padauk; rich Padauk-bearing forest being often found a short distance inland behind the shelter of this evergreen belt. In sheltered valleys also Padauk grows at a greater altitude than in exposed localities; in fact, it is very rare to find Padauk at all on exposed aspects, whatever the altitude may be.

2. *Description of Padauk-bearing forests.*—There are two more or less distinct types of Padauk-bearing forest, which may be described as semi-evergreen and deciduous. On hot southern aspects Padauk is found growing with deciduous species only, such as *Bombax insigne*, *Sterculia sp.*, *Terminalia sp.*, *Artocarpus sp.*, etc.; while on cool northern aspects or on low badly drained plateaux a certain number of evergreen species, such as *Lagerströmia hypoleuca*, *Mesua ferrea*, *Careya arborea*, *Dipterocarpus lævis* (var.), etc., will be found associated with the Padauk and the other deciduous species mentioned above.

Padauk is the predominant species in both types of forest, and averages about two first class trees * per acre.

The overhead canopy is usually very incomplete, and it is rare to find more than 12 trees of all species over 4½ feet in girth per acre.

The undergrowth in the deciduous forests is fairly light, and consists mostly of thorny creepers and the advance growth of the trees forming the high forest, with here and there prickly shrubs

* Trees which have a girth of over 7½ feet measured at 4½ feet from the ground.

(*Euphorbia sp.*). In the semi-evergreen forests the undergrowth is somewhat denser, and consists largely of scandent bamboo (*Dinochloa andamanica*) and canes (*Calamus sp.*), and in some localities of pure bamboo forest (*Oxytenanthera nigrociliata*).

3. *Influence of locality on girth and height growth.*—Padauk grows best on well-drained sheltered slopes, especially if the soil happens to be a coarse rubbly sandy loam. In such localities Padauk will have a magnificent height growth and attain a girth of 17 or 18 feet, with a clean cylindrical bole for 40—50 feet.

On low flat badly drained country, Padauk has a fairly good girth and height growth, but usually produces very large "buttresses" and is often unsound.

In the North Andaman there are several very dry tracts which are practically waterless from December to June and which are covered with a very open deciduous forest. Here the Padauk is found to be somewhat stunted and rarely attains a girth of more than 9 feet.

4. *Natural regeneration.*—Considering the over-mature condition of the crop due to the forest never having been worked, and the probability that only a certain proportion of the seed produced is fertile, the natural regeneration of Padauk may be considered to be fairly good. The density of the undergrowth and the similarity of young Padauk seedlings to those of certain other species makes it very difficult to distinguish Padauk seedlings, but it has been noticed, wherever the undergrowth is comparatively light, that the natural regeneration is distinctly good, and considering how numerous Padauk saplings and poles are in the semi-evergreen forests in which the undergrowth is fairly heavy, it may be presumed that Padauk natural regeneration is fairly satisfactory over the whole Padauk-bearing area.

The natural regeneration of Padauk is influenced to a very slight extent by the shade of the overhead canopy which, as stated above, is usually very incomplete; more depends on the type of undergrowth, whether natural regeneration is successful or not.

The type of undergrowth which appears mostly to hinder the natural regeneration of Padauk is a mass of canes, scandent bamboo

and other creepers; if any Padauk seed happens to germinate among such undergrowth, the seedling is soon covered with creepers and suppressed. On the other hand, Padauk seedlings seem to be able to stand a comparatively heavy shade as long as the canopy causing the shade is at some height from the ground; for instance, in bamboo forest, where there is usually little or no other undergrowth, Padauk saplings are often found growing quite vigorously in spite of the heavy canopy 20—30 feet above them.

For the first two or three years of its life a Padauk seedling suffers from attacks of caterpillars, these pests strip it almost entirely of leaves and retard its growth considerably. Once the seedling reaches a height of 4 or 5 feet, it appears to become immune to these attacks.

5. *Rate of growth.*—As it is very doubtful whether Padauk has true annual rings or not, the rate of growth has been calculated roughly as follows:—

On the east coast of the North Andaman, in Port Cornwallis, is situated Chatham Island which was cleared of jungle in 1792 in order to establish a settlement; it was, however, abandoned in 1796; thus the Padauk trees at present growing on the island must all be under 110 years old; but to be on the safe side it has been assumed in the following calculation that they are all exactly 110 years old:—

The girths of 50 Padauk trees were carefully measured and the average was found to be 6 feet 1 inch, which gives an annual girth increment of ·66 of an inch. As these trees, however, have grown up under rather favourable conditions, ·6 of an inch is assumed to be the mean average annual girth increment. Allowing 10 years for a seedling to establish itself, it is estimated that

a Padauk tree 3′ in girth is 60+10=70 years old.

" " 6′ " " 130 " "

" " 7′ " " 150 " "

The rate of growth is very much more rapid when the Padauk is artificially planted, as many of the trees in the 1885 plantation at Port Blair are over 2 feet in girth, and some in the 1883 plantation 2½ feet in girth.

6. *Injuries to which the Padauk forest is liable.*—The chief cause of injury is wind: not the ordinary monsoon wind, but cyclones. The damage done by the latter is very serious and the effect is quite noticeable many years after the occurrence. For instance, along the track of the cyclone, which visited the North Andaman in 1893, there is now nothing but an impenetrable mass of canes, scandent bamboo, and creepers of all sorts in which it is impossible for a Padauk seedling to establish itself.

The dense masses of creepers and scandent bamboo (*D. andamanica*) in the semi-evergreen forests are such that little or no natural regeneration is possible.

Ficus-bound trees are not so common as might be expected in these moist forests, though a certain number of Padauk trees in the semi-evergreen forests were found to be attacked.

Fire does very little damage, as only a small portion of the North Andaman forests is dry enough to burn.

7. *Description of the timber.*—The following description of the timber of Padauk is taken from an advertisement issued by the Forest Office, Port Blair.

"PADAUK—(*Pterocarpus dalbergioides*, R.)—Colour, pale red to rich bright red deepening on exposure, or dark brown. Weight per cubic foot 40 to 60 lbs. (dry), 60 to 80 lbs. (green).* Seasons quickly and easily.

Heart-wood immune to attacks of white-ants and borers, except the marine worm, and to all kinds of rot.

Sap-wood, white, liable to attacks of borers and to rapid decay through dry rot. Squares usually up to 20 feet in length; siding up to 2 feet.

Uses:—Posts, beams, planks and shingles in house building; and for keel, stem and stern posts, knees and other parts of boats. Makes handsome furniture, panels, parquet flooring, and carving, taking a beautiful polish. Is used for frame-work of organs, pianofortes and billiard-tables; frame-work of buggies and gun-carriages; parts of machines and implements; fittings of railway

* Over 90 per cent of the green logs extracted from the Andaman forests will float in sea-water.—F. H. T.

carriages, ships' saloons and tramcars ; and is generally suitable for all purposes to which teak, mahogany, hickory, oak, and ash are applied."

All Padauk, however, is not "pale red to rich bright red" in colour; not infrequently the timber is found to be of a light reddish brown and is in consequence of considerably less value. It is difficult to say what percentage of the logs extracted from the Andaman forests is of this inferior colour, but 10 per cent may be taken as an approximate estimate.

The reason for the difference in colour of trees growing together is not fully understood, but considering that trees of exceptionally large girth and the timber of all windfalls, stumps, and dead standing trees are generally of the richer colour it would appear to be that the timber becomes redder in colour the nearer a Padauk tree approaches maturity, or, which is still more probable, death.

It is possible that the girdling of Padauk two or three years before it is felled would have a favourable effect on the colour of the timber.

8. The following are some of the more important timber trees found growing with the Padauk :—

Local name.	Botanical name.
Koko.	Albizzia Lebbek.
Pyinma.	Lagerströmia hypoleuca.
Gurjan.	Dipterocarpus sp.
Didu.	Bombax insigne.
White Chuglam.	Terminalia bialata.
Black	Myristica Irya.
Marble or Zebra-wood.	Diospyros Kurzii.
Bambwè.	Careya arborea.
Chooi.	Alphonsea ventricosa.
Lakuch.	Artocarpus Lakoocha.
Gangaw.	Mesua ferrea.
Thingan.	Hopea odorata.
Taungpein.	Artocarpus Chaplasha.
Ywegyi.	Adenanthera pavonina.

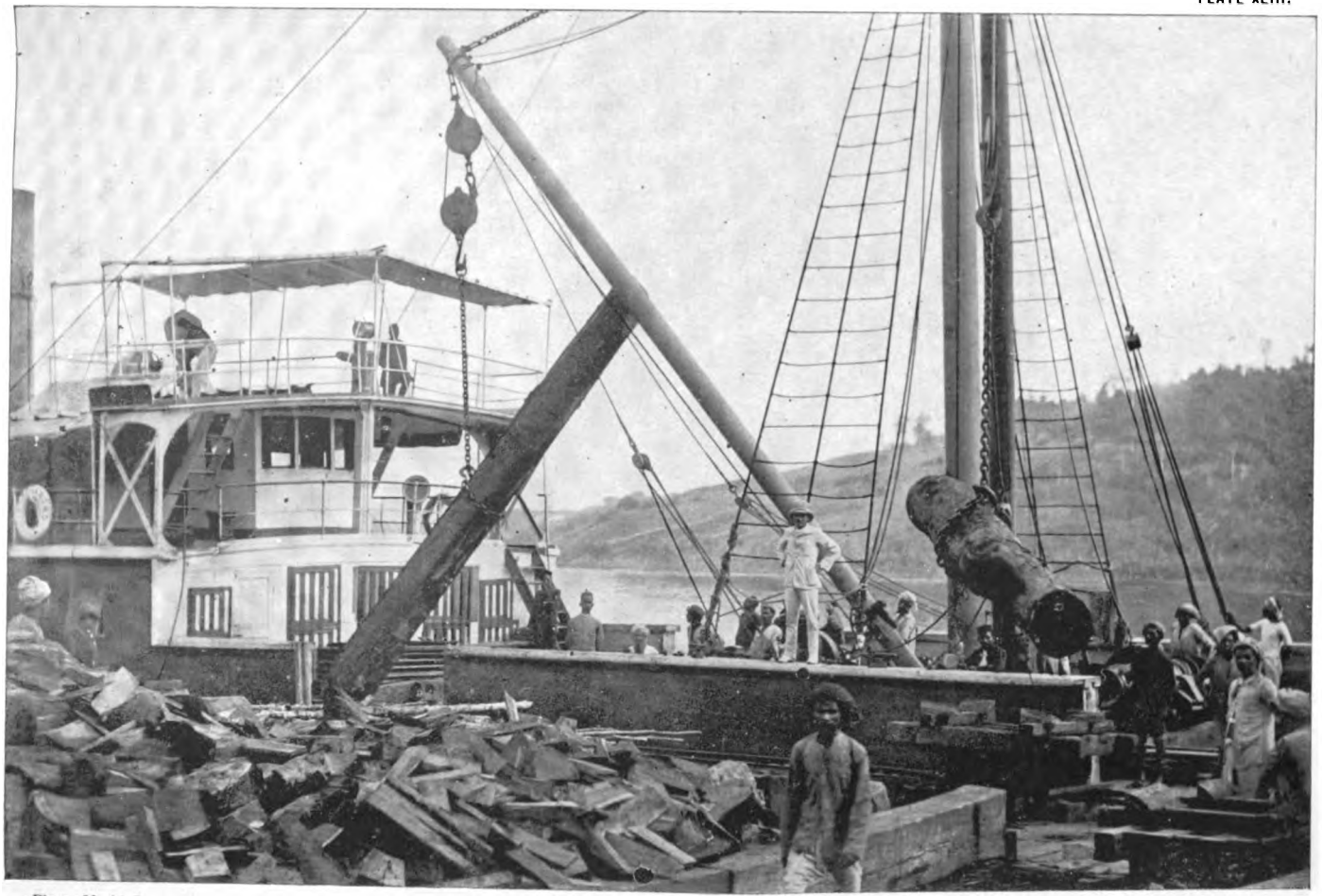


Photo.-Mechl. Dept., Thomason College, Roorkee.

Photo. by Mr. Boreham.

Unloading the Forest Department Twin screw Timber Boat ROSAMUND in the Andaman Islands.

9. The Padauk forests of the North Andaman will in future be treated under the selection system, and the whole area will be worked over once in 15 years, *i.e.*, half the period it takes a Padauk tree of the lowest dimension of Class II (6½ feet in girth) to become Class I (7½ feet in girth)

During the first period of 15 years the minimum girth limit for felling will be 8 feet, except in certain very dry localities [*vide* para. (3) above] where the minimum girth limit will be 7 feet.

Padauk natural regeneration is believed to be sufficiently good to ensure a steady yield if assisted by suitable fire-protecting measures and judiciously executed improvement fellings, and also by sowing or planting up the blanks caused by the fellings.

Although fairly satisfactory results have been obtained in the South Island, near Port Blair, by planting Padauk in areas that have been practically cleared of forest-growth for cultivation, the cost of clearing and tending such plantations is very high in proportion to the results obtained.

TIMBER WORK IN THE ANDAMANS.

BY F. TRAFFORD, I.F.S.

I enclose two photographs taken here which will give the readers of the *Indian Forester* some idea of the timber work undertaken departmentally in the Andamans. One of these depicts the unloading of the Forest Department twin screw timber boat "Rosamund" built by Mr. Bonig, the Extra Assistant Conservator of Forests. With the exception of the machinery and fittings this boat is built of local timber. The boilers are heated with wood fuel (the billets can be seen in the foreground). The logs for export are put on the truck, the rails running close to the side of the ship, and then arranged for measurement by the tusker elephant which, owing to sores, is unable to do dragging work. After measurement the logs are dropped into the sea and taken to the Calcutta Steamer. The second photograph shows an arrangement for stacking logs on dry

land in a limited space which works well; the idea may be useful to some of your readers. Logs cannot be kept in the sea for any length of time owing to the depredations of the teredo, which prefers hard woods to soft ones curiously enough.

The stacking arrangement consists of a differential pulley for hoisting (about two men per ton weight) slung on a frame supported on a single grooved wheel; this wheel runs on a rail fastened on to a jointed longitudinal beam which is carried on brackets attached to upright posts. The distance between the posts is 18 feet. The posts are 10″ × 10″ in section and the beam 13″ × 6″. The rail is about 18 feet from the ground but it has now been found better to have it 25 feet from the ground, which will allow of logs being stacked in six tiers instead of three.

I am indebted to Mr. Boreham, overseer, Ross Island, Port Blair, for the two photographs I send.

PORT BLAIR, ANDAMANS:
13th October 1906.

CORRESPONDENCE.

TO THE HONORARY EDITOR OF THE INDIAN FORESTER.

FORESTRY TUITION AT OXFORD AND DEHRA DUN.

I.

SIR,—During the last 30 years the system of preliminary training of Forest Officers has been changed three times, and we have no assurance that the latest method—that of University training—is intended to be permanent. The discussion now proceeding in the pages of the *Indian Forester* is therefore of special interest, and if conducted with temperance and without personalities may be productive of much good in influencing the selection of the system of training best adapted to English recruits for the Indian Forest Service. The question before us is not whether a continental training or an Engineering College training has produced the best Forest Officers in the past, but what method

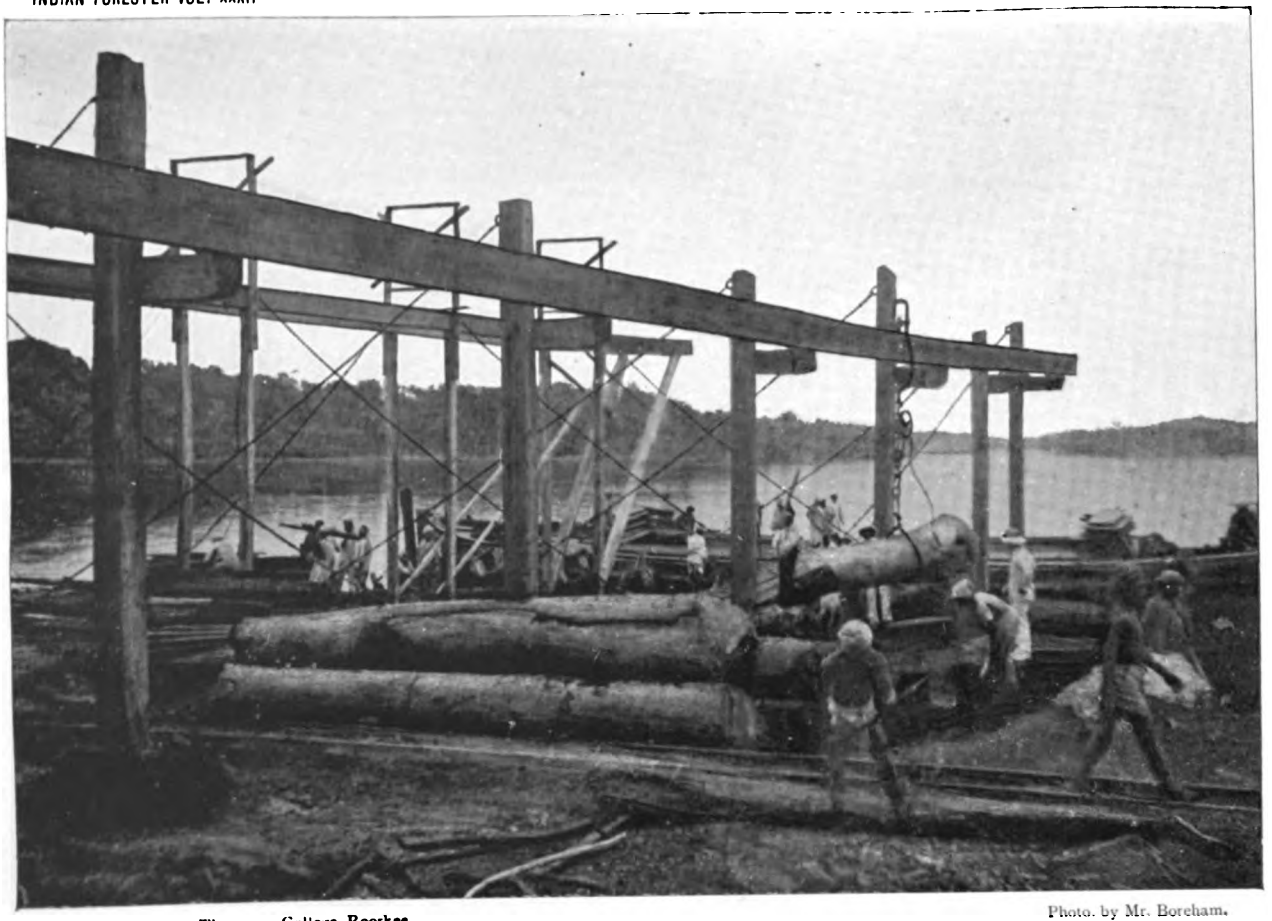


Photo. Mechl. Dept., Thomason College, Roorkee. Photo. by Mr. Boreham.

Method of stacking logs in a limited space on land employed in the Andaman Islands.

of training will produce the officer best adapted to the requirements of a department which has shown remarkable expansion in the past and must show much more in the future; and whatever system is advocated must be applicable to the average recruit and not to the so-called "best men" who would in any case be capable of rising above the disadvantages of an inferior system of training.

If we compress the subject into its narrowest limits, the enquiry really amounts to what proportion of the period of preliminary training should be assigned practical, as distinct from theoretical, forestry; whether the practical training should precede or follow theoretical instruction; which are the most suitable localities in which each should be carried out, and what are the social influences present in the various training grounds. We require a foundation in which the recruit may securely build up professional knowledge and experience in India so as to become as rapidly as possible an efficient member of the Forest Service, and we also require self-reliance, and those other qualities which we like to assume are characteristic of the English gentleman. It may aid our investigation to recall the results of abandoned systems of training, but this alone will not go far to solve the question which is now under discussion.

I suggest that you apply to the Divisional Forest Officers of the present day, not to those who are employed in the collection of grazing dues or in the distribution of brushwood to right-holders, but to those who are in charge of valuable forests whose time is fully employed in their scientific management, in exploitation, improvement and protection, in short to those who possess a practical knowledge of what a recruit should be, and ask them to tell us what changes in the system of education they would advise to make the recruit best suited to his work and more quickly useful to his employers; ask them to write of the ideal recruit and suggest how such material may be prepared, so that we may perchance find some system superior to all three of its predecessors.

When doing this let it, however, be remembered that theory can be taught anywhere but that practice, to be valuable, must

be local; that therefore practice in Europe amounts merely to theory in India, and that the rational system of preliminary training is that adopted in every civilised country, namely, that this training should be imparted where the practice is to be carried out, and that knowledge should subsequently be enlarged by visits to other countries where details of forest management have received the most careful attention. The application of this rule to the English recruit may not be possible at this time, but the subject will doubtless receive consideration by all thoughtful foresters; it has done so already to a certain extent and is probably responsible for prompting criticisms of the University training now in force, and even comparison between it and the course of instruction at Dehra Dun. Provided that such criticisms and comparisons are not allowed to degenerate into expressions of feeling by an individual or by a class of officer, they can be only productive of good, for it is surely the officers of the department who are best qualified to judge of the suitability of the material which the Secretary of State supplies to them and of the steps necessary to be taken to make it of the best.

VERB. SAP.

II.

SIR,—Some of your correspondents exhibit a fatal facility for saying the wrong thing and also for running down the men of their own Department. "Observer" in the September *Indian Forester* has added one to the number.

He asks us to consider (1) the stamp of man now being recruited for the Imperial Service; (2) the training now being given in regard to (*a*) the teaching staff, (*b*) their teaching and the training ground.

The Government of India will surely take serious note when it reads that of all the men now in the service only the seniors and the exceptions among the juniors are likely to be of much use to it in the future. A dreary outlook, indeed, if it were true! But there are probably not more than two or three men in the service who, by actual contact with a large number of their fellow-foresters, are

qualified to express such an opinion, and we do not expect that "Observer" is one of them. Frankly, we suspect that he is merely beginning to suffer from Anno Domini. We probably all remember the latter part of our school days, when every year as we progressed, up the school, the boys of the lowest forms appeared to grow smaller and gradually less! We remember also how entirely we lost touch with the juniors, and yet those boys now are just as good and big men as we are! They did not ask our permission to grow! We cannot hope for *esprit de corps* in the Department when we know that the men trained in one school of forestry have little sympathy for and belief in those trained in another.

We turn to "Observer's" remarks on the training at Coopers Hill and Oxford. When he makes the astounding generalisation (on which he bases his argument for the training of Imperial Officers at Dehra Dun) that "forestry in India is rapidly tending to leave forestry in Europe far behind," we wonder how he was taught to define "forestry," and whether he makes any attempt to keep up his sylviculture and any other of the neglected branches of the main subject. Administration comes easy to the Britisher, and we do not minimise the progress made in bringing our immense forest estate under simple and efficient management, and again that made in putting it under suitable working-plans. But we have only to read through the list of important forest questions to be worked out now by the officers of the Research Institute, many of them forming almost the ground-work of our sylviculture and of the scientific side of working-plans, to see how we have lagged behind, albeit through no fault of our own, in the solution of many parts of scientific forestry in its essential application out here.

Let us assume, for the sake of argument, that the School of Forestry at Oxford is for India only. In championing Nancy, "Observer" refrains from answering the obvious question why it was given up 20 years ago. We expect that few officers, including Coopers Hill men, would be found to deny that the continental training is the best at least in theory. Is it so in practice? Could the requisite number of suitable men be recruited for it now? We

doubt it. Could they for Dehra Dun? Certainly not! Oxford should give us a wide field for recruitment among men of a good class, together with the discipline and sympathetic surroundings which are necessary for English students.

There can be little doubt that it would be an excellent introduction to this country, after the English and continental training, if instead of being thrust out into the jungles straight away, a six months' tour through some large forests could be given to each batch of recruits, a course of lectures being added to enable them to dovetail the home-acquired knowledge into Indian forestry. Knowledge which now evaporates all too quickly would be retained, and life in India would begin more easily, more quickly, and with a firmer grasp.

UNDER 15 YEARS' SERVICE.

THE GASS FOREST MUSEUM AT COIMBATORE.

SIR,—It has been suggested to me that I should send you the description of the opening ceremony of the Forest Museum at Coimbatore, which is named after me, and of the Museum itself which appeared in the *Madras Mail* of the 26th and 27th September last, and I accordingly enclose them, though it hardly appears to me becoming that I should do so.

An article on this Museum has already appeared in the *Indian Forester*, but it may be of interest to other Forest Officers, who are in a position and anxious to organise a similar undertaking, to know something of the history and the objects and scope of this Museum, as set forth by Mr. Weir, the Forest Member, and I am sure that the remarks of His Excellency the Governor will be most gratifying and encouraging to all Forest Officers. Mr. Weir and His Excellency were pleased to refer to my share in the formation of the Museum in very kindly terms with which I was greatly honoured, but I should like to explain to Forest Officers especially how dependent I was on the kind help and good will of others. I might have informed His Excellency that whatever I did was a labour of love with me, and that the creation of the Museum was a work of fascinating interest, as

indeed it was. I gave up most of my leisure time willingly to the Museum when I was at headquarters, as constant and unremitting attention were necessary to ensure anything approaching success. I had to design every show case and the built up trophies of timber specimens, models, photographs, etc., and this was not easy in the absence of previous experience and samples to guide me; but the real labour of getting those designs carried out correctly by the carpenters employed fell upon Mr. Gunda Row, the manager of the office. He also supervised the trimming, shaping and polishing of all the timber specimens, and I am greatly indebted to him for all the interest he took in everything and the energy and intelligence he displayed. The office staff was also most helpful, working willingly at labelling and arranging, and giving up so much of its own time to it. I could have done nothing without the co-operation of my brother officers, and I acknowledge most gratefully their assistance and that of many kind friends outside the Department who have contributed many interesting exhibits.

I am sure that all who have seen the Museum will agree that the collection of timber specimens is a superb one, though still very incomplete. I should add that these specimens are not varnished but polished with sandpaper so as to show the beauty of the grain to the greatest perfection. The models form a very interesting series, and these are all exact reproductions to scale of the things they represent, and for many of them I was indebted to the ingenuity of the subordinates of the Department, and I may call special attention to those of buildings, boats, working elephants, etc., from Malabar.

When I retired from the service in September 1905, as I was in doubt as to my permanent successor, I thought it advisable, though the new building was then only in course of construction, to prepare plans to illustrate how, in my opinion, the ground in front of the Museum could best be laid out, and how the show cases and specimens could best be distributed. Mr. F. H. Lodge has since been in charge, and I am very grateful to him for his most loyal support in carrying out my suggestions, and I

feel no misgivings at all about the future of the Museum, as I am quite sure that he is as interested in the institution as I was, and that he will maintain and develop it to the highest degree during his tenure of office as Conservator of the Southern Circle. The specimens which were formerly spread over three rooms and the spacious side-verandahs of the office buildings have how been transferred to the new building, and two out of the three former rooms and verandahs, and in spite of the fact that the new building is fairly spacious, it is already filled to overflowing, and it will become necessary at an early date to build on wings, as I feel sure that the museum, which is still in its early childhood, will under Mr. Lodge's supervision go on increasing in importance and interest. The botanical section is very incomplete and much space is wanted for it. Injuries and pests and economic products will also require much attention, and there are other untrodden fields, such as birds, earth-snakes, land-shells, etc., which are found only in forests, notably evergreen ones, in such beautiful variety.

I was latterly ably assisted by the Curator, Mr. Srinivasa Row, a graduate in Botany. Much of the revision of the Catalogue, which was a difficult task, was entrusted to him, and he has ably carried it out.

The collection of heads and skins is large and representative of the circle. There is always a difficulty in collecting such specimens, as sportsmen do not willingly part with trophies they have shot. Many of the heads are deposited in the Museum for safe custody, and must be given back in due course. I would specially call the attention of Forest Officers to the above, and state that trophies from any part of India would always be gratefully accepted.* I may add also that photographs and

* Without in any way wishing to prejudice Mr. Gass' appeal, we should like to point out that as the Gass Forest Museum is admittedly an institution for the education of the Officers of the Madras Circles, it would appear inadvisable to exhibit anything in it beyond *bonâ fide* species from that Presidency. The Madras Government, we believe, keep up a large Central Museum in the capital town for the purpose of exhibiting a general Indian collection, whilst at the Imperial College at Dehra Dun an all-Indan *forest* collection is being built up and maintained by the Government of India.—Hon. Ed.

pictures of forest scenery and operations will always be gladly received.

I cannot close these notes without referring to the exceptionally fine collection of entomological specimens and birds' eggs, which have been left in the Museum for safe custody by Mr. Hearsey, Extra Assistant Conservator of Forests.

Finally, I refer with pleasure to the ornamental garden which was started by me in 1901, in the barren compound of the public offices. Coimbatore is a notoriously difficult place to form a garden in, on account of the nature of the soil and the quality of the water, but this garden shows what may be done by introducing new soil and by irrigation. It has been extended more than once, and lastly by Mr. Lodge, till it is now of considerable extent, and being full of bright and beautiful flowers and shrubs, it is a great attraction.

Here again I am glad to be able to point to the care and energy of the office manager. The present excellent condition of the garden is almost entirely due to his unsparing efforts.

I trust that the Museum will always prove most useful and instructive both to the officers of the Department and to the general public, and that the latter may by its means be able to form an idea of the nature, importance and absorbing interest of forest work. It is now found to be a necessary adjunct to the Forest Training School for Deputy Rangers and Foresters at Coimbatore and it may yet fill a more ambitious rôle and take a prominent part in the training of Assistant Conservators and the higher grades of subordinates, when a Central Forest College is opened at Coimbatore, which is indicated as the best centre for it in the south, which I venture to predict, will be the case before many years are past. Here it will become a fitting companion to the Agricultural and Research College, of which His Excellency the Governor laid the foundation stone on the 24th September last.

VIZIANAGRAM : H. A. GASS.
12th October 1906.

REVIEWS AND TRANSLATIONS.

ON THE INFLUENCE OF FORESTS ON THE STORAGE AND REGULATION OF THE WATER-SUPPLY.

Forest Bulletin No. 9—Notes on the Influence of Forests on the Storage and Regulation of the Water-supply. By S. Eardley Wilmot, Indian Forest Service. Government of India Press, Calcutta (1906).

The subject to which this Bulletin is devoted is one of such vital importance to a country, that it appears little short of remarkable that the Department should have waited so long to enunciate in a popular manner the dangers which inevitably follow in the train of excessive forest destruction. The question, as the author states in his opening paragraph, has, during the past few months, once more come into prominence, and he deals shortly with the reasons which have resulted in the subject not having previously received that attention which it now most urgently requires.

Mr. Eardley Wilmot devotes the first part of his note to a consideration of "European Research into Forest Influences." He points out that only too often in former days the reason given for not forming reserves in particular localities was the absence of valuable timber or that the land was required for cultivation, no consideration being given to the point that forest growth, for which there may be no market, is often of inestimable value in clothing hill slopes or that cultivation once successful may become precarious or impossible when extended so as to annihilate protective forest growth.

In 1894 appeared the first public expression of the forest policy of Government in the now well-known Resolution. It is pointed out that in this expression of policy it was not intended to enter fully into the subject of the beneficial mechanical influences of the forests, and that these received but a passing reference inadequate to what is now known to be their importance, while no mention was made of the necessity of maintaining a

permanent water-supply but only of "protection from the devastating action of hill torrents of the cultivated plains which lie below them." In other words, the consideration of forestry in its more indirect connection with agriculture was postponed until it should have become more urgent. This period has now arrived and the author makes it the keynote of his treatment of the subject.

The steps taken in France with the object of controlling the devastating floods in the Pyrennees and the generally accepted ideas of the physical influences of forests as set forth by R. Huffel are then briefly considered.

Part II deals with the "Application of the Results of European Research to Indian Conditions."

The author points out that the mechanical effects of forest vegetation on the storage of water should vary in degree with the intensity of the climatic influences they are designed to modify. In other words the benefits conferred by forest growth should increase in value when rainfall is in excess or deficit, when the seasonal temperatures are high, and when the gradients of the hillsides are steep, so that tropical or sub-tropical countries would appear to present the very conditions where the preservation of forests in suitable localities may become a matter of vital importance. India furnishes an excellent example of this, the chief industry being agriculture which is dependent entirely on a timely water-supply, provided either direct from the atmosphere, or by rivers, tanks and wells. It is well known that in the present condition of the country in many places no certain dependence can be placed on seasonable rainfall, and it is not inconceivable that if any considerable portion of the aqueous atmospheric deposits is allowed to run to waste, India may later on find her rivers silting up and her canals running dry. Properly located forests tend effectively to diminish this waste and, especially in the hills, permit the formation of natural reservoirs from which a perennial flow proceeds, and it is therefore rather more than probable that in India the indirect value of forest growth may be of far greater moment than the direct benefits it at present confers, valuable as these may be.

It has come to be recognised that in India the denudation of the hills and catchment areas of the rivers certainly affects larger interests than those of the individual or local community; these latter may lose houses and land as a result of local floods, but the State as a whole suffers when famine is frequent over large areas and when torrents are unloosed causing a waste of water, which should be stored in the soil for use in the dry season, and carrying devastation hundreds of miles away to towns and cities and expensive public works. It is pointed out that the distribution of the water-supply by means of canals, of dams, of tanks and wells is well within the power of man, and this important work would be comparatively easy if our rivers and streams and springs flowed permanently and equably. It is a different matter when their courses are alternately dry and in flood, because Nature's efficient system of storage is ignored and because dependence is placed more or less entirely on the surface flow of water which the forests appear specially created to prevent. Even if the protection and efficiency of the large distribution works is alone considered such measures should be insisted on as would ensure that in future a regular and more even supply of water should reach these works wherever this is possible.

Our author divides the rivers of India into two categories, those fed by the glaciers of the Himalayas or trans-Himalayan tracts, and secondly, those with smaller catchment areas which are more entirely dependent for their flow on atmospheric precipitations. He shows that though at first sight it would be concluded that the flow of the glacier-born rivers of India was beyond the control of man, that this is not so, for it has been proved that the catchment area in the hills between the snows and the plains is that portion of a river's course which should receive the most careful attention as being the area within which the forests are capable of preventing avalanches and torrents and of storing up a large proportion of the monsoon waters to give them off gradually in perennial springs and streams. From the permanent snow level to the upper tree limit no protection is required to control the course of the Himalayan rivers, but from this point onwards

the influence of atmospheric precipitations is felt in increasing intensity with decreasing elevation, the rainfall in India, being heaviest roughly speaking, from the 7,000 feet contour line to the foot of the hills. At the top we have the stiff shrubby growth of dwarf rhododendrons and juniper which form an effective surface protective covering. Close below are the birch forests and below them again the firs, pines and cedars forming naturally dense forests which are succeeded by the oak and pines of the lower elevations merging gradually into the broad leaved species which clothe the lower slopes leading into the level country. This protective belt if left untouched will ensure absolutely the equable flow of the waters of the great river's down to the plains below. The lowering of the water level in the great rivers, the drying up of springs, the covering up of fair and fertile agricultural lands with mountain débris and the destruction and annihilation of villages, towns and lands by disastrous floods have been one and all solely due to the interference with and removal of the protective forest covering of the mountain slopes.

Mr. Eardley Wilmot quotes at length numerous examples, taken all over the country, in proof of the above assertion for an account of which we would refer our readers to the paper under review. One of the latest which occurred as recently as the past summer is connected with the flow of the Cauvery River. The water level in this river was reduced below the lowest estimates on which the Mysore electric power works were based, so that great expense and inconvenience were incurred by the unexpected diminution of the power delivered under contract to the Kolar Gold-fields and elsewhere. As the author points out no industry necessitating a certain supply of water could be profitably started on so uncertain a flow as at present obtains in many Indian rivers.

Although one-fourth of British India is under the management of the Forest Department, it should not be inferred that the distribution of the forests throughout the country is such as to efficiently control and regulate the water-supply. The catchment areas of many Indian rivers are in Native States and thus

outside the control of the Government. Especially is this the case in regard to the important rivers of Upper India upon which the chief works of the Irrigation Department depend. In the case of the principal rivers of other provinces in India (of which a valuable list is given in an Appendix with details of country, origin, whether utilised for irrigation, etc.), a number of them also have their catchment areas in Native States. Although not expressly stated in words the author evidently holds the opinion that the whole crux of the present situation is that some effective steps should be taken by the Government of India to ensure the safety and *improvement* of the catchment areas of all important rivers which are situated in Native States, and we think this matter is one of the greatest urgency in many parts of the country. We would reiterate an opinion previously expressed in these columns that the matter should be one for early consideration at the hands of a small Commission who should tour round the country and submit a report. The value of the work of such a Commission would be incalculab'e. We regret that such a step has not been more strongly advocated by our author.

The Bulletin is illustrated by some beautiful examples of Himalayan scenery showing various forms of devastation. We are happy to be able to reproduce with this review yet another example.

CURRENT LITERATURE.

The FORESTRY QUARTERLY (No. 3, 1906) opens with an interesting paper on "Unprofessional Forestry" in which the author shows that the Canadian maritime provinces afford many examples where simple business interests have dictated careful and conservative management on the part of forest owners. In this region there are numerous forest properties which have been cut over for many years and yet retain their growing power and value. A moist climate and a law-abiding population have secured considerable exemption from fire. Logging methods conservative of the forest have been employed. The temper of the owners has not been

such as to force timber worthlessly on the market. As a general rule only trees of good size have been cut, an amount of timber frequently within the power of the tenants to produce. This has been good all round. The people and the operators have done well, and the lands in spite of 50 years' cutting are more valuable at the present time than ever before. Some of these properties are handled to-day as nearly according to the principles of true forestry as is practicable. The author then proceeds to consider the work of such a company, the Hollingsworth and Whitney Company of Boston, whose mills are at Wateville, Me. The Company is one of the largest paper-manufacturing establishments of New England.

Part IV of Volume I of the AGRICULTURAL JOURNAL OF INDIA has been recently issued. The articles of chief interest to readers of this journal will be found in H. Marsh's paper on Protective Works in Central India, Some Diseases of Palms by E. J. Butler, Weather Charts and Reports, and their utility to the Indian Agriculturist, by W. L. Dallas, and Assam Rubber and its Commercial Prospects, by H. H. Mann.

Mr. Marsh's paper is of considerable interest since it deals with an aspect of the problem to which Mr. Eardley Wilmot's Bulletin reviewed above is devoted. The latter writer has ably shown the reasons which lead to a too rapid disposal of rain water, to the lowering of the river levels and to the disastrous floods which bring ruin to the cultivator. Mr. Marsh shows how conditions in Central India can be improved by the construction of scientific field embankments, the construction of artificial lakes, and by the maintenance and improvement of wells. Mr. Marsh also draws attention to the fact that a subsidiary method of improving the conditions of Central India is to be found in the improvement of communications. He states that the feeder lines of communication would be greatly improved if the available money was steadily spent at the difficult points, *i.e.*, in easing the descents into *nallahs* and ascents over passes.

Dr. Butler in his paper on Diseases of Palms states that fungus diseases of palms are rare, which is a fortunate matter when the extraordinary value of these trees to the people of tropical countries

is remembered. A few have, however, appeared in India in recent years, each apparently confined to a particular part of the country. The author describes the attack of a species of *Phytophora* on the betel-nut palm (*Areca catechu*) in Mysore and Sylhet, it having appeared in the latter district within the last two years only. The second disease dealt with affects the Palmyra palm (*Borassus flabellifer*) plantations which are such a feature of the landscape in the Godaveri delta. It has also been found to infest cocoanut palms. The disease is caused by a fungus of the genus *Pythium*, a near ally of the *Phytophora* pest. Suggestions are made for combating both these diseases.

In his paper on Assam Rubber and its commercial products, Mr. Mann is pessimistic on the subject of the financial prospects of *Ficus elastica* cultivation in Assam. The prospects, he thinks, are so poor when compared with the outturn of Para rubber in Ceylon and the Malay States and even in Southern India, that he considers that it is only possible to recommend the cultivation of *Ficus elastica* in Assam as a bye product on gardens, the poorer qualities of soil unsuited to tea being devoted to it.

In the REVUE DES EAUX ET FORETS (1st November 1906) A. Magnein gives a short description of the forests of the provinces of Vinh and Thauh-Hoa of Indo-China After dealing briefly with the soil and general configuration, etc. he describes the different species of trees present chiefly, unfortunately, under their local vernacular names. The author then deals with the different forms of fruits present in the various localities, the methods of exploitation, and methods of sale.

In the BOTANICAL GAZETTE (October 1906) W. Crocker has an extremely interesting article entitled "Rôle of Seed Coats in delayed Germination." The author says: "It is well known that in many species of plants not all the seeds of a given crop germinate promptly after being subjected to so-called germinative conditions; instead, they germinate at irregular intervals, through a period of weeks, months, or even years. It happens in many species that none of the seeds of a crop will germinate until they have been subjected to germinative conditions for a year or more, and that in these

cases of marked delay germination is distributed through a further period of greater or less length."

In view of the marked difficulty experienced in India with seeds, such as the teak, etc., the following conclusions based on experiments made with various seeds are of considerable importance:—

1. Delayed germination is reported in the seeds of many plants, and, in exact opposition to the view commonly held, its cause generally lies in the seed coats rather than in the embryos; but in the hawthorns, as perhaps in some other seeds, it is due to embryo characters.

2. In the upper seed of the cocklebur the delay is secured by the seed coat excluding oxygen, while in *Axyris amaranthoides*, *Abutilon Avicennæ* and many other seeds it is secured by the coats excluding water.

3. In tree seeds the failure to germinate is due to the endosperm and cap stopping water absorption before the quantity necessary for germination is obtained by the embryo.

4. In *Plantago major*, *P. Rugeli*, *Thlaspi arvense*, *Avena fatua* and others, the real method by which the coats secure the delay is not yet determined, but there is no doubt that the delay is due to the coats.

5. Seed coats which exclude water are much better adapted to securing delay than are seed coats which exclude oxygen, because of the much greater reduction of respiration in the first case.

6. In nature growth of the delayed seeds comes about through the disintegration of the seed coat structures by a longer or shorter exposure to germinative conditions, and the length of the delay depends upon the persistence of the structure securing it.

7. In the cocklebur the bur aids in preserving the seed coat of the upper seed by being most persistent over it.

8. Even in hawthorns, where the delay is secured by embryo characters, the germination finally comes about in the course of long exposure to germinative conditions and not in dry storage.

SHIKAR, TRAVEL, AND NATURAL HISTORY NOTES.

AFRICAN BIG GAME.

PRESERVATION MEASURES.

As long ago as 1896 the "excessive destruction by travellers" of big game in Africa attracted the attention of the late Lord Salisbury, as Minister of Foreign Affairs, and caused him to write a despatch to Mr. A. Hardinge of the East Africa Protectorate, and Mr. Berkeley of Uganda, asking them to consider whether it would be advisable to deal with the question by establishing a close-time and specifying reserved districts, and by limiting the number of a particular class of game to be shot by an individual sportsman. In any case, Lord Salisbury suggested, those intending to shoot big game for sporting purposes should be made to take out a license, the fee for which should be high enough to serve as a check.

There has been a great deal of correspondence on the subject since then, and the whole of it is gathered together in a formidable Blue Book which has just been presented to Parliament. A proposal was mooted in 1897 that the export of tusks of less than five kilogrammes weight should be prohibited, and that thus all incentive to the killing of young animals should be withdrawn, and an international convention to this effect was signed in May 1900 by Great Britain, Germany, Spain, France, Italy, Portugal, and the Congo Free State. By the same convention a system of reserves was established, the destruction of females was to a certain extent prohibited, and other precautions were taken to avoid interference during the breeding season with those animals which it was desired to preserve.

At the conference which agreed to this convention a memorandum was submitted by Sir Harry Johnston on the future of the elephant. Ivory he pointed out was the chief export of British Central Africa, and the elephant was the most valuable animal in

the country from the commercial point of view. "I have given a good deal of consideration," he added, "to the question of whether the elephant is likely to become extinct, or whether it is possible that a moderate trade in ivory and the continued existence of the elephant are compatible. I have come to the conclusion that, provided the Brussels Act is enforced and guns and gunpowder kept from the natives, especially from the Arabs, and Europeans only are allowed to shoot elephants by taking out a license, the elephant is likely to exist with us for all time, and yet supply a sufficiency of ivory for the trade. The fact is we should leave the bulk of the elephant-killing to those natives who kill the elephant by trap and spear. They do not perpetrate anything like the same destruction as the natives armed with guns, who indiscriminately shoot every elephant they come across. On the contrary, the natives who use only the spear naturally select bull elephants with good ivory, as it is almost as dangerous to attack a cow with small tusks, or with none at all, as to attack the biggest bull elephant. For the same reason they do not kill the young elephants.

"As regard traps and pitfalls, they do not ensnare many beasts after all, and are generally so constructed that a young elephant might succeed in passing where a large and heavy beast would fall in. There are, further, certain marshy districts of vast extent, such as those which surround the south end of Lake Mweru, where the elephant would appear to have found a naturally guarded preserve —a refuge where only the white man would have the energy and resources to follow him. To these preserves, there is no doubt, the female elephant retires at the time when it is giving birth to its young. Consequently, if the white hunter is kept under control, and gunpowder is from the natives, there may be some chance of the elephant's existence being prolonged indefinitely. I think, however, some improvement in our existing regulations might be made in increasing their stringency, and making it almost a penal matter to shoot the cow elephant or the young elephant with tusks under certain weight and size, as the slaughter of these beasts is simply wanton destruction, for their commerical value bears no proportion to the risk and trouble involved in killing them."

There was some idea then that the elephant might be trained for commercial purposes, but that notion was eventually abandoned. Sir Harry Johnston observes on the question: "As to whether the African elephant could be tamed, it is a question on which I hesitate to pronounce an opinion. Not infrequently young elephants are caught and given to Europeans; but they invariably die, because it is not a country where the milk supply is abundant, and it is usually impossible to procure enough milk to rear young elephants. Even, however, if he were reared to maturity, I think the disposition of the African elephant is too capricious and naturally savage to constitute him in any way a reliable beast of burden."

Towards the hippopotamus Sir Harry Johnston has no kindly feelings. He declares him to be a greater pest than any mammal found in Africa.

"He is extremely dangerous in all the rivers to boats and canoes," says Sir Harry, in description of the animal's wickednesses, "and I can personally testify that he frequently attacks without the least excuse—that is to say, without any provocation having been offered him. He commits intolerable ravages amongst the natives' crops or on such European plantations as are near the river banks. As a commercial item, his tusks are moderately valuable and his hide very valuable. Although I would advocate the extermination of the hippopotamus, I know that in pronouncing this sentence it is much less easily accomplished than the extinction of the elephant, for there are many parts of the country where the hippopotamus, like the elephant, finds natural preserves into which it is almost impossible to follow him, and as the hippopotamus breeds at a quicker rate than the elephant he is able to keep pace with the attacks which are made on him.

Local settlers urge another objection to the preservation of big game besides the direct injury they do. The ravages of the tsetse fly among herds of cattle are a very serious matter in many parts of the African Continent, and some of the planters urge that these insects are harboured by the larger wild animals. In opposition to this view the Society for the Preservation of the Fauna of

the Empire has repeatedly urged on the Colonial Office that this statement should not be accepted till inquiry has been made as to whether there are not other means of destroying the tsetse fly than by the butchery of the wild animals, and that in any case it would be possible to discriminate between the different varieties of big game.

The signing of the International Convention by no means concluded the correspondence. Since then the Society for the Preservation of the Fauna of the Empire has pressed the Colonial Secretary for greater stringency in the enforcement of the regulations, and a deputation waited upon Lord Elgin in June of this year to that end, Lord Curzon of Kedleston being a principal speaker. About the same time a new ordinance was promulgated for Southern Rhodesia, embodying very elaborate regulations. In a final despatch Lord Elgin intimates to Commissioner Sir A. Sharpe, of the British Central Africa Protectorate, that he desires him to prohibit the sale of elephant tusks under 25 lbs. and to permit no shooting, except for administrative reasons, in a reserve. —*The Pioneer.*

EXTRACTS FROM OFFICIAL PAPERS.

OBITUARY.

PROF. H. MARSHALL WARD, F.R.S.

We reproduce below an excellent Obituary Notice of the late Prof. H. Marshall Ward, F.R.S., which has appeared under the signature of Prof. S. H. Vines, F.R.S., in *Nature*.* Many officers in the Forest department, who owe such a deep debt to the great botanist, will sincerely lament his death at a comparatively early age and regret that the valuable work of this brilliant life has come to an end. Marshall Ward was a Forest Botanist in the true sense of the word, and it would be difficult to over-estimate the value of his lectures to the forestry students at Cooper's Hill. We count

* *Nature*—September 13th, 1906.

the period spent under Marshall Ward as one of the greatest assets of our student days.—[HON. ED.]

It is long since the cause of British botany has sustained so severe a loss as that from which it is now suffering by the deaths, within a few days of each other, of Charles Baron Clarke and of Harry Marshall Ward. Though differing widely in most respects, in age, in pursuits, in circumstances, yet this they had in common, high distinction in their respective lines of work and a long record of devoted and unremitting toil. It is not for me to attempt an appreciation of Clarke—that will be done by more competent hands—but I cannot forbear this slight tribute of esteem and regard. Nor is it possible for me, within the limits of space and time at my disposal, to give an at all adequate account of Ward's life and work. I can only aim at recalling some of the memories of a personal association at one time most intimate, at no time entirely severed, and at merely indicating the scope and the value of his achievements.

My acquaintance with Ward dates from the year 1875. In the spring of that year I was assisting Sir William Thiselton-Dyer at the Royal College of Science, South Kensington, in the conduct of a course of instruction in botany, one of the earliest courses of practical study, in the modern sense, ever given in this country. We were both struck by the singular intelligence and enthusiasm of one of our pupils, who, we felt, ought to be secured for the service of botany. That pupil was Ward. At our suggestion he became a candidate, in the spring of 1876, for an open scholarship in natural science at Christ's College, Cambridge, where I was a lecturer, and, having obtained the scholarship, he came into residence in October of that year. His undergraduate career was marked by a further development of those characteristics that had so impressed Sir William Thiselton-Dyer and myself at South Kensington. Under considerable difficulties, the practical teaching of botany was being established in the University; but whatever the shortcomings of the instruction, they were amply compensated by the earnestness of the students, who, besides Ward, included Prof. Bower, F.R.S., of Glasgow; Dr. Hill, Master of Downing

College; Prof. Hillhouse, of Birmingham; Dr. Walter Gardiner, F.R.S., and others. However, Ward did not confine himself to the study of botany, but availed himself to the full of the excellent opportunities for acquiring a sound knowledge of physiology under Sir Michael Foster, and of comparative anatomy under the late Prof. F. M. Balfour. A first class in the natural sciences tripos of 1879 was a fitting close to his undergraduate days at Cambridge.

After taking his degree, Ward went abroad for purposes of study, and worked for some time under the late Prof. Sachs at Würzburg; but the respite from botanical duty was not long. In 1880 he was called upon, as cryptogamic botanist to the Government of Ceylon, to go out and investigate the coffee-leaf disease then ravaging the island, a difficult task that he accomplished with considerable success. On his return, in 1882, he was elected Berkeley fellow at Owens College, Manchester, and became assistant to the late Prof. Williamson, F.R.S. Here he laboured for three years, and did much to promote the growth of the botanical school, leaving Manchester in 1885 to become Professor of Botany in the forestry department of the Royal Indian Engineering College, Coopers Hill. In the meantime (1883) he had been elected a fellow of his old college at Cambridge. For ten years he remained at Coopers Hill, throwing himself with his habitual energy into the life of the place, until in 1895 he succeeded the late Prof. C. C. Babington, F.R.S., as Professor of Botany in the University of Cambridge, becoming at the same time professorial fellow of Sidney Sussex College. In this larger and most congenial sphere he found full scope for the play of his activities in every direction. Supported by a highly competent staff, and with such colleagues as Mr. F. Darwin, F.R.S., reader in botany, Dr. Gardiner, F.R.S., and Mr. Seward, F.R.S., university lecturers, Ward soon succeeded, by his infectious enthusiasm, in giving a fresh impulse to the progress of his science at Cambridge. He himself always took charge of the large elementary class, and won therefrom many recruits for the ranks of botany by the attractiveness of his lectures; he gave besides one or more courses on advanced

subjects during the year, generally, as might be expected, on some groups of fungi. His weak point as a teacher is eminently characteristic—it was that he generally attempted to cover a great deal more ground, to convey a great deal more information in his lectures, than was possible either physically or mentally. He educated many who have since done excellent botanical work, for he not only taught his pupils what was known, but also inspired them to attack the unknown. Under him the botanical school attained such importance that the University allotted a large portion of the benefaction fund to the erection of a new botanical institute, one of the best in the country, which, together with other university buildings, was formally opened by His Majesty the King in March 1904.

So far I have spoken of Ward only as student and as teacher; I have yet to speak of him as investigator, his most important *rôle*. The bent towards original research was strong within him from the very first. His earliest papers date back to 1879 (Journ. Linn. Soc., vol. xvii; Quart. Journ. Micr. Sci., vol. xx), and relate to the embryo-sac, a subject that, owing to the brilliant discoveries of Prof. Strasburger and others, was at the time especially engaging the attention of botanists; but it was not until his visit to Ceylon that he entered upon what was to be his life-work, the investigation of the fungi and bacteria. The first fruits of his work there was a series of three elaborate reports on the coffee-leaf disease to the Colonial Secretary (1880-81), and a scientific paper on the fungus producing it (*Hemeleia vastatrix*), read before the Linnean Society on June 1st, 1882 (Journ., vol. xix); moreover, his experience in this case led him to form views on the physiology of parasitism that influenced all his subsequent work. However, when in Ceylon his attention was not so wholly absorbed by the coffee disease as to prevent him from making other observations, the results of which are embodied in a paper on the perithecium of Meliola, published in the Phil. Trans. of the Royal Society, 1883, and in another on a curious epiphyllous Lichen, *Strigula complanata*, that appeared in the Trans. Linn. Soc., vol. ii, 1884. After these, and two other papers on the Saprolegniæ and

on Pythium in the Quart. Journ. Micr. Sci., vol. xxiii, 1883, there was for a time, owing to his transfer to Coopers Hill, a lull in the activity of publication, broken by the appearance in 1887 of two papers in the Phil. Trans., the one on *Entyloma Ranunculi*, the other on the tubercular swellings on the roots of *Vicia Faba*, of which the latter is of special interest. At this time the causation of these swellings and their relation to the nitrogenous nutrition of the plants bearing them was one of the leading problems of plant physiology. To the solution of this problem Ward's paper contributed the important facts that (1) the tubercles are undoubtedly of parasitic origin, and (2) that the parasite gains admission by the root-hairs, though he thought the parasite was a myceloid fungus, whereas it has since been proved to be a bacterium. The whole subject was admirably resumed by him in an article contained in vol. i of the *Annals of Botany* (1887-88) of which periodical he was one of the founders. The same volume opens with a paper by him and Mr. T. Dunlop on the histology and physiology of the fruits and seeds of Rhamnus, perhaps one of the best of his researches, in which it is shown that the yellow pigment (rhamnin), obtained from the fruits for dyeing purposes, is formed by the decomposition of the glucoside (xanthorhamnin) contained in the pericarp by a ferment existing principally in the testa of the seed. In the second volume of the *Annals* (1888-89) there is an elaborate paper, "A Lily-disease," the chief point of interest being the discovery that the fungus (Botrytis) penetrates the cell-walls of the host by means of a ferment (since termed *cytase*) secreted at the tips of the hyphæ. Ward's views on parasitism were further developed in his paper "On some Relations between Host and Parasite in certain Epidemic Diseases of Plants" (Proc. Roy. Soc., vol. xlvii, 1890), which gained the honour of selection as the Croonian Lecture for that year. Passing over with mere mention the papers on Craterostigma (Trans. Linn. Soc., 1890) and on the Ginger-beer Plant (Phil. Trans., 1892), I come to his most laborious achievement, a series of reports on the bacteriology of the Thames, presented, in conjunction with Prof. Percy Frankland, F.R.S., to the Water Research Committee of the Royal Society in the years 1893—96. It

is difficult to form any adequate conception of the unfailing assiduity necessary to the working out, as Ward did, of the life histories of the no less than eighty different bacterial organisms that he found in the river, nor is it possible here to give an account of these voluminous documents a *rèsume* of which, so far as his share of the work is concerned, was given by him in the fifth report (Proc. Roy. Soc., vol. lxi, 1897). He had proved his fitness for this difficult task by his paper "On the Characters or Marks employed for Classifying the Schizomycetes" in the *Annals of Botany*, vol. vi, 1892, and the accomplishing of it gave rise to such interesting *parerga* as the papers "On the Action of Light on Bacteria" (Phil. Trans., 1895), "A Violet Bacillus from the Thames," and "Some Thames Bacteria" (*Ann. Bot.*, xii, 1898). The first of these papers is of considerable importance in that the bactericidal effect of light, whether of the sun or of the electric arc, is conclusively demonstrated, and is shown to be confined to the more highly refrangible rays of the spectrum.

Ward was a regular attendant at the meetings of the British Association for the Advancement of Science, and was president of the botanical section at the meeting in Toronto in 1897. His address on that occasion dealt with a subject that was always in his mind, the economic significance of the fungi, of which he gave a characteristically exhaustive account. In fact, all his subsequent work was the expression of this idea. Thus in 1898 (Phil. Trans.) he published an investigation of *Stereum hirsutum*, the fungus that attacks the wood of the oak, having succeeded, by means of pure cultures, in tracing its life-history from the spore to the fructification, and he did the same for *Onygena equina*, the horn-destroying fungus (Phil. Trans., 1899). He then entered upon what was destined to be his last line of research, the investigation of the Uredines or Rusts, with an energy that was remarkable even for him; but it was not until 1902 that the publication of the results began, so long and so numerous were the experiments from which they were drawn. The first paper on the subject was read before the Cambridge Philosophical Society in January 1902 (Proc., vol. xi), treating of the physiological races of these fungi, with

special reference to the Brown Rust of the Brome-grasses. Having shown that certain species of Bromes can only be attacked successfully by certain forms or breeds of the Rust, he arrived at the striking conclusion that "the capacity for infection, or for resistance to infection, is independent of the anatomical structure of the leaf (of the Grass), and must depend upon some other internal factor or factors in the plant." Two papers published later on in the year (Proc. Roy. Soc., vols. lxix and lxxi) discuss the question, with an answer in the negative, as to whether or not susceptibility to infection depends upon the nutritive conditions offered by the host to the parasite, the foregoing conclusion being re-asserted thus :—"All the evidence points to the existence, in the cells of the fungus, of enzymes or toxins, or both, and in the cells of the host-plant of antitoxins or similar substances, as the decisive factors in infection or immunity, although I have as yet failed to isolate any such bodies." In the meantime yet another paper had appeared in the *Annals of Botany* (vol. xvi, June 1902), confirming his previously expressed conviction that differences in details of anatomical structure do not afford any explanation of the relations between the Bromes and their Rusts. His last paper on this subject is that dealing with the adaptive parasitism of the Brown Rust (*Annales Mycologici*, vol. i, 1903), in which he developed the interesting idea of the existence of what he termed "bridging species." The idea is briefly this, that although it is generally true that the adapted races of the parasitic fungus are restricted to groups of closely allied host-species, there do occur host-species which serve as intermediaries in the passage of the parasite from members of one section of the host-genus to those of another section.

Incidentally, a controversy arose between Ward and Prof. Eriksson, of Stockholm, with reference to the "mycoplasm-theory" of the latter. In order to account for the occurrence of sudden and widespread epidemics of Rust, Eriksson had assumed the persistence in a dormant state, within the tissues of the host-plants, of a combination of the protoplasm of the fungal hyphæ with that of the host, which he had described and figured and had called

" mycoplasm." As stated in his paper on the question (Histology of *Uredo dispersa*, &c., Phil. Trans., Ser. B, vol. cxcvi, 1903), Ward was unable to confirm Eriksson's observations, and regarded his assumption as unnecessary. One of the most interesting discussions in Section K during the Cambridge meeting of the British Association, 1904, was that in which the *pros* and *cons* of this theory were urged by the two protagonists. Their views were subsequently published, side by side, in the *Annals of Botany* (vol. xix, January 1905).

At this point the record of his work as an investigator abruptly ends, when great things might still have been anticipated, and it might well be deemed sufficient to have occupied all the time and energy at his disposal. However, this is far from being the case. Besides writing all these papers, many of them illustrated by elaborate drawings—for Ward was an excellent draughtsman—as well as others necessarily omitted here, he produced several books :—A translation of Sachs's " Physiology of Plants," 1884 ; " Timber and some of its Diseases," 1889 ; " The Oak," 1892 ; an edition of Laslett's " Timber and Timber-trees," 1894 ; " Diseases of Plants," 1889 ; " Grasses," 1901 ; " Disease in Plants," 1901 ; " Trees," a considerable work, of which several parts have appeared, and I understand that some MSS. remain to be published.

It is pleasant to reflect that so much good work was not allowed to pass unrecognised. In addition to the distinctions already mentioned, many others were conferred upon him. Ward became a Fellow of the Linnean Society in 1886, and was elected a Fellow of the Royal Society in 1888, receiving a Royal medal in 1893 ; he served on the council of the Linnean Society, 1887—89, and on that of the Royal Society, 1895-96. He was elected an honorary fellow of Christ's College, Cambridge, in 1897, and in 1902 received the degree of D.Sc. *honoris causa* from his first *Alma Mater*, the Victoria University, having previously taken the same degree at Cambridge. He was president of the British Mycological Society, 1900—02, and had received the honorary fellowship of the Manchester Literary and Philosophical Society and of other societies.

Beginning in 1854 at Hereford, his life is a story of unremitting and successful effort until its close at Torquay on Sunday, August 26th, 1906. I remember Ward as a genial companion, a man of varied interests, delighting especially in music; but the dominant impression is that of his whole-hearted devotion to his science; all else counted with him as nothing in comparison with that. No doubt this led him to impose too severe a strain upon a constitution never very robust; but such as he was, it could not have been otherwise. He was laid to rest in the Huntingdon Road Cemetery, Cambridge, on September 3rd, attended by many friends and colleagues, amid tokens of regret from near and far.

S. H. VINES.

MISCELLANEA.

ENGLISH GOLF BALLS BARRED IN AMERICA.

If you play golf with a ball made in England you are liable to arrest, says the New York *Sun*. Over there, unless the lower court and chancery divisions are reversed on the appeal pending in the House of Lords, the rubber cored golf balls controlled by the patentee and his licensees in the United States may now be manufactured by any one. As a consequence, there is a flood of home manufactured rubber cored balls on sale in England, and some specimens have been brought to America by tourists, while other players have had a box or two as a gift from friends abroad. The American makers cannot prevent the balls coming here in these underhand ways, but they propose to get after the players who may use them.

Priority of invention is the point that the American patentee [meaning Haskell] has so far been unable to establish in the English courts. In this country all other makers of rubber core balls pay a royalty to the patentee's firm and should the House of Lords sustain the American patent, which the lower courts have not done, makers of rubber core balls the world over would have to pay a similar royalty. In England the manufacturers act as though they had already proved their contentions fully and the output is

being sent into the home and colonial markets at a great pace. The retail price in England will average, according to the advertisements, $5 a dozen. The American price will average $6 a dozen, and, as in spite of the duty there might be a profit in sending the balls here, there is a special interest in having the English balls declared from the outset contraband of trade.

"We can't reach the makers or the underhand consignors of these balls made in contempt of the American patent," declared a leader in the New York trade, "but we can get after the individuals who openly play with them. We will stop by legal means, and very quickly, the golfer who openly uses an English golf ball, or any golf ball made in defiance of our rights on an American course."

The situation is very different from what it was when golf first attained popularity here in 1895. Then the golf balls were all imported from England, but there were no restrictions on the manufacture of the solid gutta-percha ball, and American firms soon jumped into the trade. By 1900, when the patentee first began selling broadcast the rubber core ball, the greater proportion of the solid balls used here were of American manufacture. Various sorts of rubber core balls followed the first on the market, until in 1903 the patentee brought suit against all other makers for infringement of his patents and cumulative damages. The two principal defendants confessed judgment, and since then all makers of golf balls having a core of wound rubber have paid a royalty.

In England the new American ball received a patent right in 1898, and although the firms and the professionals made a stand against it, the fight was as futile as that of the old leather-ball makers against the first solid gutta-percha balls. By 1901 the new ball had revolutionized the demand for golf balls in England, and the rubber core became the admitted ideal in such articles, so that all theories of playing the game, laying out courses and placing the hazards, based on a solid and slow ball, were also revolutionized. The English trade was naturally averse to conceding a monopoly to the American patentee and has waged a bitter fight in the law courts.

The combination of elasticity and inelasticity of the American patent has been the aim of many makers of golf balls in Scotland and England, according to the evidence brought forward, and Justice Buckley, in the Chancery Division, seemed to have been convinced that two of the Scottish inventors at least had forestalled the American patent in principle without making the ball a commercial or even a playing success. He decided that the lack of novelty in the American patent destroyed the claim to be granted an undisturbed possession of the right to make such balls.

What is supposed to have most influenced the Justice was that Captain Duncan Stewart, R.N., deposed that in the early 70's he made golf balls, sold them and gave them away, in the composition of which only rubber threads were used in the core, and that two professionals, George and William Fernie, stated that they had made similar rubber-core balls and that a patent had been taken out for them, although they were never brought to the practicable point reached by the American balls. Justice Buckley's decision was made last July, and in March it was sustained by the court of appeals. These judges relied on Captain Stewart's testimony, not attaching much weight to the Fernie evidence.

Whether the rubber-core golf balls now in this country from England are better or worse than these being made here has nothing to do with the attitude of the American makers. Whether the House of Lords sustains the English patent or not, they do not propose to let the English balls into this market without a litigation, and the golfer who is in possession of any such balls had better watch out, unless he is yearning for a law suit.

"The course to be pursued," remarked a lawyer who is a golfer, "would be to serve an injunction on the player who is using the obnoxious ball. A temporary injunction might be asked for from the court, and unless the player demonstrated his legal right to use the ball the injunction would then be made a permanent one. There could be no arrest in the first instance, but if the injunction were granted and subsequently violated there might be cause for a criminal action.

"It is good law, I believe, that an American patent must be protected from encroachments on the American market of articles made in violation of that patent in other countries. But in general law, to speak offhand on the point, it may not be easy to obtain a permanent injunction against a golfer who may prefer to use a golf ball made in England and which is not on sale in this country. The golfer may prove to the court that in England it has been decided it is lawful to make and vend the golf ball he is using. Law is largely a matter of precedents, and, on the principle of *res adjudicata*, an American Judge might follow the English court decision and refuse to enjoin the golfer from using the foreign-made ball."

A permanent injunction against one player would become general in its application to similar cases, and, according to one golf goods dealer, should the American patent be beaten in the House of Lords, the way the English dealers will get their cause before the American courts will be in defending an injunction suit of the sort mentioned. They feel confident over there, he says, on the question of priority of invention, and beginning with an injunction defence will push the case all the way up for a final verdict by the supreme court at Washington. Meanwhile, should a friend get some for the English golf balls to you, it would be wise not to proclaim the fact from the club-house roof.—*India Rubber World.*

A WOOD PRESERVATIVE AGAINST WHITE ANTS.

It is announced that the great scourge known as white ants or termites, which destroy so ruthlessly all descriptions of woodwork, from railway sleepers to household furniture, in tropical and sub-tropical lands, can now be effectually dealt with, as by a newly-discovered process any wood may readily be rendered impervious to their attacks. Attempts have been made hitherto to combat these pests by various means, but until now either the means have proved unsuccessful, or the odour of the preservative used has been so pungent as to preclude its employment for constructional timbers or for furniture.

It has been claimed that some woods, such as teak, Australian cypress pine and turpentine wood in their natural state are more or less immune from attack, but the evidence in favour of their total immunity is often so contradictory that the conclusion can only be drawn that much depends on the ground in which the trees are grown, and the species of termite to whose voracity the wood is afterwards exposed. Mr. Saville Kents points out, in his very able chapter on Australian termitidæ, that Jarrah grown on the Ironstone ranges is practically proof, while that grown elsewhere is by no means so. Again, some species of white ants display a decided preference for certain woods, for instance, the *Calotermus domesticus* of the Malay Peninsula, while rarely touching woods of a piney or resinous nature, readily attacks other timbers, especially those grown locally.

Two pieces of ordinary yellow deal, a most toothsome morsel to nearly every variety of white ants, were bolted together, and placed by Mr. H. N. Ridley, Curator of the Government Botanical Gardens, Singapore, some months ago in a position where termites abound. The untouched piece had been treated in London by the Powell wood-process, with a termite resisting solution, which is absolutely odourless and innocuous except to insects, while the other was left in its natural condition. It will be observed that the latter has been almost consumed, while the former remains intact. The specimens were removed before the natural piece had been entirely consumed, as had been the case in other places.

This discovery is naturally of immense importance to dwellers in the tropics, and specially to timber merchants, furniture manufacturers, etc., who trade with tropical countries: for merchants will now be able to guarantee all prepared wood against destruction by termites. Curiously enough, the process, which only occupies a few hours, actually improves the appearance of the wood, which at the same time is effectually seasoned and rendered proof against dry rot and similar fungoid growths. The cost, too, is said to be low. Particulars may be had free from the Secretary, 28, Fleet Street, E. C.

THE AVAILABLE SUPPLY OF WOOD.

It has always been our custom to give publicity to the views of those who have raised a warning cry as to the possibility of a timber famine. Mr. A. E. Moeran recently contributed a well reasoned letter to the columns of this journal but it is a tall order that he would impose upon it, "to collect and publish authoritative information and figures on this subject."

Such an undertaking is too great and important to be lightly entered upon either by a private firm or company; and if it is necessary that the work should be done, it would more properly devolve upon a Government commission or department; and, to make the survey complete, the cost would be enormous, and would take some four or five years to complete.

The importance of timber in every department of industrial economics cannot be over-rated, and it is surprising that, notwithstanding the enormous introduction of ironwork in primary construction that concurrent with this, the gross consumption of timber is constantly increasing. This is the more remarkable, seeing that the moment any difficulty arises as to getting a specification of timber required, the engineers are ever ready with, "Oh! we will substitute iron or steel." And this runs throughout all classes of work—ship-building, railway wagon and carriage building, etc.

If it should be possible to interest the Government to form a commission to consider the question of timber supplies for the present, and the outlook for their continuity, what would be the extent or scope of the enquiry? And who are the persons equipped with the necessary knowledge for the work who could devote the necessary time to elucidate all the points?

To do the work properly, it would require no arm-chair commission sitting in London, but active commissioners to go here, there, and everywhere, and personally satisfy themselves.

No doubt the knowledge so acquired would be invaluable, but would it materially add to the facts already known, and which are slowly but surely forcing themselves forward, as to the coming economic conditions of timber supplies?

The position may be summarised somewhat as follows : No one wood is absolutely indispensable. Thus, if certain sizes available of a certain wood are not sufficiently large enough for certain work another wood will be substituted. In like manner if the price becomes unduly inflated, the immediate result is that a cheaper wood is brought into requisition.

It is quite true that economies have already been worked to a considerable extent ; and that in addition to the introduction of cheaper woods as substitutes, there is another system in vogue—that of using less of it.

Old-fashioned wardrobe ends were made of 1 in. stuff by 22 in. wide. Many are now ½ in. by 16 in. to 17 in. wide. So much for furniture. To take another illustration, go into an old-fashioned and well-built house, and see the substantial architraves and plinths, and compare them with their puny representatives in the modern so-called good houses of to-day !

There must, however, be some limit to the process of substituting one wood for another, and the use of a fourth quality as against a second or third ; and if the 1 in. by 11 in. plinth be reduced from one size to another, it is only a question of time for the total elimination of wood to ensue.

The uses and the demands for wood throughout the world have enormously increased, and there can be no doubt that timber supplies, especially of softwoods, are pretty well exploited ; and that, as hitherto, little or nothing has been done to conserve the supply.

The enormous uses for timber arising from the development of railroads in the States and Canada in the permanent way, rolling stock and packing of food stuffs, are potential factors almost unthought of forty or fifty years ago. The introduction of iron and steel for constructive purposes also make for increased demand for timber, in staging, scaffolding, and model-making, etc.

Then, in coal getting, is it realised that for every 100 tons raised 2 tons of timber are needed ! For every pound of metal, every ounce of gold, raised, requires wood in its mining, wood in its manufacture, wood in its transportation. As Fernow says, "we are

rocked in wooden cradles, play with wooden toys, sit on wooden chairs and benches, eat from wooden tables, use wooden desks, chests and trunks, are entertained by music from wooden instruments, enlightened by information printed on wooden paper with black ink made from wood, and even eat our salads seasoned with vinegar made from wood." And, finally, we are interred in a wooden coffin.

So much for the uses and utility of wood, and no doubt there will be sufficient for the present generation, but it is not right that we should be content to cut down every stick of wood, and leave the world as though it had been over-run with a plague of locusts. The active movements in the States and Canada, in aid of re-afforestation, should be sufficient evidence to our Imperial Parliament that something should be done to utilise the waste places, and grow such timbers as it may be possible to raise. Every variety of timber has its utility.

With pitch pine at £20 a standard, Quebec waney pine at 4*s.* per foot cube, and at these figures very little procurable, our industrial position is seriously menaced, and the birthright of the young jeopardised

The position is to-day undoubtedly acute, but what it will be twenty or fifty years hence, it is difficult to estimate. The remedy then is for the country to set about and re plant our lands with suitable young trees, which would, in time to come, become a valuable national asset. The present Government do not appear disposed to grasp the situation, judging from some recent replies of the Prime Minister in the House of Commons.—*Timber Trade Journal.*

NEW ZEALAND TIMBERS.

WHAT THEY ARE, AND USES TO WHICH THEY CAN BE PUT.

Totara (*Podocarpus totara*).—Wood of a reddish brown colour and does not warp and twist. It is clear and straight in the grain, and therefore easily worked. It is of extreme durability and is largely employed for building purposes, bridges, wharves, telegraph posts, railway sleepers, house blocks, fencing posts, and

various other purposes. Owing to its unrivalled powers for resisting the attacks of the teredo, it is highly valued for marine poles, and is unquestionably the best timber in the colony for that purpose. It is subject to the attacks of no insect whatever in any stage of growth or use. It is a splendid wood for engineers' patterns for which it is now much used. It cuts to long lengths and great widths. Specific gravity, 0·559; weight per cubic foot, seasoned, 35·77; breaking weight, 133·6 lbs.

Matai (Black pine).—This timber is of a red or yellowish brown tint; it is straight in grain, firm, dense, heavy, of great strength and durability, while it is easily worked. It is largely employed for bridges and constructive works, house blocks, framing joists, weather-boards, railway sleepers, piles, millwrights' work, bed-plates, etc., and is especially valued for the flooring of churches and other public buildings. Its specific gravity varies from 0·572 to 0·792, its weight per cubic foot, when seasoned from 46·862 lb. to 47·508 lb.; and its breaking weight is 384·03 lb., for a piece 2 ft. long and 1 in. by 1 in., supported at each end, and loaded in the centre. Cuts to long lengths, and up to 36 in. in width.

Kauri (*Agathis australis*).—This timber is of the highest value, and combines a larger number of good qualities in a higher degree of perfection than any other pine timber in general use; for while of great strength, it is of high durability, and unites a firm, compact texture with great silkiness, so that it is worked quite as easily as the best Quebec yellow pine. This wood is used for wharves, bridges, and constructive works generally; squared piles, railway sleepers, ship building (especially for deck planking) house building, fencing, railway coaches, and other purposes too numerous to mention. Its specific gravity varies from 0·498 to 0·700. Its relative strength when compared with English oak is as 892 to 1,000; weight per cubic foot when seasoned, 37·11 lb. to 42 lb. The mean average breaking weight obtained from twelve specimens is 165·5 lb. It cuts to long lengths and great widths.

Red pine (*Dacrydium cupressinum*).—This wood is the chief building timber employed over two-thirds of the colony, and is used for framing, flooring, joists, weatherboards, railway sleepers,

mantelpieces, etc. It is of a brown colour, varying greatly in intensity, but often beautifully shaded, resembling some varieties of rosewood, so that it is extensively used in the manufacture of plain and ornamental furniture, for which, indeed, it is especially suited. It is of great strength, and may be used for beams. Selected logs are used for the construction of bridges. Its specific gravity is 0·550 to 0·664, and its weight per cubic foot, when seasoned, is from 24·38 lb. to 40·11 lb. Its breaking weight is 350·88 lb., so that it is equal to English oak in strength. It cuts to long lengths, and up to 4 feet in width. The selected panels are deep-red in colour, with dark or light streakings, forming handsome markings.

White pine (*Podocarpus dacrydioides*).—This wood is white or pale yellow, tough, elastic, and of great strength, but it is not of great durability when exposed, although often employed for general building purposes, especially for flooring. It is extensively used for cheap furniture. It is straight in the grain, even in texture, and very light. In addition to being used for building purposes, it is used for whitewood furniture, butter boxes, tallow-casks, and coopers' ware, covering-boards for boots, packing cases, etc. Its specific gravity, seasoned, is 0·459 to 0·557; its weight per cubic foot 29·11 lb. to 29.505 lb. A piece 2 ft. long and 1 in. square, supported at each end, and loaded in the middle, requires a weight of from 308 lb. to 358 lb. to break it. Occasionally logs are met with having a much higher specific gravity. Cuts up to long lengths and 4 ft in width.

White silver pine (*Dacrydium westlandicum*).—This timber is of great value, as it is of extreme durability, combined with great strength, toughness, and elasticity. It is clear in the grain, dense, firm, and compact, charged with resin, and of low specific gravity. When seasoned it has a yellowish satiny lustre, and takes a high finish. It shrinks but little in drying. It is employed for piles, bridges, wharves, and other constructive works; for marine piles it is fully equal to Totara. It is much used for furniture, and from the unusual combination of great strength and toughness, with extreme durability, is admirably suited for the woodwork of

agricultural implements, etc. It is largely used for railway sleepers. It cuts to long lengths and up to 3½ ft. in width.

Yellow silver pine (*Dacrydium intermedium*).—This wood is very resinous, reddish-yellow, straight grained, compact, and even combining great strength with extreme durability. It is applied to the same purposes as the preceding species, and is especially valued for boat-building. It cuts up to long lengths, and 2 ft. in width.

Kawaka (*Libocedrus doniana*).—This wood is of a dark red colour, with darker streaks; it is straight and even in the grain, and often very ornamental. It is extremely durable, and has been used for general building purposes, fencing-posts, shingles, palings, etc.; but is especially valued by cabinet-makers on account of its ornamental character, and the facility with which it takes a high finish. It cuts up to long lengths and 4½ ft. in width.

Pahautea (or Cedar) (*Libocedrus bidwillii*).—The Pahautea is closely related to the Kawaka. The wood is remarkably straight in the grain, but light and rather brittle; it is of a uniform dull-red colour, extremely durable in all kinds of situations. It is largely used for general house-building, fencing, house blocks, telegraph posts, railway sleepers, bridges, and other purposes, for which great durability is required. It is excellent for venetian blinds, and stands much better than the imported redwood of California. When seasoned, its weight per cubic foot is 26·306 lb. to 28·611 lb. Its breaking weight is only 99·98 lb. It cuts up to long lengths and 2½ ft. in width.

Kohekohe (Cedar) is a similar wood to Pahautea, and it is the Pahautea, Kohekohe, and Kawaka (Cedars), and the tops of the Totara trees (which is a very good substitute for Cedar) that Mr. Onyon is getting converted into pencils for his Government State School and the colony's requirements.

Puriri (*Vitex littoralis*).—The Puriri is called the New Zealand oak, on account of its great strength. It is, however, more closely allied to teak. This wood is excessively hard, dense, heavy, and is the strongest as well as the most durable timber in the colony. It is of a dark-brown colour, with the fibres crossed

and interlaced, so that very often it is difficult to work, although as a rule it splits easily. It is used for house-blocks, piles, railway sleepers, machine beds, and for ornamental cabinet-making. The veneer is darker than the Italian burr, is remarkably rich in its markings, and has more life and brilliancy. It is considered of great value for pianos, bedroom suites, etc. It cuts up to long lengths, and up to 4½ ft. in width.

Black birch.—This wood is red in colour, straight, even, compact in grain, tough, and durable in all situations. It is used for railway sleepers, piles, stringers, bridge and wharf planking, mining props and mining timbers. The red birch is a somewhat similar timber, and Mr. Onyon is now engaged in cutting these birches into mining props of 6 in. to 10 in. diameter—for the South African market.

Pohutukawa (Maori Christmas tree).—This wood is deep red in colour, heavy and compact, and of great strength; it exhibits great power in resisting the teredo. It is extensively used for shipbuilding, machine beds, bearings, treenails, etc., and for various special purposes, such as framing and sills of dockgates.

Honeysuckle (*Knightia excelsa*).—This wood is deep red in colour, and beautifully mottled in silver grain. It matches very nicely with the Puriri burr. It is used for dining-room suites of furniture, drawing-room floorings, and ornamental cabinet-work generally. It cuts into long lengths and up to 3 ft. in width.

The following are the New Zealand veneers, Mr. Onyon intends placing on the home markets:—Mottled and wavy puriri, totara burr and wavy totara, mottled kauri (large mottle), and wavy kauri, rowarowa (honeysuckle), pohotukawa, mangeao, silver pine, ake-ake, towai, figured rimu, wharangi, and a number of others, some of which show all the colours of a rainbow.

These timbers are good, entirely free of knots, and are being put on the English market by Mr. Onyon at a fair price, and one which will meet English importers. Mr. Onyon's address is Municipal and County Club, Whitehall Court, Westminster, London, and 15, Market Street (J. Lake's offices), Manchester.—*Timber Trades Journal.*

THE FOREST OF MOURBHANJ.—In the note on Mourbhanj, one of the Tributary States of Orissa, it is stated, under the head of culture, that at the end of 1905-06 an area of 63 mans (1 man equals 3,338 square yards) of land was under shrub mulberry cultivation; and it is expected that before the present year closes another area of 100 mans will be brought under the same cultivation. In each of the last three years several small crops of cocoons were reared and reeled into thread. It is encouraging to note that Mourbhanj silk worms have already found their way to such far distant tracts as Baroda and Mysore.

The forests of Mourbhanj yield various kinds of minor forest produce such as lac, tassar, myrabolans, bahera, kuchila, shalia, mohul, kuchra pagra, honey, catechu, horns, wax, sabai grass, fuel, charcoal, bamboos, birds, wild animals, hides and various edible roots and barks and fruits for tanning and medicinal purposes.

Lac is grown on kusum trees; it yields two crops in the year, The July crop is not so abundant as the November one.

The rearing of tassar cocoons forms an important industry in Mourbhanj. The cocoons are reared on the assan trees and yield only one crop in the year. The tassar industry like the lac one is, however, subject to extremes of weather. Hides, the revenue from which is increasing every year, form an important part of the minor forest products.

The chief mineral wealth of the State consists in its iron ores, which are possibly among the richest and most extensive in India. They occur in quantity at several places. A mining lease has been granted to Messrs. Tata and Sons, Bombay, who are floating a Company in England.

Red and yellow ochres, steatite, limestone and kaolin, building stone, mica, ornamental stone, pottery, clay and gold are found in abundant quantity in many places. A prospecting license for gold has been granted to a syndicate.

A lease for exporting ochres, limestone, kaolin, building stones and ornamental stones has been granted to a firm, who have already commenced operations.

CINCHONA CULTIVATION IN INDIA.—The total area under Cinchona cultivation in India in the year 1905-06 was 5,808·77 acres. Of this, 2,992 84 acres, planted with 2,421,924 mature and 3,893,900 immature trees, represented Government effort. Private plantations measured 2,815·93 acres in area, and consisted of 1,930,935 mature and 1,008,487 immature plants. The Government plantations are situated only near Darjeeling, and in the Nilgiris, whilst private plantations exist in several places in the Madras Presidency and in the Native States of Travancore and Mysore. The species of tree most commonly planted was the *C. succirubra*, various hybrids being next in number, whilst the *Calisaya* and *ledgeriana* were also evidently thought well of.

PROTECTION OF WOODEN PILES FROM THE TEREDO BORER.—The ravages of the teredo on all descriptions of wooden piles, even if the wood is soaked with creosote, has been a great objection to the use of wood for sea-jetties, harbour and dock work generally. The *United States Railway Gazette* publishes a description of an invention which it is claimed allows the use of wooden piles with complete immunity from the teredo. This, as described, consists of piping made of cement and divided longitudinally in halves, with keyways in each section which, when placed around a pile and keyed, form a scarf joint. This pipe is made in sections of 2 feet and 3 feet long, and the diameter varies according to the size of the pile. The pipe is placed around the pile at the top of the water, and section by section lowered until it rests on the bottom. The pipe is then allowed to settle a few inches and the annular space between the pipe and the pile is filled with sand. This casing, it is stated, affords absolute immunity from the teredo, whilst destroying any that may already be infesting the wood. The piping is made on the spot in iron moulds supplied by the patentees.

THE GOVERNMENT TIMBER DEPÔT AT KADO, MOULMEIN.—We understand that this depôt, through which all the timber floated down the Salween to Moulmein passes, is to be enlarged by the acquisition of an additional area of 35 acres.

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FORESTS AND THE WATER-SUPPLY.

The connection between the forests and water-supply of a country is of such an intimate nature that at first sight it is almost inconceivable that its full significance and importance should not be obvious to all well-educated men. And yet it is the general rule amongst the well educated Englishman to question this intimate relation. To point his arguments he will instance his own well-watered, damp, cold, misty and richly-rained-upon country.

We have no large forests and yet we have plenty of water is the argument put forward, the Englishman being entirely oblivious of the fact that his little Island home is entirely surrounded by water! It is to his upbringing doubtless that the Englishman, both collectively and individually, takes so little interest in forestry and all appertaining thereto. In spite of the length of time the British have held sway over India, it is only now that the real importance of this question is beginning to receive that meed of recognition which has been accorded to it for a century and more, for even in the Middle Ages some attention was paid to this subject, on the Continent

of Europe. Those who have followed forestry literature during the past decade are aware that slowly but surely a great awakening has been taking place all over the world, and that opinions formerly cast-iron in their conservative ignorance have been modified and revolutionised. It may, we think, be said that this great reformation has found its real birth in India and America. Questions which affect numerically small nations and comparatively small areas of the surface of the globe have but a slight influence as world-wide factors in forming opinions held by the human race as a whole. When, however, populations and areas of the magnitude of those of India and the United States, let alone such great Colonies as Canada, Australia and Africa, are faced with similar problems, and problems involving the future well-being of the entire race, what was the common knowledge of the few, becomes merged into the deep-rooted opinions of mankind at large. Such a state of affairs is rapidly becoming a *fait accompli* so far as the recognition of the importance of the forests on the water-supply of a country is concerned.

An article which deserves to be widely read entitled "Tree Influence on Rainfall" has, we note with pleasure, recently appeared in the columns of the Indian Press,* and we publish in this issue an interesting paper on the "Protection of the Sources of the Cauvery," in which some very noteworthy criticisms on the protection of the headwaters of the rivers in Madras appear.

Before proceeding to a consideration of some of the points raised in these articles, it may prove of interest here to quote the opinions on this subject of that eminent authority, Dr. Schlich, as expressed in his "Manual of Forestry." We read that—

(1) Forests reduce the temperature of the air and soil to a moderate extent and render the climate more equable.

(2) They increase the relative humidity of the air and tend to reduce evaporation.

(3) They tend to increase the precipitation of moisture.

(4) They help to regulate the water-supply, produce a more sustained feeding of springs, tend to reduce violent

* Allahabad, *Pioneer*, September 15th, 1906.

floods and render the flow of waters in rivers more continuous.

(5) They assist in preventing erosion, landslips, avalanches, the silting up of rivers and low lands, and arrest shifting sands.

(6) They reduce the velocity of air currents, protect adjoining fields against cold or dry winds and afford shelter to cattle, game and useful birds.

Many of our readers will be able to quote from their own personal experiences cases where the absence of or destruction of forest in this country has removed some of the benefits or given rise to some of the evils above enumerated.

Turning now to the article on "Tree Influence on Rainfall," the writer draws attention to the curious anomaly, which so well illustrates our opening remarks, that the Irrigation Commission which recently toured round the country entirely failed to take any cognisance of or to make any enquiries into the state of the catchment areas of the rivers upon which the whole foundation of their proposed elaborate network of canals entirely rested. We read—

This Commission travelled all over India, conferred with many authorities, visited works in the South, in the United Provinces, and in the Punjab, and then sat down and wrote what was meant to be an exhaustive report. They formulated proposals for new works or rather they re-stated authoritatively what had been proposed in former years, and on their recommendations colossal schemes of irrigation, costing millions sterling, have been approved and sanctioned by the Secretary of State. Yet in that Report (consisting of several hundred pages) the incidence that forests have on the question of irrigation, at the present time and especially in the future, is a factor to which no reference whatsoever is made! This is a fact which German and French critics of this voluminous report cannot understand; as the intimate connection between rainfall, forests, and the discharge of rivers is a fact so early instilled in the minds of the educated on the Continent that the omission of even a casual reference to the ultimate sources of water in a formal and in its way an epoch-making report, such as that presented to

Government by the late Irrigation Commission, is, to our foreign critics, inexplicable.

Possibly this otherwise unintelligible omission has an explanation. It may have been that an expression of opinion in this connection was ruled to be out of court for reasons of State, as a full exposition of the matter trenches upon somewhat delicate political ground. It may have been thought by the Commission that their mandate did not extend beyond the limits of British India. This is unfortunate, for as a matter of fact the territories between the 7,500 contour above the sea and the head works of our important irrigation systems in the north of India lie almost entirely in States beyond the administrative frontier of British India. Now it is between the level of the head works and about 7,500 that the intensity of the rainfall is at a maximum, that is to say, that the rain falling in that zone is chiefly, if not exclusively, responsible for the great floods that not only are wasted as far as irrigation is concerned, but that also are so destructive and cause such anxious moments to those in charge of the head works of our big canals.

If we take the excellent map of the Punjab published with the Punjab Administration Report for 1904-05, which exhibits quite sufficiently well the various canals and irrigation systems of that Province, as well as that of the North-West of the United Provinces, we find that the effective catchment basins of the Upper Indus, of the Jhelum, of the Chenab, of the Ravi, of the Sutlej, of the Jumna, and of the Ganges are all in foreign territory. The effective rain and snow that tends to feed the flow of these rivers and the forests whose function in nature is to maintain this flow as a uniform and perpetual discharge, all occur in tracts over which the Government of India has not hitherto exercised its right of efficient control, the only exception being the Bias river, whose sources are in British territory. Consequently the rulers of these extra-territorial tracts are at liberty to cut down their forests, to hew down their trees, and allow reckless grazing without system or on any organised plan. To argue that this system can be continued with impunity or that our agricultural interests are not jeopardised by such reckless disboisment shows a lamentable ignorance of the

most elementary principles of forestry. Surely it is not too early yet to bring influence to bear on the rulers of our Himalayan border and induce them to consent to their forests being administered on scientific principles.

SCIENTIFIC PAPERS.

ON POLLARD-SHOOTS, STOOL-SHOOTS AND ROOT-SUCKERS.

BY R. S. HOLE, F.C.H., F.E.S

PART III.

22. Hitherto in so far as we have considered pollard and stool-shoots, it is clear that we have been dealing with cases in which the individual tree, injured by the removal of its crown of branches, endeavours to repair the damage done and to regain its normal state of health. Under the most favourable circumstances then, all that we have here is a more or less complete rejuvenation of the individual tree, there is no division of the parent plant with the establishment of new and independent individuals and hence no true *reproduction*, in the correct sense of the term.

In all cases hitherto considered neither pollarding nor coppicing can be regarded as a method of reproduction.

23. The question next arises whether, under some circumstances, stool-shoots do become independent individuals provided with root systems of their own and not relying on the old roots of the parent tree; if so, we should be forced to conclude that true vegetative reproduction may take place not only by means of root-suckers but also by stool-shoots.

Authority for believing that vegetative reproduction may be effected by means of stool-shoots.

The following authorities support the belief that such a supposition is at all events not impossible.

Dr. Schlich speaking of stool-shoots and root-suckers on p. 175, Vol. I, of his *Manual of Forestry*, says: "If the new individual is capable of producing root-buds and of developing them into

roots it becomes independent of the mother plant, in such a case reproduction is established by a division of the mother plant."

On p. 263 of Hartig's *Diseases of Trees* (*Eng. Trans. by Ward and Somerville*) we find the following remark on stool-shoots: "As it is very desirable that these should become self-rooted, so that the new plants may be unaffected by the health of the parent stool, it is an advantage to have them as low down on the stool as possible."

Stool-shoots of teak may produce independent roots.

24. No one who has had experience of teak coppice forests can have failed to notice when an old tree, the interior of whose stem has entirely decayed, has been felled level with the ground, that vigorous coppice shoots often make their appearance from the periphery of the old stool and that, after a few years, in the place of the stool which is no longer traceable on the surface, several young plants are found which, in shape and appearance, resemble healthy and vigorous seedling trees. Such shoots are often several feet apart, there is no visible connection between them at the ground surface, and at the first glance we recognize that we have conditions here which differ widely from those obtaining in the case of pollard-shoots, or of a group of coppice shoots situated on the top of a small and healthy stool. I have recently dug up several teak coppice stools and have had sections of them prepared. There is, I think, no room for doubt that with teak at all events coppice shoots are capable of developing independent roots of their own.

Probable that in the case of teak a division of the parent stool may occur with the establishment of independent individual plants, *i.e.*, that true vegetative reproduction is effected by means of stool-shoots.

25. Whether or not the young shoots, in such a case, ever become entirely separated from the parent stool, I have been unable to prove as yet. From the specimens seen by me, however, it does appear that in the case of teak, coppicing, especially of old trees, usually results in the production of young shoots, many of which are provided with an independent root system of considerable extent, but which usually maintain alive in their immediate neighbourhood a more or less

extensive area of tissue belonging to the parent tree. From this living tissue which is situated below the level of the ground adventitious roots are usually developed in considerable numbers which, it would seem, must help in procuring the necessary water and salts required by the young shoot nearest to them, in return for the food materials supplied to them by that shoot. May we not then reasonably conclude that the living tissue which, before the cutting of the tree, was subservient to the dominating individuality of the parent stem, has since the removal of the latter, become mainly devoted to the service of the individual shoot from which it receives the greater portion of its necessary food supplies; that, in other words, we have under such circumstances a more or less complete division of the living tissue of the mother plant, with the establishment of distinct individuals?

It appears, it is true, possible that, in many cases, all the shoots arising from one stool as above described are connected, more or less directly, with each other by links of living tissue, but there seems to be no *primâ facie* reason for believing that such connection between different individuals is in itself likely to be injurious, as already noted in paragraph 15 above.

26. The question of decay spreading from the old stool to the young shoots, in the case of teak at all events, does not appear to be a serious danger. A young shoot 13 years old, examined showed that the decay had only spread slowly downwards in the centre of the heartwood of one of the old roots of the parent stool in one case, whilst in others there was no sign of decay spreading to the young shoot or its roots.

Decay spreading to the young shoots is probably not a serious danger in the case of teak.

27. Such evidence may surely afford us reason to believe that with some of our Indian species continued reproduction is possible not only by root-suckers but also by means of stool-shoots.

28. The shape of the cut surface of the stool is a point on which much stress is often laid in the rules to be observed in coppice fellings and a dome-shaped surface is usually recommended, *i.e.*, one which is highest at the centre. It has been

Best method of cutting the stools in coppice felling.

noticed however that a high stool may interfere with the development of the independent root system of a young shoot.

The rapid decay of the old stool thus appears not only to afford the necessary room for the development of such young roots but also to provide a soil enriched with decaying organic material from which they can obtain their needful supplies of salts.

In the class of cases mentioned in paragraphs 17 and 19 above, it has been pointed out that the object to be kept in view is the rapid recovery of the parent plant from the injury inflicted, the body of the parent plant being kept as far as possible *intact*, and this object would clearly be promoted by the rapid healing and covering over of the cut surface of the stem by healthy living tissue.

In the class of cases now under discussion, however, it would appear that the more extensive the independent root systems of the young shoots and the more rapid the decay and disappearance of the greater part of the stool and roots of the parent tree, the more successful are the young shoots likely to be, from the point of view of reproduction. In other words the object to be kept in view is not to maintain the body of the parent plant intact but to ensure its *rapid disintegration*.

29. It is doubtful whether we shall be able for several years yet to draw up sound rules for the management of our coppice forests based on an accurate knowledge of the life histories of our species, but, on the evidence at present available, it would certainly seem preferable to adopt, as a general rule for coppice fellings, a flat section, cut level with the ground, and not a dome. The former offers no obstruction to the rapid covering of the cut surface by vigorous young shoots on a small stool, and, in the case of old stools, every extra bit of wood left in the stool may be distinctly injurious to the young shoots, by obstructing the development of their roots.

In some cases of course, where the decay spreading from the old stool is likely to be injurious to the young shoots, or where natural decay is not likely to ensure the disappearance of the central portion of the stool with sufficient rapidity, it may be advisable to cut away the greater part of the stool, and, where the object is

to favour the production of root-suckers, the removal of the entire stool will often be necessary.

It is interesting to note that so long ago as October 1875, in a paper read at the Forest Conference held at Simla in that year Mr. Fernandez recommended the following procedure for the coppicing of old teak :—

"The soil has to be dug up round the tree to be felled until the whole stem and principal roots are exposed. The stem should then be cut out as near as possible to its junction with those roots, and the earth thrown back and gently pressed down."

It would obviously however in all cases be a question for decision whether the extra expenditure involved by such operations is justified by the improved condition of the resulting shoots.

30. Sufficient has now I think been said to show that both root-suckers and stool-shoots may vary greatly in their character and with regard to the conditions under which they develop. Moreover we know how greatly the same species may vary in different localities and how much different species may vary in their behaviour where exposed to similar conditions and treatment, in consequence of which we must recognise the necessity of not accepting any sweeping generalisation, such as "coppice shoots can never produce fertile seed" until we have obtained for ourselves proof that this is so, with coppice shoots of the various types indicated in this paper, in the case of the particular species and locality we have to deal with. Mr. Fischer, for instance, has recently reported experiments on p. 198 of Vol. XXX of the *Indian Forester* from which it appears that seed obtained from sal coppice shoots was found to be fertile in Ganjam.

Necessity for obtaining proofs regarding the characteristics of stool-shoots and root-suckers in the case of particular species and definite localities before accepting as true any general statement regarding them.

31. Seeing that such a large proportion of our Indian forests are now managed as coppice or as coppice with standards, the subject of the present paper appears to be one of great and daily increasing importance, and I have therefore ventured to draw attention to it, now, when the establishment of

Advisability of commencing the systematic collection of data bearing on the points here alluded to without delay.

a Forest Research Bureau with its complement of botanical and sylvicultural experts, being on the eve of becoming an accomplished fact,* encourages the hope that a commencement may now be made to systematically collect reliable data bearing on some of the points here mentioned, some of the most important problems perhaps being—

In the case of definite species, in selected localities :—

(*a*) Can true reproduction be effected by root-suckers or stool-shoots?

(*b*) What are the principal conditions which respectively favour and obstruct such reproduction?

(*c*) In each case which method of reproduction is the best?

(*d*) In what cases is pollarding preferable to coppicing?

(*e*) What are the best practical methods of felling to be adopted in each case with the object of helping the tree cut to recover from the injury inflicted as quickly and completely as possible?

It should be noted that the problems here referred to do not necessarily only concern those forests which are to be permanently managed as coppice or coppice with standards. Their solution will for instance enable us to decide whether, in some cases, a preliminary round of coppice fellings is not a better treatment to apply to a poor and irregular crop, when it is desired to manage the same ultimately under one of the High Forest Systems than that usually known in India as the System of Improvement Fellings.

32. In conclusion, it seems advisable to draw attention to the despairing strain so often found of recent years in our Annual Reports to the effect that our coppice forests are being denuded, as a good example of which we may take the following extract from the Bombay Northern Circle Report for 1894-95 printed at p. 457, Vol. XXX, of the *Indian Forester*:—

No apparent necessity for immediate anxiety regarding the possible denudation of our coppice forests.

"It cannot be overlooked that there is a great dearth—too often a total absence—of seedlings to replace the present stools when

* Created on June 5th, *vide* R. and A. Department, Government of India, Forests Circular No. 11—166-2-F., dated Simla, 5th June, 1906.

Photo.-Mechl. Dept., Thomason College, Roorkee.

TRANSPORT OF TIMBER BY HAND IN THE GOALPARA FORESTS.

their reproductive power shall be exhausted. The vitality of the present stools may last out two or even three revolutions, but unless seedlings are produced to replace them as they fail, the ultimate result must be denudation."

Seeing that there is reason to believe that both stool and pollard-shoots are not necessarily inferior to seedling trees in their power of producing fertile seed and also that the continued reproduction of many of our species may be ensured by means of root-suckers or by stool-shoots, there certainly seems to be no ground for immediate anxiety regarding the possible denudation of our coppice forests.

ORIGINAL ARTICLES.

THE GOALPARA FOREST TRAMWAY.

BY W. F. PERRÉE, I.F.S.

PART I.

In places where ordinary means of transport are scarce or costly, where the use of carts is possible only for a short season, and where materials in quantity have to be transported in excess of the capability of ordinary local means, tramways may often offer a solution of transport difficulties. The Goalpara forests which are situated under the Bhutan Himalayas at distances varying from 30 to 60 miles from the Brahmaputra river, have always suffered from insufficient means of export. The resident population has never kept draught cattle for any purpose beyond ploughing, and the transport of timber has been hitherto done by hand, large trees being cut into short logs (dhums) under 7 feet in length which are rolled by hand sometimes for 12 or 15 miles to a floating stream. Smaller timber has been carried out of the forest on men's shoulders, *vide* plate XXXIV. On reaching a suitable stream the timber is lashed to dugouts and taken to the Brahmaputra whence it is rafted with the help of large boats to the principal towns of Eastern and Lower Bengal. It is evident that these extensive

forests could not be worked successfully by means of such primitive transport; the inaccessible blocks generally remained untouched and the entire yield was seldom brought to market. The land adjoining the reserved forests is, with the exception of a few Mech villages, almost uninhabited. Local labour is therefore scarce, while the unhealthiness of the Terai tract renders work by imported labour possible only during the short season from December to April. Difficulties are enhanced by the presence of a waterless or "Bhabar" tract varying in width from 8 to 15 miles which is waterless during the open season. Attempts to sink wells have been made, but below 30 feet large boulders are encountered rendering excavation next to impossible and water is not found even at a depth of 80 feet. In deciding on additional means of transport it was therefore necessary to always bear in mind that workmen in the "Bhabar" tract would have to be supplied with water. Elephants are in use for dragging timber and a part of the outturn has been extracted with their help, but these animals are liable to outbreaks of anthrax and are unsuited for work at a distance from water. Buffaloes or bullocks could have been used for draught, but they would have involved the construction of roads for cart traffic which in forests where the rainfall exceeds 150 inches are soon churned into quagmires, and the local cattle are infested with rinderpest and foot-and-mouth disease, so there was clearly great danger in relying solely on horned cattle. After due consideration, it was decided to lay a tramway in the Western Range which is the most remote from the sale depôts and offers the greatest difficulties of transport, as well as disadvantages regarding water-supply. The line was commenced from a convenient floating stream and gradually pushed northwards to deal with the coupes in succession. Some re-arrangement of coupes was necessary to ensure the most economical use of the tramway. In 1901-02, a commencement was made with 2½ miles, subsequent additions bringing up the total to 9½ miles. The gauge and strength of materials had first to be settled. Portability is an important factor and the universal 24 inch gauge was therefore adopted. In deciding on the strength of materials it was necessary

to know the safe loads for rails of different strength. The weight per yard of rails is used to indicate the quantity of metal in the various sections, so that the strength varies with the weight. The safe load is indicated by the maximum pressure which a wheel can carry without causing deflection in the rail and this again varies with the spacing apart of the sleepers.

The following table shows the wheel pressures for different weights of rails with the spacing of sleepers in most general use :—

Sleepers apart.	Wheel pressures for rails of -					
	10 lbs. per yard.	14 lbs. per yard.	18 lbs. per yard.	18¾ lbs. per yard.	20 lbs. per yard	24 lbs. per yard.
40"	990	1,700	1,960	2,485	2,900	3,970
36"	1,100	1,900	2,130	2,755	3,210	4,600
32"	1,275	2,150	2,500	3,170	3,685	5,300
27"	1,450	2,510	2,900	3,650	4,230	6,075

These figures are approximate for mild steel and it should be remembered that laboratory tests require a substantial margin of safety. The comparatively large differences between rails of 18 lbs. and 18¾ lbs. is due to the difference in section ; the latter is nearly ½ inch taller and while offering greater resistance to vertical pressure is obviously more liable to lateral deflection. It is, however, important to realise that a comparatively light rail may carry the same load as a heavier one, if more closely sleepered, a useful fact to remember in determining the initial outlay. In the present case it was considered that the maximum size of logs which the rails need carry would not exceed 50 cubic feet, allowing 70 lbs. per cubic foot and three such logs per bogie truck on eight wheels, the wheel pressure would be only 1,312 lbs., so that 14 lbs. rails would clearly be of sufficient strength, especially as the above maximum load would be very exceptionally carried. In order also to keep the initial expenditure as low as possible, 14 lbs. rails were decided

upon, and, with a view to maintaining portability, corrugated steel sleepers weighing about 12 lbs. per yard and 40 inches apart were adopted. It has, however, been proved that on temporary lines where the sleepers do not always rest on a firm bed, it is preferable to place them at about 32 inches' interval. This admits of placing sleepers nearer the rail joints, at which places the rails always show a tendency to bend, especially on gradients where the speed of loaded trucks is considerable.

The rails are in 5 metre lengths (16½ feet); the materials were purchased in Calcutta from Messrs. Martin & Co., the then agents for Messrs. Arthur Koppel & Co.* I am greatly obliged to the latter firm for allowing me the use of woodcuts from their illustrated catalogue and for the table of wheel pressures above quoted.

The laying of the line offers no practical difficulty and is easily accomplished by unskilled labour. The ground in the tract here dealt with is generally level with a slight slope from north to south which is the general direction of the alignment. A few undulations and shallow depressions necessitated small embankments in order to keep the slope down to 1 in 200. After selecting the alignment, the trees are felled by the roots to a width of 10 feet, a track 6 feet wide is then raised about a foot above the surrounding level by cutting drains 2 feet wide on either side and throwing the earth on the centre. In high land this is sufficient, but in places liable to inundation the line must always be above flood level. The surface is then approximately levelled by eye—see plate XXXII. The tramway materials are fixed together by a simple system of bolts and nuts. Mech and Santhal coolies were employed. It is important to keep a check on the issue of clips, bolts, nuts, etc.; such small articles are easily mislaid and lost. It is advisable to issue each morning the approximate quantity required for the day's work. The materials are roughly placed in position and bolted together—see plate XXXII. The rails are fixed to the sleepers by clips which are bolted through the sleeper as shown in the annexed woodcut—Figure 1. There is a rectangular hole in the sleeper through which the similarly shaped bolt head is passed. The

* Messrs. Arthur Koppel & Co. have now their offices at 1, Mission Row, Calcutta.

SECTION READY FOR LAYING TRAMWAY.

Photo.-Mechl. Dept., Thomason College, Roorkee. Photos. by W. F. Perrée.

MATERIALS IN POSITION FOR LINKING.

PREPARING LINE FOR PACKING.

Photo.-Mechl. Dept., Thomason College, Roorkee. Photos. by W. F. Perrée.

PACKING LINE.

bolt is then turned through 90° and the clip firmly screwed down. The holding is found to remain firm for years. In the last extension of 3½ miles, which it is calculated will remain in position for 6 or 7 years, wooden sleepers (4½′ × 5″ × 4″) at 33 inches interval have been employed. The cost is very little less per mile than if steel sleepers at 40 inches interval are used owing to the enhanced cost of laying by skilled labour.

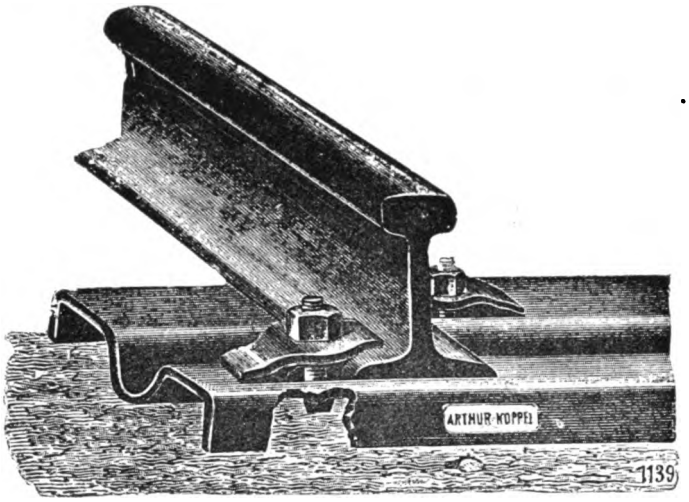


FIG. 1.—CLIP AND BOLT FASTENING FOR ATTACHING RAILS TO SLEEPERS.

The defect in the steel sleeper is that, resting on the surface, and the end being open, it does not offer the same resistance to lateral displacement as a wooden sleeper firmly buried to a depth of 4 inches in the well trodden earth. Wild elephants walking between the rails kick them outwards as they pass along and displace the line laid on steel sleepers laterally but have no such effect on the section laid over wooden sleepers. After the line has been securely bolted it is straightened with crowbars and packed. For this purpose some earth is thrown on the line from the drains and packed firmly under the sleepers—see Plate XXXIII. This is an important operation as the line must at the same time be finally levelled, and the firmness of the rails as well as the durability of the line depends on this. Ballasting is unnecessary, but good drainage

is essential. Men should patrol as soon as possible after rain and open all drains which may be choked and let out any water which may collect between the rails. Plate XXXI shows a finished section of line.

For control of traffic and also in order to facilitate laying, long straight lengths are preferable to a series of curves, however slight. The laying of curves is a simple matter As a rule this can be done by eye, remembering always that too steep a curve is apt to cause trucks to derail ; on the other hand, it is not advisable to bend more rails than are absolutely necessary, as this may affect the usefulness of materials later on. A jim crow—see Figure 2—is applied at intervals of a foot or so along the rail until it

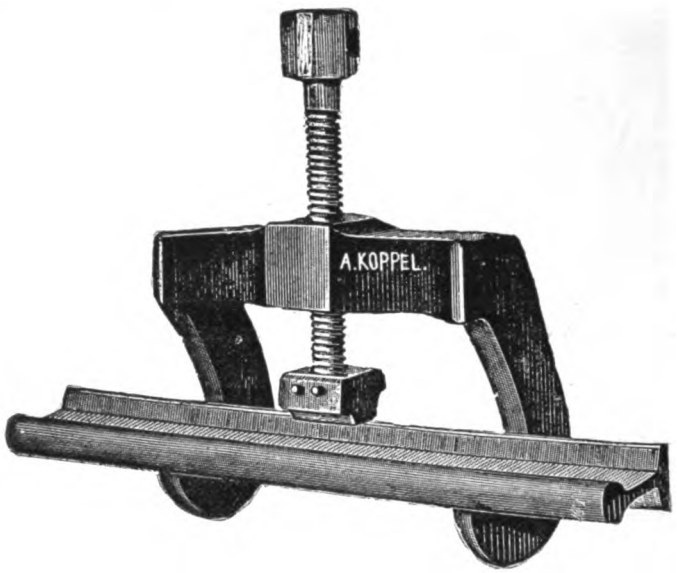


FIG. 2.—"JIM CROW" OR RAIL BENDER.

reaches the necessary curve. Some practice is required to apply force evenly all along the rail and thereby avoid an uneven curve Having completed one rail, the other is placed on top of it now and then, as the jim crow is applied, in order to gauge the progress and thereby ensure exact correspondence of adjoining rails. When lifting the line and relaying it in another place, it is

not necessary to open the sleeper bolts at all, the fish plates only need be opened and the line lifted in rail sections. In practice it is found easy to lift the 14-lb. plant in sections of two rail lengths. For this purpose the rail joints should be kept exactly opposite each other. This is not possible on curves, where the inner rail soon projects beyond the outer. The former can be cut or on temporary lines a block of wood may be inserted to fill up the gap. If hard wood is employed and firmly fixed to a wooden sleeper renewal will not be necessary more often than twice a year.

Rolling stock, the outlay and working of the tramway will be dealt with in a subsequent article.

THE PROTECTION OF THE SOURCES OF THE CAUVERY.

In the May number of the *Indian Forester* appears a short article entitled "Mysore Forests and the Cauvery River," calling attention to the necessity for the careful preservation of the forests on the catchment areas of the Cauvery. Judging from the various articles which have been printed in the *Indian Forester* any stick is good enough to beat Mysore, but is Mysore alone to blame for want of protection of these important areas? The answer must surely be in the negative. Every tree that grows must, of course, have its effect on the distribution of water, but, though I have never seen this principle clearly laid down, I think it is generally accepted that, from the water point of view, the deciduous forests represent the copper, the semi-shola the silver and the true shola forests the gold. If this axiom be true, it is the protection of the actual evergreen forest which is of the first importance, when the proper distribution of water is considered. As far as my experience goes in the south of India, no reckless destruction of Government shola forest is going on for the sake of the revenue from timber. The most valuable trees in this class of forest are the Mesua ferrea, the ebonies, the Gluta Travancorica of Tinnevelly, the White and Red Cedars of the West Coast and the Poonspar and Artocarpus hirsuta of the Anaimalais and the West Coast. Valuable as are these species, their distance from the

various centres of consumption renders them less remunerative than the more easily extracted Teak, Vengai and Rosewood. There is then little danger from over-extraction of timber, but, in other ways, much of this valuable forest has been or is being destroyed, and an examination of the Cauvery river cannot but be instructive from several points of view. Not only is Mysore benefited by the supply of water in the Cauvery, but a great deal of the wet cultivation of Coimbatore, Trichinopoly and Tanjore is dependent on it and the value of a regular supply of water can therefore scarcely be over-estimated.

My geography is distinctly weak and I am quite open to correction, but are not the actual sources of the Cauvery outside Mysore and somewhere up in the Western Ghats of the Bombay Presidency*? If this is the case then Mysore is not able to control the chief source of supply, and can only assist in its maintenance by the proper upkeep of the shola forests of the principal streams which fall into it. At all events Mysore is not in any way responsible for the proper supply of water in the Kabbani, a large river which falls into the Cauvery before it reaches the Sivasamudram works, and which alone should, if properly controlled, give sufficient water for the continual supply required by those works. Now the Kabbani is a Mysore river and belongs to Mysore alone, but Mysore has practically no control over it whatever. Throughout its course it runs through dry arid plains, with no forest near it but the dry deciduous forest round Kakenkotta and the neighbourhood. But the Kabbani itself is formed by three considerable Malabar rivers, known locally as the Pannamaram, the Manantoddy and the Bavali rivers. All these rise in the dense sholas of Malabar and run through the Wynaad, a country which should be dense with evergreen and semi-evergreen forest. As regards the sources of the Pannamaram I know very little; but it rises in the region of heavy rainfall and runs through a country, which must at one time have been dense shola, which, however, was subsequently converted into coffee estates. When these estates were abandoned, the original sholas became a dense mass of lautana or

* The Cauvery River rises in the Western Ghats in Coorg. [HON. ED.]

bare grass land, the remaining forest being subjected to that pernicious system of cultivation known in various districts as Tuckle, Ponam, Podu, Kumri and a variety of other names. The Manantoddy river is formed by three considerable streams which rise in dense sholas, but to my certain knowledge, a large part of the catchment area of the chief of these has been cleared for coffee and abandoned, and the shola which contains the headwaters is now to be opened out for the sake of an experiment in rubber. Now it may be argued that Government has nothing to do with these lands, because, as is usually the case in Malabar, the lands belong to private owners; but, considering the vast interests at stake both in Mysore and in British territory, ought not the Government to step in and acquire the catchment areas of these streams and rivers and insist on their rigid protection? The Bavali rises in what is now Government evergreen forest and runs for a great part of its length through semi-shola, at the bottom of a deep valley, which forms a splendid catchment basin. Unfortunately, however, considerable areas in the valley were at one time given over to coffee estates, but under protection these are gradually reclothing themselves with forest, and it is the duty of the department to see that this forest is properly protected and so contributes its proper share towards the perennial water-supply of the Cauvery.

The next portion of the Cauvery to be considered is that between the Sivasamudram Falls and the Bhavani. In this portion there are no large rivers, but there are three considerable streams which ought to add considerably to the water-supply. These are the Gundila, the Odontharai Halla and the Palar. Most of the water of the Gundila drains into a series of large tanks near Kollegal, where it is absorbed by wet cultivation, but the balance drains into the Cauvery and all the drainage from the Kollegal fields must also eventually find its way to that river. This stream is dependent on the dense sholas around Bellagie, the chief of which is the fine Bellagie shola itself. It is therefore surprising to learn that part of this splendid shola is to be given up to the rubber craze. Apart from this, the fire protection is not what it ought to be in this neighbourhood and, what with the mischievous sholagar and

the incendiarist shepherd, there is little doubt that the shola forest, instead of increasing in area, is little by little being eaten into by fire. The Odontharai nalla rises from the same neighbourhood and has been chiefly mentioned to call attention to the fact, noted by Mr. A. W. Lushington, that within the memory of man it was a perennial stream but is so no longer, clearly proving that our protection of the sholas is not what it ought to be. As regards the Palar I can say very little, for, though I have often been along its banks, I have never traced it to its source, which is, I believe, in a somewhat inaccessible portion of the Burgur Hills. Its very inaccessibility may have assisted in the protection of the head-waters, but as all that part of the country is a vast grazing ground, I consider it very possible that the protective forests are being lessened by fire, which, in North Coimbatore, appears to be the natural concomitant of grazing.

The next important tributary of the Cauvery is the Bhavani, with its perennial affluent the Moyar. Of what importance this river is may be judged by the fact that for many years there has been a project under investigation of bunding up these two rivers with a big dam, thereby forming a large lake of about 40 square miles. The chief object of this scheme is to lead the water into the Cauvery during the dry weather, and thus secure the third crop of paddy in the Tanjore District.

The Moyar is very nearly as important as the Bhavani itself, for, though it is only a small river, yet in the hot weather it is always full of water, and from this I should judge that its sources are well protected. These sources are, I believe, in the Nilgiri District in the Moyar reserve, but on this point I am not certain and it is for the District Forest Officer of that Division to say to what extent they are protected.

For the greater part of its length this river runs through forest reserve and, after entering North Coimbatore, it receives useful additions from the reserve known as the Nilgiri Eastern Slopes. Even there protection is by no means perfect, as parts are occupied by coffee totes, and the Trulars are a source of nuisance breaking up out-of-the-way parts of forest for cultivation and setting fire to the

slopes. As, however, the reserved area is large and the portions cultivated small, the sources of water cannot be greatly affected.

The Bhavani river itself rises in the Attapadi valley in south Malabar, and in this valley Government have been able to secure some small patches of reserve, but the greater portion has been declared to be private land, and disputes as to ownership have been innumerable and have actually given rise to bloodshed. Many years ago Mr. Porter was instructed to report on the forests required for the protection of the headwaters of this important river, and he seems to have made some judicious selections, which however were not acted upon, possibly because Government were not prepared at the time to acquire such a large extent of private forest. Needless to say these private forests have since deteriorated under the woodcutter's axe and the Ponam of the hillman, but there are still large areas practically untouched, owing to their inaccessibility, and it would be well for Government to acquire them before they are destroyed, and to carefully protect them when they are acquired. This will mean the proper opening out of the valley and the spending of money on rest-houses, without much hope of return from the forest point of view, but the return will be there in the increased and properly regulated supply of water, not to Malabar, but to the Tanjore District, many miles away. What then are the lessons to be learned from this study of the Cauvery system?

(1) That we should not throw stones at Mysore, until we have thoroughly protected our own glass-houses.*

(2) That we should point out to Government that it would be wise to spend money on the protection of water sources without any hope of direct return.

* The *raison d'etre* of the *Indian Forester* is to draw attention to and impartially discuss any and every point bearing upon forest matters, amongst the most important of which is the subject here treated of. Our correspondent will therefore, we feel sure, admit that the writer of the note on the 'Mysore Forests and the Cauvery River, who has no connection with either Mysore or Madras, has performed a service of no mean value; for his remarks and inferences with respect to the state of things in Mysore have resulted in our correspondent's most interesting and valuable note on the position of affairs in Madras.—[Hon. Ed.]

(3) That our shola forests must be treated with the greatest caution and that we must look upon them as protective and not remunerative.

(4) That the hillman is out of place in a shola forest and that, if he will not conform to the uses of civilisation, he will have to go elsewhere for the sake of the welfare of the greater number.

(5) That we must steel our hearts against the wiles of the planter so long as the land he requires is in the vicinity of an important source of water (which it generally is).

(6) That we should insist on the proper protection of sholas which are now in our possession, and spend money in fire protecting them, without hope of direct return.

Government spends large sums of money in the investigation of possible irrigation projects. Is it too much to ask that they should properly investigate their natural sources of water and see that they are being protected in the right way?

P. M. LUSHINGTON.

CAMP ANTERASAUTA:
9th July 1906.

CORRESPONDENCE.

TO THE HONORARY EDITOR OF THE INDIAN FORESTER.

FORESTRY TUITION AT OXFORD AND DEHRA DUN.

SIR,—I notice that some recent remarks of yours on the instruction imparted at Dehra Dun and Oxford have raised a protest on the part of Dr. Schlich. He labours to show that so much time is given up to lectures in one subject under the best instructors available, and so many hours to another. All this seems to me to be beside the mark. What the clear-headed business man cares to know is not the details of instruction but the result of it when put to the test of actual practice. Dr. Schlich quotes the case of one man who found, after taking honours at Dehra Dun, that there was still something to be learnt at Oxford.

I do not for a moment doubt it; I would, on the other hand, suggest that if the men coming out in the Department from Oxford were to go to the Dehra Forestry College they would find that they had still almost everything to learn as far as practical forestry in India is concerned. There is always something new to learn in forestry, and the training at any centre can never be regarded as final. The instruction at Oxford may no doubt be imparted by Fellows of the Royal Society or other eminent specialists; these gentlemen are generally, however, unacquainted with our Indian requirements. What we want is that it should be imparted by men who have an up-to-date knowledge of what is required in India, of what will be most useful, and what will tend to make their pupils efficient servants of the Indian Government: the desideratum is not theoretical instruction (however good) aided by narrow practical work while on a small excursion or in a botanical garden, but theoretical instruction on broad lines backed by useful practical work that will adequately illustrate and allow to be assimilated this instruction in the actual localities where in after time it will have to be applied.

To my mind in spite of the eminent men at Oxford and the long hours of lecture, the training there, if the test be practical efficiency in India, must end in failure. Dr. Schlich goes on to say that the present course of instruction is what it has been at Coopers Hill during the last few years. This will not give unalloyed satisfaction to the Department out here. Should the opinion of almost any Conservator, who has the progress of forestry at heart, be asked, he will tell you that, although the Old Nancy and Coopers Hill men of the earlier years turned out as a general rule excellent practical officers, there has been a marked falling off of late years (though naturally there are brilliant individual exceptions), and if the course of instruction at Oxford is what has lately obtained at Coopers Hill, the close observer will find ample cause for grave doubt as to whether the results will prove satisfactory. It is evident that if we are not obtaining the men we require, and there is little doubt about this, the cause must be that the stamp of man coming forward

leaves much to be desired, or that the method of training as judged by the results is largely capable of improvement. If the right stamp of man will not come forward, surely Dr. Schlich must, unless he has lost all touch with India, also recognise the fact, and, while doing so, must see that it is his duty to point this out to the Government at home and advocate radical improvements in the pay and prospects of the service and in this way co-operate with the Government of India. If, on the other hand, the method of training is a barrier to our obtaining the men we require, the course at Oxford should be abolished or at least new blood should be infused into that portion of the teaching staff responsible for the education in the forestry subjects. By new blood I mean men who are keeping themselves intimately acquainted with the progress of foresty in India, who are in active touch with such progress, and can impart such instruction as, while meeting our present requirements, will be an incentive to greater progress in the future. There can be no doubt that a marked advance has taken place in the last few years, and that in order to keep pace with this at Oxford we require our " hopefuls " to be instructed by practical men who have been and are taking part in this advance.

Dr. Schlich considers it of the first importance that the forest students should be well acquainted with the details of forest management in a country where forestry has been brought to the highest state of efficiency. I entirely agree. I must question, however, whether the younger Forestry Departments of the world have not overtaken and even outrun those of Europe, as far as efficient forest management and economics are concerned. There is a very widespread feeling that we, in some of the Indian provinces at least, have little to learn from France and Germany, and will have still less when the new Forestry College and Research Institute at Dehra are firmly established. On the other hand my impression is that Europe will, however unwillingly, be forced to recognise, at no remote period, that it has much to learn from the more practical and go-a-head methods of India and the United States. Very lately I met a member of the French Forest Service touring in India. He

expressed himself absolutely astonished at our maps, our working plans, and frankly confessed that there is nothing comparable with these at home. The unprejudiced mind must be rapidly forming the opinion that forestry in India, no doubt partly owing to the far greater opportunities, is rapidly tending to leave forestry in Europe far behind, if this is not already an accomplished fact. The conclusion that I am being driven to is, always provided that we induce the right stamp of men to come forward (and this should and can be done by offering adequate pay and prospects, thus removing the discontent that is permeating the Department out here and finding its echo at home), that the training of our recruits is a mistake at Oxford or elsewhere in Great Britain, where natural training grounds are too restricted or non-existent, where the practical requirements of Indian forestry are subordinated to narrow theoretical instruction, imparted no doubt by men of high eminence but out of touch with the progress now discernible in India—that three years on the Continent would permit of an infinitely wider training, resulting in our obtaining men of a more practical bent—but that the best training ground of all is India itself where, at Dehra Dun, our actual requirements would be duly appreciated and adequately met. The only objections that at present occur to my mind with reference to an Indian training are that men might be brought out to India too young (this could, however, be obviated by raising the age limit and by allowing the period under training to count towards pension), and that if, after spending two or three years at the Forestry College, they were found to be unsuitable, or for some reason or another did not enter the Forest Service, they would find it somewhat difficult to obtain a start in a more congenial career and might be stranded. What, therefore, I would advocate is two years' training on the Continent, followed by one year's probation at Dehra Dun. I believe that this would give us practical men and be a strong incentive to the advance of forestry that is now showing itself in parts of India after many years of comparative stagnation.

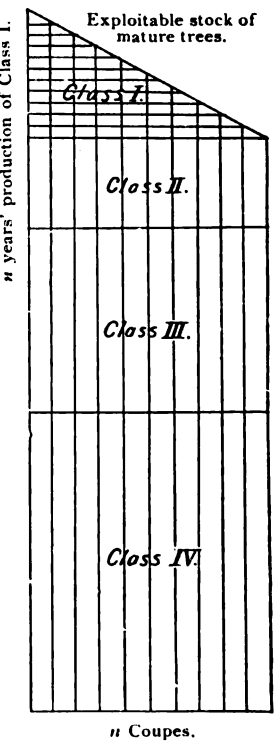
OBSERVER.

SELECTION BY AREA.

SIR,—In the July number of the *Indian Forester*, a letter appeared by Mr. Lovegrove, in which he condemned the method of calculation in the Working-plan under discussion, on the ground that the total number of second-class trees taken into consideration in calculating the possibility will not be included in the outturn during the first felling-cycle.

Without entering into any discussion as to the merits of the so-called selection-by-area method, or its value as a fresh discovery in the world of Forestry, I wish in a few words to combat the strange theory that an error is committed by any Working-plans Officer who allows any second-class trees that have been included in the possibility calculations to be left standing in the coupes after the first passage of the fellings through the area.

I feel that I owe an apology to the readers of the *Indian Forester* in re-stating the very obvious and elementary fact that the yield of an entire area of forest can only be realised annually off an $\frac{i}{n}$ of its surface, on the condition that n years' production of trees of the exploitable size have been allowed to accumulate on this fraction of its surface. Consequently, in order to be in a workable condition, every forest must always be constituted in the manner roughly indicated in the accompanying diagram; the vertical distances representing the relative proportions of the different size-classes, and the horizontal distance the number of years in the felling cycle.



If all trees already mature, together with all second-class trees attaining maturity within the first felling-cycle were to be removed within this period, there would obviously be a very insufficient stock of trees left with which to continue the fellings

during the second rotation, so that the constitution of a sufficient stock of exploitable trees which, though they must always be kept standing on the ground, are not "surplus" is (so far from being an "error") a matter absolutely essential to the regular working of the forest, and a much more important feature of the plan than the correct calculation for the next score or two of years of the exact number of trees available for extraction.

In an extreme (but by no means unheard of) case, the whole of the first-class, and the whole of the second-class trees attaining maturity during the first felling-cycle, might have to be left to form the exploitable stock to be kept standing on the ground (the size of which would be directly proportional to the length of the felling rotation), and nothing at all would then be available for extraction during the first felling-cycle.

H. JACKSON.

NAINI TAL:
14th August 1906.

REVIEWS AND TRANSLATIONS.

SCHLICH'S MANUAL OF FORESTRY.

FOREST POLICY IN THE BRITISH EMPIRE.

Schlich's Manual of Forestry. Vol. I—Forest Policy in the British Empire, by W. Schlich, Ph.D., C.I.E., F.R.S., F L.S., M.A., Oxon., 3rd Edition, revised and enlarged. London: Bradbury, Agnew & Co., Ld., 10, Bouverie Street—(1906).

We have to welcome a third edition of Schlich's well-known Manual of Forestry. In the preface to the first edition it was explained that this Manual was destined, in the first place, for the instruction of probationers for the Indian Forest Service. It was also stated that, during the progress of the work, alterations of the original plan were likely to be introduced. The third edition of Volumes I and II has accordingly been re-arranged. The second half of Volume I has been transferred to Volume II and instead the part of the first volume dealing with "Forestry in

Britain and in India" has been enlarged so as to become an abstract of "Forestry in the British Empire." This new portion of the work is eminently readable, and the gifted author is to be congratulated on a re-arrangement which, by omitting the chapters on sylviculture, gives much more needed space to the discussion of the advancement of Forestry in the British possessions.

No changes have been made in Parts I and II, which remain identically the same as in the second edition, and therefore require no fresh consideration here.

Part III deals solely with Forestry in the British Empire and is divided into five chapters treating respectively of the British possessions in Asia, Australasia, British possessions in Africa, America and Forestry in the United Kingdom.

In Chapter I East India is first considered, being subsequently followed by Ceylon, the Straits Settlements, the Federated Malay States, Cyprus, North Borneo and Samarak. The forest conditions, policy and organisation are, in so far as is possible, treated of under each.

Under Australasia in Chapter II, Queensland, New South Wales, South Australia, Western Australia, Tasmania, New Zealand, and Victoria are respectively considered. The British possessions in South Africa treated of in Chapter III are Cape Colony, Natal, Orange River Colony, the Transvaal, Southern Rhodesia, the West Coast of Africa, East African Protectorate, Uganda Protectorate, Central African Protectorate, the Sudan and Mauritius. In America (Chapter IV) the Dominion of Canada and the West Indies, British Honduras and Guiana are discussed.

The mere enumeration of the above list of British possessions and Colonies serves to bring out in startling prominence the immense forest resources of the British Empire and to enhance the at present all too inadequate means the Empire possesses of affording the requisite forestry instruction and training to the number of professional experts she requires if her vast forest resources are to be maintained and improved.

As might be expected in a work of this nature, considerable space is devoted (Chapter V) to the subject of Forestry in the

United Kingdom. Its importance is discussed as also the measures to be adopted and studies of certain types of woodland in England and Ireland are introduced.

In treating of the land available for afforestation, Dr. Schlich comes to the following conclusions :—

1. We require enormous and ever-increasing quantities of timber.

2. Prices are likely to be higher in the future than they were in the past.

3. Supplies from outside rest on a very unsafe basis.

4. An increase of the woodlands in this country (United Kingdom), if brought about by the afforestation of surplus land, will keep a large amount of money in the country, lead to an increased demand for labour in the establishment and management of such woodlands, and it is likely to cause the development of additional industries which use wood as their raw material.

With regard to the land available for afforestaion, Dr. Schlich states that there are over fifteen million acres of mountain and heath land available in the United Kingdom for planting

Turning to Canada and Australasia, much stress is laid upon the necessity for an improved forest policy in these Colonies. There is also a valuable appendix detailing the progress in Forestry in the United States and the organisation of the Forest Service in that country which Canadians are recommended to study.

The book is well illustrated by numerous photographs depicting the characteristics and conditions of forests in different parts of the world. There are also charts showing the average annual rainfall and the direction of prevailing winds in different parts of India.

We think we shall be voicing a very general opinion in stating that the book is a marked improvement over its preceding editions. To Dr. Schlich we extend the heartiest congratulations on the evidence it shows of undiminished powers and an indefatigable industry.

That the evil of deforesting mountain ranges is a very real one, the well-known case of the Alps from France to Austria has

proved once and for all. Wherever in these mountains extensive deforestation has taken place the consequence has been the gradual formation of a series of torrents in all places where the surface did not consist of hard rock; the débris brought down has covered more and more fertile land at the base of the torrents; and this evil has grown to such an extent that not only in France, but also in other Alpine countries, great efforts have been made to re-afforest the denuded area at a great outlay. When once the evil has been created, immediate afforestation is not possible; it must be preceded by the construction of dams, dykes, walls, etc., to steady the soil until the young forest growth has had time to establish itself and once more lay hold of the surface soil. It requires no detailed calculation to estimate the enormous cost such operations would entail in this country, nor the magnitude of the losses the covering up of the cultivated lands at the foot of the mountains would give rise to. The writer of the article alluded to above raises another aspect of the question, one which was alluded to in considering the position of the Cauvery river and the power required for the Kolar Goldfields. He says:—

Hitherto the rivers and canals have been regarded almost entirely from an agricultural point of view. If the rivers run low, or if the canals afforded an inadequate supply that was a matter that affected the ryot alone, and the disturbance to the canal revenue was a departmental incident whose occurrence did not affect other interests acutely. But will this be the case a generation hence? Will not other interests be concerned and will not other influences make themselves felt and demand imperatively a better regulation of the sources of their prosperity? A generation hence the value of hydraulic motive power along the whole southern aspect of the Himalayan Range from Gilgit to Assam and thence south to Siam may have so increased, and its importance may have so appreciated, that any diminution of its effective force that can be possibly prevented will be resented by the whole power of industrial India, which a generation hence will certainly not be a negligable quantity. When new industries are set on foot, fresh demands are inevitably made on

a Government. It has to undertake duties which before were not dreamt of; for instance, some twenty years ago that portion of France that is bounded on the north and west by the Rhone and on the east by the Alps and south by the Mediterranean was almost wholly given over to agriculture. Now it teems with industrial mills and factories, all actuated by hydro-motive power either directly or by means of electricity. Its area is about 22,000 square miles, or equivalent to the area comprised between Simla, Sirsa, Lyallpur and Jammu. Within this portion of France there were in 1904 no less than 46,000 hydraulic installations varying from 16 h.-p. to several thousand h.-p.

It will be unnecessary here to quote from our correspondent's letter on the "Protection of the Sources of the Cauvery" which will be found elsewhere; but attention may be drawn to the fact that the writer points out a state of affairs in the south which greatly resembles that existing in the Himalayan ranges to the north. In the interests of the community at large there can be no doubt that the time has arrived at which it has become of the very first urgency that the entire question of the available water-supply of the country should be enquired into by experts, and that an authoritative report on the catchment areas of all the important rivers, whether actually in British territory or in that of the great Native States, who are ever so ready to demonstrate their loyalty and allegiance to the Crown, should be drawn up. With this report before them the Government of India would be in a position to lay down definite rules upon the subject which would secure what may almost be termed the most important areas on the Continent from the destruction they have experienced in the past. This destruction has ever been in the interests of the few, either to satisfy a pecuniary greed or with the object of starting, in ignorance, experiments for the cultivation of coffee, tea, or, as in the newly projected idea in Madras, of rubber on the catchment areas of rivers or far up on mountain slopes, the removal of the forest covering of which can but result, as in the, case of the Alps, in heavy and lamentable denudation of the hillsides and the covering up of the cultivated lands below to the ruin of the unfortunate ryot.

In conclusion, we would suggest the formation of a small expert Commission consisting of an expert Irrigation Officer, a member of the Indian Civil Service who has had experience of the losses ryots have suffered from wanton destruction of hill forests, and a Forest Officer of experience. That this Commission should visit all the catchment areas of the important rivers of the country and submit a report on their present condition. That they should be also required to frame lists of all districts, no matter at what distance they might be away from the catchment areas of the rivers in question, which in their opinion depended on particular rivers for their water-supply. That in addition to reporting upon the matter from the agricultural point of view in the interest of the ryot, the Commission be asked to record, wherever possible, a note upon the possibility or otherwise of the rivers visited being serviceable as sources of hydraulic power.

CURRENT LITERATURE.

BULLETIN NO. 2 published by the Director of Forestry of the Philippine Islands deals with the *Charcoal Industry*. The charcoal industry in the islands, though not of paramount importance, is kept alive by demands which cannot be filled from other sources. The note is of interest since it describes and compares the advantages of the kilns prepared by the natives and those of the Japanese, to the advantage of the latter. The native kiln is made by piling the billets on end round a central guide post or pole having the desired height of the kiln. Each tier decreases in diameter and they finally converge to form a cone-shaped pile. In order to provide draught in burning a small radial vent leads along the ground to the central axis, then upwards to the apex of the cone The Japanese construct permanent kilns on well drained hillsides, half the kiln being excavated out of the hill, while the front containing the door for filling is built up from stone and clay. The kiln is about a yard deep and has a capacity of 5 cubic meters. A chimney with a 3-inch diameter is constructed in the rear having its inner opening at the bottom of the kiln. The unfinished kiln

GAZETTE NOTIFICATIONS.

1.—GAZETTE OF INDIA.

30th October 1905.—No. 1373—149-22-F.—Mr. A. F. Gradon, Conservator of Forests, 3rd (officiating 2nd) grade, on return from the privilege leave granted to him in the notification of this Department, No. 967—149-6-F., dated the 28th July 1905, resumed charge of the Northern Circle, Central Provinces, on the forenoon of the 23rd October 1905.

With effect from the same date the following reversions took place :—

(*i*) Mr. C. P. Fisher, Officiating Conservator, 2nd grade, to Conservator, 3rd grade.

(*ii*) Mr. A. M. F. Caccia, Officiating Conservator, 3rd grade, to Deputy Conservator, 2nd grade, Central Provinces.

18th November 1905.—No. 1389-305-3-F.—Mr. C. C. Hatt, Deputy Conservator of Forests, Bengal, is transferred to Eastern Bengal and Assam.

2.—MADRAS GAZETTE.

28th October 1905.—*Confirmation of Appointment.*—K. Ramaswami Aiyar, Ranger, 6th grade and sub *pro tem.* 5th grade, is confirmed in the latter grade.

31st October 1905. *Privilege Leave.*—To M. R. Ry. A. N. Venkatachalam Chetty, Ranger, 4th grade, Trichinopoly district, for two months, under article 260 of the Civil Service Regulations, with effect from the 20th October 1905.

1st November 1905.—*Transfer.*—M. R. Ry. A. Krishnamachari, Probationary Ranger, from the Nellore district to the Tanjore district. To join immediately.

3rd November 1905.—*Leave.*—To Mr. M. Callanan, Ranger, Tanjore district, on medical certificate under article 336 of the Civil Service Regulations for three months from date of relief.

10th November 1905.—*Appointment.*—S. V. Venkatakrishna Aiyar, D. D. R., Deputy Ranger, 3rd grade and acting 2nd grade, Kurnool West, is appointed as Ranger, 6th grade, on probation for one year from 1st November 1905.

11th November 1905.—*Leave.*—Mr. F. S. Brito, Forest Ranger, 4th grade, Tinnevelly district, is granted privilege leave on medical certificate under article 260 of the Civil Service Regulations for two months from 2nd November 1905.

23rd November 1905.—No. 442.—Mr Claude du Pre Thornton, Deputy Conservator of Forests, to be District Forest Officer, Trichinopoly *cum* Tanjore. To join on return from leave.

No. 443.—M. R. Ry. Trichinopoly Muthalu Nallaswami Nayudu Garu, Extra Deputy Conservator of Forests, to be District Forest Officer, Nellore. To join on relief by Mr. Thornton.

22nd November 1905.—*Transfers.*—The following transfers of Extra Assistant Conservators of Forests are ordered :—

(1) M. R. Ry. C. M. Maduranayagam Pillai Avargal, on relief at Nellore, is transferred to the Southern Circle to be Instructor of the Training School for Deputy Rangers and Foresters.

(2) M. R. Ry. V. S. Gurunatha Pillai Avargal, on relief by M. R. Ry. Maduranayagam Pillai, is transferred to the Central Circle to be Extra Assistant Conservator of Forests, Tiruvannamalai, South Arcot district.

23rd November 1905.—*Services dispensed with.*—The services of K. Aiyadurai Aiyangar, Ranger, 6th grade are dispensed with from date of relief.

24th November 1905.—*Promotions.*—The following promotions in the class of Rangers are ordered with effect from 21st November 1905 : -

(1) M. R. Ry. A. S. Mariapragasam Pillai, Acting Ranger, 2nd grade, South Salem, to be Ranger, 2nd grade.

(2) M. R. Ry. T. Subroyalu Naidu. Acting Ranger, 3rd grade, North Salem, to be Ranger, 3rd grade.

(3) M. R. Ry. R. Sama Rao, Acting Ranger, 4th grade, South Arcot, to be Ranger, 4th grade.

(4) Mr. H. W. A. Gaudoin, Ranger, 5th grade, South Salem, to act as Ranger 4th grade.

3.—Bombay Gazette.

31st October 1905.—No. 8836.—Mr. P. E. Aitchison, Assistant Conservator of Forests, 1st grade, is allowed furlough on medical certificate from 19th September to 15th November 1905.

No. 8837.—His Excellency the Governor in Council is pleased to appoint Mr. P. E. Aitchison, Assistant Conservator of Forests, 1st grade, on return from leave, to be Divisional Forest Officer in charge Working Plans Office, Southern Circle.

7th November 1905.—No. 9080.—Mr. J. D. Maitland-Kirwan, Assistant Conservator of Forests, 1st grade, has been allowed by His Majesty's Secretary of State for India an extension of leave on medical certificate for four months in continuation of the privilege leave granted to him in Government Notification No. 5208, dated 27th June 1905.

21st November 1905.—No. 9396.—Mr. Ganpat Jayavant Rege, Extra Assistant Conservator of Forests, 2nd grade, held charge of the office of Divisional Forest Officer, W. D. Kanara, during the absence of Mr. P. E. Aitchison on furlough on medical certificate granted in Government Notification No. 8836, dated 31st October 1905.

4.—Bengal Gazette.

Nil.

5.—United Provinces Gazette.

3rd November 1905.—No. 4452-II-316 - 1905.—Mr. P. H. Clutterbuck, Deputy Conservator of Forests, on reversion to this province, to the charge of the Kheri Forest Division, Eastern Circle.

3rd November 1905.—No. 4453-II-316—1905.—Lalla Gulab Rai, Extra Assistant Conservator of Forests, on being relieved from the charge of the Kheri Forest Division, Eastern Circle, to the charge of the Gonda Forest Division in the same Circle.

2nd November 1905.—No. 4410-II-7—1905.—The undermentioned officer has been granted, by His Majesty's Secretary of State for India, permission to return to duty :—

Name.	Service.	Appointment.	Date on which permitted to return.
Mr. F. F. R. Channer ...	Forest ...	Assistant Conservator of Forests.	Within period of leave.

14th November 1905.—No. 4628-II-527—1905.—Lalla Madho Pershad, Extra Assistant Conservator of Forests, from the Garhwal Forest Division, Western Circle, to the Dehra Dun Forest Division in the same Circle.

24th November 1905.—No. 4833-II-282—1905.—In supersession of notification No. 2078-II-282—1905, dated 30th May 1905, Mr. J. M. Blanchfield, Extra Deputy Conservator of Forests, in charge of the Bundelkhand Forest Division, Eastern Circle, leave on medical certificate from 1st June to 31st July 1905, inclusive.

23rd November 1905.—No. 4800-II-86A-12.—The following temporary reversions are notified for general information :—

Entry No.	With effect from	Consequent on	Name.	From	To
1	28th October 1905.	The return from deputation of Mr. P. H. Clutterbuck.	Mr. R. C. Milward.	Officiating Deputy Conservator of Forests, 2nd grade.	Officiating Deputy Conservator of Forests, 3rd grade.
			Mr. E. R. Stevens.	Officiating Deputy Conservator of Forests, 3rd grade.	Officiating Deputy Conservator of Forests, 4th grade.
			Mr. F. Canning.	Officiating Deputy Conservato of Forests, 4th grade.	Officiating Assistant Conservator of Forests, 1st grade.
2	30th October 1905.	The return from leave of Mr. F. A. Courthope.	Mr. R. St. G. Burke.	Ditto ...	Ditto.
			Mr. T. Carr .	Officiating Assistant Conservator of Forests, 1st grade.	Assistant Conservator of Forests, 2nd grade.

6.—PUNJAB GAZETTE.

Nil.

7.—CENTRAL PROVINCES GAZETTE.

Nil.

8.—BURMA GAZETTE.

2nd November 1905. No. 499 (*Forests*).—Mr. W. F. L. Tottenham, Deputy Conservator of Forests, on being relieved of the charge of the Tenasserim Forest Circle, is posted to the charge of the Bhamo Forest Division.

No. 500 (*Forests*)—On relief by Mr. W. F. L. Tottenham, Deputy Conservator of Forests, Mr. P. E. Plunkett, Extra Assistant Conservator, is transferred from the Bhamo Forest Division to the charge of the Shwegu Sub-division, Bhamo Forest Division.

No. 501 (*Forests*).—Mr. A. E. Ross, Deputy Conservator of Forests, has been permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

27th October 1905. No. 28.—With reference to Revenue Department Notification No. 469 (Forests), dated the 2nd October 1905, Mr W. R. French, Extra Assistant Conservator of Forests, reported his return to duty to the Deputy Conservator of Forests, Kado Division, on the forenoon of the 7th October 1905.

3rd November 1905. No. 20.—With reference to Revenue Department Notification No. 416 Forests), dated the 22nd August 1905, Mr. G. R. Jeffery, Officiating Deputy Conservator of Forests, assumed and relinquished charge of his timber-measuring duties in the Yaw Division on the forenoon of the 14th September and 26th October 1905, respectively.

No. 21.—With reference to Revenue Department Notification No. 417 (Forests), dated the 22nd August 1905, Mr. F. W. Collings, Assistant Conservator of Forests, reported his arrival at Pakokku and assumed charge of his timber-measuring duties in the Yaw Division on the forenoon of the 7th September 1905.

No. 516. (*Forests*).—Mr. H. L. P. Walsh, Assistant Conservator of Forests, has been permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

No 517 (*Forests*).—Mr C. H Philipp, Assistant Conservator of Forests, is transferred from Maymyo and is posted to the Myadaung Sub-Division, Katha Forest Division.

No. 518 (*Forests*).—On return from leave Mr. R. McIntosh, Deputy Conservator of Forests, is posted to the charge of the Rangoon Forest Division, in place of Mr. D. H. Allan, Extra Deputy Conservator of Forests, transferred.

No. 519 (*Forests*).—On relief by Mr. R. McIntosh, Deputy Conservator of Forests, Mr. D. H. Allan, Extra Deputy Conservator of Forests, is transferred from Rangoon and is posted to the charge of the Myittha Forest Division in place of Mr. R. E. Marsden tranferred.

No. 520 *Forests*).—On relief by Mr. D. H Allan Extra Deputy Conservator of Forests, Mr. R. E. Marsden, Officiating Deputy Conservator of Forests, is posted to Working Plans duty in the Myittha Forest Division.

No. 521 (*Forests* .—Mr F. W. Collings, Assistant Conservator of Forests, is transferred from Pakokku and is posted to the charge of the Gangaw Sub-Division, Yaw Forest Division, in place of Mr. G. R. Jeffery, transferred.

No. 522 (*Forests*).—On relief by Mr. F. W. Collings, Assistant Conservator of Forests, Mr. G. R. Jeffery, Officiating Deputy Conservator of Forests, is transferred from Gangaw and is posted to the charge of the Katha and Myitkyina Forest Divisions, in place of Mr. C. B. Smales, transferred.

No. 523 (*Forests* .—On relief by Mr. G. R. Jeffery, Officiating Deputy Conservator of Forests, Mr. C. B. Smales, Depnty Conservator of Forests, is transferred from Katha and is posted to the charge of the Pyinmana Forest Division, in place of Mr. F. H Todd, proceeding on deputation to the Andamans.

This department Notification No. 476, dated the 9th October 1905, is hereby cancelled.

No. 524 (*Forests*).—On return from leave Mr. H. L. P. Walsh, Officiating Deputy Conservator of Forests, is posted to Working Plans duty in the Ruby Mines Forest vision.

No. 525 (*Forests*). —On return from leave Mr. W. J. G. Cooper, Extra Assistant Conservator of Forests, is posted to duty in the Upper Chindwin Forest Division.

No. 526 (*Forests*).—On return from leave Mr. F. C. Purkis, Extra Assistant Conservator of Forests, is posted to duty in the Tharrawaddy Forest Division.

No. 527 (*Forests* .—On return from leave Mr R. C. A. Pinder, Extra Assistant Conservator of Forests, is posted to duty in the Mu Forest Division.

No. 530 (*Forests*).—The following alterations in rank are ordered in the Forest Department:—

(1) With effect from the 19th January 1905, consequent on the retirement of Mr. H. B. Ward, Deputy Conservator, 1st grade, and the reduction of Pilot No. IV by four places in the list:

Mr. H. Jackson, Deputy Conservator, 2nd grade, to be Deputy Conservator, 1st grade.

Mr. G. F. R. Blackwell, Deputy Conservator, 2nd grade, to be Deputy Conservator, 1st grade, *prov. sub.*

Mr. W. F. L. Tottenham, Deputy Conservator, 2nd grade, *prov. sub.*, to be confirmed in that grade.

Mr. W. T. T. McHarg, Deputy Conservator, 3rd grade, to be Deputy Conservator, 2nd grade, *prov. sub.*

Mr. C. W. A. Bruce, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. S. Carr, Deputy Conservator, 3rd grade, *prov. sub.*, to be confirmed in that grade.

Mr. H. S. Ker-Edie, Deputy Conservator, 3rd grade, *prov. sub.*, to be confirmed in that grade.

Mr. C. R. Dun, Deputy Conservator, 4th (officiating 3rd) grade, to be Deputy Conservator, 3rd grade, *prov. sub.*

Mr. C. B. Smales, Deputy Conservator, 4th grade, to be Depnty Conservator, 3rd grade, *prov. sub.*

Mr. A. H. M. Lawson, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. C. W. Doveton, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. G. K. Parker, Deputy Conservator, 4th grade, *prov. sub*, to be confirmed in that grade.

Mr. R. S. Troup, Deputy Conservator, 4th grade, *prov. sub.*, to be confirmed in that grade.

Mr. H. W. A. Watson, Assistant Conservator, 1st grade Officiating Deputy Conservator, 4th grade), to be Deputy Conservator, 4th grade, *prov. sub.*

Mr. J. J. Rorie, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 4th grade), to be Deputy Conservator, 4th grade, *prov. sub.*

Mr. A. Lawrence, Assistant Conservator, 1st grade, to officiate as Deputy Conservator, 4th grade.

Mr. H. C. Walker, Assistant Conservator, 1st grade, *prov. sub.*, to be confirmed in that grade and to officiate as Deputy Conservator, 4th grade.

Mr. H. L. P. Walsh, Assistant Conservator, 1st grade, *prov. sub.*, to be confirmed in that grade.

Mr. R. E. Marsden, Assistant Conservator, 2nd (officiating 1st) grade, to be Assistant Conservator, 1st grade, *prov. sub.*

Mr. G. R. Jeffery, Assistant Conservator, 2nd (officiating 1st) grade, to be Assistant Conservator, 1st grade *prov sub.*

(2) With effect from the 18th February 1905, consequent on the departure on privilege leave of Mr. H. C. Walker, Officiating Deputy Conservator, 4th grade:

Mr. H. L. P. Walsh, Assistant Conservator, 1st grade, to officiate as Deputy Conservator, 4th grade.

(3) With effect from the 20th March 1905, consequent on the deputation of Mr. R. S. Troup,* Deputy Conservator, 4th grade as Instructor at the Imperial Forest School, Dehra Dun:

Mr. A. Rodger, Assistant Conservator, 1st grade, (Officiating Deputy Conservator, 4th grade), to be Deputy Conservator, 4th grade, *prov. sub.*

Mr. L. C. Davis, Assistant Conservator, 1st grade, *prov. sub.*, to officiate as Deputy Conservator, 4th grade.

Mr. J. C. Hopwood, Assistant Conservator, 2nd (officiating 1st) grade, to be Assistant Conservator, 1st grade, *prov. sub.*

(4) With effect from the 29th March 1905, consequent on the departure on leave of Mr. J. Copeland, Deputy Conservator, 1st grade:

Mr. H. Carter, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator 1st grade.

Mr. H. H. Forteath, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. G E. S. Cubit, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. R. E. Marsden, Assistant Conservator, 1st grade, *prov. sub.*, to officiate as Deputy Conservator, 4th grade

(5) With effect from the 3rd April 1905, consequent on the departure on leave of Mr. McIntosh, Deputy Conservator, 3rd grade.

Mr. G. K. Parker, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. G. R. Jeffery, Assistant Conservator, 1st grade, *prov. sub.*, to officiate as Deputy Conservator, 4th grade.

(6) With effect from the 5th April 1905, the date of Mr. H. C. Walker's return from leave.

Mr. G. R. Jeffery, Assistant Conservator, 1st grade, *prov. sub.*, (Officiating Deputy Conservator, 4th grade), to revert to his *prov. sub.* appointment.

(7) With effect from the 8th April 1905, consequent on the departure on leave of Mr. A. Lawrence, officiating Deputy Conservator, 4th grade.

Mr. G R. Jeffery, Assistant Conservator, 1st grade, *prov. sub.*, to officiate as Deputy Conservator, 4th grade.

(8) With effect from 12th April 1905, consequent on the reversion of Mr. H. Jackson, Deputy Conservator, 1st grade, to his substantive rank on the Burma list.

Mr. G. F. R. Blackwell, Deputy Conservator 1st grade, *prov. sub.*, to revert to Deputy Conservator, 2nd grade, but to continue to officiate as Deputy Conservator, 1st grade.

Mr. W. T. T. McHarg, Deputy Conservator, 2nd grade, *prov. sub.*, to revert to Deputy Conservator, 3rd grade.

Mr. C. B. Smales, Deputy Conservator, 3rd grade, *prov. sub.*, to revert to Deputy Conservator, 4th grade.

[*Mr Troup is entitled, while on deputation, to officiating promotions with Mr Todd, and will revert when Mr. Todd reverts.]

Mr. A. Rodger, Deputy Conservator, 4th grade, *prov. sub.*, to revert to Assistant Conservator, 4th grade.

Mr. J. C. Hopwood, Assistant Conservator, 1st grade, *prov. sub.*, to revert to Assistant Conservator, 2nd grade, but to continue to officiate as Assistant Conservator, 1st grade.

(9) With effect from the 23rd April 1905, consequent on the deputation of Mr. C. E. Muriel, as Officiating Conservator of Forests, Assam Forest Circle.

Mr. F. J. Branthwaite, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade.

Mr. F. A. Leete, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. F. H. Todd, Deputy Conservator, 4th grade, *prov sub.*, to officiate as Deputy Conservator, 3rd grade.

Mr. J. C. Hopwood, Assistant Conservator, 2nd (officiating 1st grade), to officiate as Deputy Conservator, 4th grade.

(10) With effect from the 3rd May 1905, consequent on the departure on leave of Mr. G. E. S. Cubitt, Officiating Deputy Conservator, 3rd grade:

Mr. H. W. A. Watson, Deputy Conservator, 4th grade, *prov. sub.*, to officiate as Deputy Conservator, 3rd grade.

(11) With effect from the 25th May 1905, consequent on the departure on leave of Mr F. Linnell, Deputy Conservator, 3rd grade, *prov. sub.*

Mr. J. J. Rorie, Deputy Conservator, 4th grade, *prov. sub.*, to officiate as Deputy Conservator, 3rd grade.

This Department Notification No. 443, dated the 11th September 1905, is hereby cancelled.

No. 531 (*Forests*).—The following alterations in rank are ordered in the Forest Department:—

(1) With effect from the 4th July 1905, consequent on the appointment of Mr. H. Carter, Deputy Conservator, 2nd grade (Officiating Deputy Conservator, 1st grade), to officiate as Conservator, 3rd grade.

Mr. W. F. L. Tottenham, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade.

Mr. S. Carr, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. A. Rodger, Officiating Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

(2) With effect from the 14th July 1905, consequent on the return from leave of Mr. C. B. Smales, Deputy Conservator, 4th grade:

Mr. C. B. Smales, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. A. Rodger, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

(3) With effect from the 23rd July 1905, consequent on the appointment of Mr. W. F. L. Tottenham, Officiating Deputy Conservator, 1st grade, to officiate as Conservator, 3rd grade:

Mr. G. R. Long, Deputy Conservator, 2nd grade, *prov. sub.*, to officiate as Deputy Conservator, 1st grade.

Mr. H. S. Ker-Edie, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. A. Rodger, Assistant Conservator, 1st grade Officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

(4) With effect from the 7th August 1905, consequent on the departure on leave of Mr. H. S. Ker-Edie, Officiating Deputy Conservator, 2nd grade:

Mr. F. Linnell, Deputy Conservator, 3rd grade, *prov. sub.* (on privilege leave), to officiate as Deputy Conservator, 2nd grade.

Mr C. R. Dun, Deputy Conservator, 3rd grade, *prov. sub.*, to officiate as Deputy Conservator, 2nd grade.

Mr. H. C. Walker, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

8th November 1905.—No. 29.—With reference to Revenue Department Notification No. 496 (Forests), dated the 24th October 1905, Mr. A. S. Rencontre, Extra Assistant

Conservator of Forests, was relieved of the charge of the Mergui Range on the afternoon of the 12th October 1905.

7th November 1905.—No. 13.—Six months' leave on medical certificate is granted to Mr. E. W. Dalton, Ranger, 3rd grade, sub. *pro tem.*, of the Upper Chindwin Division, with effect from the 3rd November 1905.

7th November 1905.—No. 21.—Mr. G. R. Jeffery, Officiating Deputy Conservator of Forests, made over, and Mr. F. W. Collings, Assistant Conservator of Forests, received charge of, the Gangaw Sub-division, Yaw Division, on the afternoon of the 3rd November 1905.

20th November 1905.—No. 533.—(*Forests*).—Mr. W. T. T. McHarg, Deputy Conservator of Forests, has been granted by His Majesty's Secretary of State for India an extension of leave on medical certificate for six months.

This Department Notification No. 451 (Forests), dated the 18th September 1905, is hereby cancelled.

No 534 (*Forests*).—On return from leave Mr. A. Rodger, Officiating Deputy Conservator of Forests, is posted to the charge of the Upper Chindwin Forest Division, in place of Mr. L. C. Davis, Officiating Deputy Conservator of Forests, transferred.

No 535 (*Forests*).—On relief by Mr. A. Rodger, Mr. L. C. Davis, Officiating Deputy Conservator of Forests, is posted to Working Plans duty in the Upper Chindwin Forest Division.

No. 540 (*Forests*).—In exercise of authority granted by the Government of India the Lieutenant-Governor is pleased to delegate to Divisional Forest Officers in Burma the power to grant travelling allowance in accordance with the provisions of Article 1107 of the Civil Service Regulations to inferior servants transferred within their divisions.

22nd November 1905.—No. 541 (*Forests*).—Mr. W. H. Craddock, Extra Assistant Conservator of Forests, is transferred from Rangoon to the charge of the Railway Revenue Range in the Toungoo Forest Division.

No. 542 (*Forests*).—Mr. H. R. Blanford, who has been appointed by His Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator of Forests, 2nd grade, reported his arrival in Rangoon on the 13th November 1905, before noon.

Mr Blanford is posted to the headquarters of the Pyinmana Forest Division of the Southern Circle.

No. 543 *Forests*).—Mr. E. V. Ellis who has been appointed by His Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator of Forests, 2nd grade, reported his arrival in Rangoon on the 13th November 1905, before noon.

Mr. Ellis is posted to the headquarters of the Toungoo Forest Division of the Tenasserim Circle.

20th November 1905.—No. 14 (*Forests*). With reference to Revenue Department Notification No. 522 (Forests), dated the 13th November 1905, Mr. C. B. Smales, Deputy Conservator of Forests, made over, and Mr. G. R. Jeffery, Officiating Deputy Conservator of Forests, received, charge of the Katha Division on the afternoon of the 9th November 1905.

No. 15.—(*Forests*).—With reference to Revenue Department Notification No. 522 (Forests), dated the 13th November 1905, Mr. C. B. Smales, Deputy Conservator of Forests, made over, and Mr. G. R Jeffery, Officiating Deputy Conservator of Forests, received, charge of the Myitkyina Division on the afternoon of the 9th November 1905.

14th November 1905.—No. 22.—Mr. F. H. Todd, Deputy Conservator of Forests, made over, and Mr. C. B. Smales, Deputy Conservator of Forests, received, charge of the Pyinmana Forest Division on the afternoon of the 11th November 1905.

21st November 1905.—No. 23.—Mr. H. R. Blanford, Assistant Conservator of Forests, reported his arrival for duty at Pyinmana on the forenoon of the 16th November 1905.

9.—EASTERN BENGAL AND ASSAM GAZETTE.

Nil.

10.—MYSORE GAZETTE.

Nil.

TIMBER AND PRODUCE TRADE.

DENNY, MOTT & DICKSON, LIMITED.

WOOD MARKET REPORT.

London, 1st November, 1905.

TEAK.—The landings in the docks in London during October consisted of 585 loads of logs and 252 loads of planks and scantlings, or a total of 837 loads, as against 202 loads for the corresponding month of last year. The deliveries into consumption were 270 loads of logs and 342 loads of planks and scantlings—together 612 loads, as against 960 loads for October 1904.

The dock stocks at date analyse as follows :—

	4,499	loads of	logs, as against	5,044	loads at the same date last year.
	3,057	,,	planks ,,	3,801	,, ,, ,,
Total ...	7,556	loads	,,	8,845	loads ,, ,,

The continued small import of Teak, as shewn above, is the more disquieting, seeing that nearly half of such import consists of Java wood, which, owing to its want of good length and its being heavier than Burmah wood, is not liked for some descriptions of first-class work. It should, however, be recognised by those responsible for the small production and consequently almost prohibitive present prices of Teak in India—whether Government Forest Administrators or commercial concessionaires of forests—that the production of a part of the British Empire is being discouraged at the cost of the European consumer learning to put his money into the pocket of a Dutch possession ; and as Siam Teak has continued to displace the consumption of Burmah Teak, notwithstanding the original prejudice against it, so will the consumption of Java Teak develop and the consumer accommodate himself to the shorter lengths and greater weight, if the undoubtedly superior description from Burmah is not procurable, except at an unreasonably high comparative cost. The stocks in London at date consist of fully 25 per cent. of Java wood, whilst the last month's landings and consumption approximated to 50 per cent. of the figures shown above. These facts are sufficiently significant to merit the serious consideration of all concerned, both in India and Siam, whilst the merchant on this side can only utilise such facts as they may be most advantageous to his business, which admits of little sentiment.

MARKET RATES FOR PRODUCTS.

TROPICAL AGRICULTURIST.

4th October 1905.

Cardamoms	per lb.	1*s.* 3*d.* to 1*s.* 5*d.*
Croton seeds	,, cwt.	20*s.* to 25*s.*
Cutch ,, ...	,, ,,	24*s.* to 28*s.*
Gum Arabic	,, ,,	17*s.* 6*d.* to 25*s.* nom.
Do. Kino	,, ,,	7½*d.* to 1*s* nom.
India-rubber, Assam	,, lb.	2*s* 9*d.* to 3*s.* 10*d.*
Do. Burma	,, ,,	1*s.* 6*d.* to 2*s.* 6*d.*
Myrobalans, Madras	,, cwt.	5*s.* to 6*s.* nom.
Do. Bombay	,, ,,	4*s.* to 6*s.*
Do. Jubbulpore	,, ,,	4*s* 3*d.* to 4*s.* 6*d.*
Do. Bengal	,, ,,	3*s.* 6*d.* to 6*s.*
Nux vomica	,, ,,	8*s.* 6*d.* to 10*s.* 6*d.* nom.
Oil, Lemon grass	,, lb.	8¼*d.*
Orchella Weed, Ceylon	,, cwt.	nom.
Seed lac	,, ,,	110*s.* to 175*s.*
Tamarinds, Calcutta	,, ,,	7*s* to 8*s*
Do. Madras	,, ,,	3*s.* 6*d* to 4*s.* 6*d.*

GAZETTE NOTIFICATIONS.

1.—GAZETTE OF INDIA.

30th November 1905.—No. 1437-301-4-F.—Mr. F. Beadon Bryant, Conservator of Forests, 1st grade, on return from the leave granted to him in the notification of this Department No. 912-F.—150-9, dated the 14th July 1905, is appointed to be Chief Conservator of Forests in Burma of which office he assumed charge on the 31st October 1905.

From the same date Mr. T. A. Hauxwell, Conservator of Forests, 2nd (officiating 1st) grade, Upper Burma, is confirmed in the latter grade.

No. 1439—251-5-F.—Mr. E. S. Carr, Conservator of Forests, 2nd grade, on return from the leave granted to him in the notification of this Department No. 600-F., dated the 8th May 1905, is appointed to the charge of the Eastern Bengal and Assam Forest Circle, with effect from the 5th November 1905, the date on which he relieved Mr. C. E. Muriel, Officiating Consevator, 3rd grade

Mr. L. Mercer Consevator, 3rd (officiating 2nd grade, United Provinces, reverted to his substantive appointment in the former grade with effect from the 5th November 1905.

1st December 1905.—No. 1449—123-41-F.—The services of Mr. W. F. Lloyd, Deputy Conservator of Forests, Bengal, are placed at the disposal of the Foreign Department for employment in Siam for a period of three years.

4th December 1905. No. 1450-F.—146-17.—The undermentioned officers, who have been appointed by His Majesty's Secretary of State to the Forest Department of India, are appointed to be Assistant Conservators, 2nd grade, with effect from the dates specified opposite their names and are posted to the Provinces named below :—

Mr. R. N. Parker, Punjab, 10th November 1905.
Mr. H. R Blanford, Burma, 13th November 1905.
Mr. E. V. Ellis, Burma, 13th November 1905.
Mr. R. Parnell, Punjab, 10th November 1005
Mr C. F. Bell, Central Provinces, 10th November 1905.
Mr. R K. Jerram, Punjab, 10th November 1905.
Mr. L. E. S. Teague, Central Provinces, 10th November 1905.
Mr. R. Kirkpatrick, Bengal, 25th October 1905.

4th December 1905.—No. 1519—251-7-F.—Mr. C. E. Muriel, Deputy Conservator, of Forests, 1st grade, is appointed to officiate as Conservator of Forests, 3rd grade, and to hold charge of the Tenasserim Circle, Lower Burma, of which he relieved Mr. W. F. L. Tottenham, Officiating Conservator, 3rd grade, on the afternoon of the 22nd November 1905. From the same date Mr. Tottenham reverted to his substantive appointment of Deputy Conservator, 2nd grade, Burma.

2.—MADRAS GAZETTE.

25th November 1905.—*Extension of Leave.*—In continuation of two months' privilege leave granted in Service Order No 199 of 1905, dated 9th October 1905, Ranger S Eggia Narayana Sastri is granted leave on medical certificate for four months.

30th November 1905.—*Extension of Leave.*—To M.R.Ry. P. V. Alagiriswami Naidu, Ranger, 5th grade, South Salem, for six months on medical certificate in continuation of the leave already granted to him.

27th November 1905.—*Promotions.*—The following promotions are ordered by the Board of Revenue, Madras, with effect from 6th August 1905 :—

S. Kuppuswami Chetti, from Acting Ranger III to Ranger III, permanent.
A R. Rama Row, from Ranger IV to Ranger III, acting.

30th November 1905.—*Cancelment of Transfers.*—The notification published on page 1256 of Part II of *Fort St. George Gazette*, dated 12th September 1905, ordering transfers of certain Rangers in the Southern Circle, is hereby cancelled (S. O. No. 173 of 1905).

Transfers.—The following transfers among Rangers are ordered :—

(1) Mr. L. S. James, IV, from Tinnevelly to South Coimbatore, to join after the Christmas holidays.

(2) Mr. A. B. Myers, I, from South Coimbatore to South Canara, to join on relief by No. (1).

(3) Mr. H. Myers, Acting VI, from South Coimbatore to North Coimbatore.

7th December 1905.—*Transfers.*—M. R. Ry. K. G. Subba, Ranger, 4th grade, Nellore, under temporary reduction to 5th grade for one month from date of return from leave to South Arcot.

12th December 1905.—*Leave.*—To M.R.Ry. S. Lakshimipathy Naidu, Ranger, 5th grade, Cuddapah district, privilege leave for fifteen days from date of relief under article 260 of the Civil Service Regulations.

13th December 1905.—*Leave.*—Mr. A. M. C. Littlewood, Ranger, 4th grade, South Coimbatore Division, is granted two months' privilege leave under article 260 of the Civil Service Regulations from 6th January 1906.

3.—Bombay Gazette.

27th November 1905.—No. 6642 - Mr. G. R. Mane, Extra Assistant Conservator of Forests, 3rd grade, delivered over and Mr. G. J. Rege, Extra Assistant Conservator of Forests, 2nd grade, received charge of the Sub-Divisional Forest Office, Belgaum, on the forenoon of the 22nd November 1905.

6th December 1905.—No. 9850.—Mr A. F. Gonsalves, L. C. E., Extra Assistant Conservator of Forests, 4th grade, and Sub-Divisional Forest Officer, Satara, passed with credit on 27th September 1905 an examination in subjects prescribed in No. VI of the rules published in Government Notification No. 2, dated 3rd January 1894, for the examination of officers of the Forest Department.

5th December 1905.—No. 6793.—Mr. G. E. Marjoribanks, Divisional Forest Officer, Kanara, N. D., delivered over and Mr. G. R. Mane, Extra Assistant Conservator of Forests, received charge of the Sub-Divisional Forest Office, N. D., Kanara, on the afternoon of 23rd November 1905.

23rd December 1905.—No. 3345.—Mr. A. F. Gonsalves, Extra Assistant Conservator of Forests, Satara, is transferred to East Khandesh Sub-Division.

10th December 1905.—No. D. 117. - Mr. B. G. Deshpande, Extra Assistant Conservator of Forests, appointed to the Southern Circle, as per Government Notification No. 10088, dated 12th December 1905, is posted to the Kanara Western Division as Sub-Divisional Officer.

4.—Bengal Gazette.

Nil.

5.—United Provinces Gazette.

23rd December 1905.—No. 5210—II/562-1005.—Mr. E. R. Stevens, Officiating Deputy Conservator of Forests, in charge of the Kumaun Forest Division, Eastern Circle, privilege leave for five days, from the 2nd January 1906.

6.—Punjab Gazette.

6th December 1905.—No. 586—A. L. No. 21.—*Notification.*—The following changes have taken place in the list of Forest Officers in the Associated Provinces, with effect from the date specified against each:—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. C. M. McCrie ..	Provisional Deputy Conservator, 3rd grade, and Officiating Deputy Conservator, 2nd grade.	Provisional Deputy Conservator, 3rd grade.	12th July 1905.	Consequent on the return from special leave of Mr. J. E. Barrett.
Mr. A. J. Gibson ..	Deputy Conservator, 4th grade, sub *pro tem.*, and Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade, sub *pro tem.*		
Mr. A. P. Percival				

No. 590—A. L. No 22.—*Notification.*—The following changes have taken place in the list of Forest Officers in the Associated Provinces, with effect from the date specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. C. M. McCrie...	Provisional Deputy Conservator, 3rd grade.	Provisional Deputy Conservator, 3rd grade, and Officiating Deputy Conservator, 2nd grade.	22nd July 1905.	Consequent on the appointment of Mr. Caccia as Officiating Conservator.
Mr. A. J. Gibson ...	Deputy Conservator, 4th grade, sub. *pro tem.*	Deputy Conservator, 4th grade, sub. *pro tem.*, and Officiating Deputy Conservator, 3rd grade.		
Mr. A. P. Percival				

No. 594—A. L. No. 23.—*Notification.*—The following changes have taken place in the list of Forests Officers in the Associated Provinces, with effect from the date specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. A. V. Monro ...	Officiating Deputy Conservator, 1st grade.	Deputy Conservator, 2nd grade.	26th July 1905.	Consequent on Mr. A. E. Lowrie's return from privilege leave.
Mr. C. M. McCrie...	Provisional Deputy Conservator, 3rd grade, and Officiating Deputy Conservator, 2nd grade.	Provisional Deputy Conservator, 3rd grade.		
Mr. A. J. Gibson ...	Deputy Conservator, 4th grade, sub. *pro tem.*, and Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade, sub. *pro tem.*		
Mr. A. P. Percival				

No. 598—A. L. No. 24.—*Notification.*—The following changes have taken place in the list of Forest Officers in the Associated Provinces, with effect from the date specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. C. A. Von B. Malcolm.	Assistant Conservator, 2nd grade.	Assistant Conservator, 1st grade, and Officiating Deputy Conservator, 4th grade.	6th May 1905.	Consequent on their having passed the examinations prescribed in section 72 of the Forest Department Code.
Mr. J. Donald ...	Assistant Conservator, 2nd grade.	Assistant Conservator, 1st grade, and Officiating Deputy Conservator, 4th grade.		

No. 602—A. L. No. 25.—*Notification.*—The following changes have taken place in the list of Forest Officers in the Associated Provinces, with effect from the date specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. A. P. Percival...	Deputy Conservator, 4th grade, sub. *pro tem.*	Officiating Deputy Conservator, 4th grade.	23rd August 1905.	Consequent on Mr. A. J. Gibson's return from deputation and departure on combined leave.
Mr. A. St. V. Beechey (on leave).	Officiating Deputy Conservator, 2nd grade.	Deputy Conservator, 3rd grade.		
Mr. W. Maye ...	Ditto ...	Ditto ...		
Mr. J. C. Carroll ...	Provisional Deputy Conservator, 4th grade, and Officiating Deputy Conservator, 3rd grade.	Provisional Deputy Conservator, 4th grade.	23rd October 1905.	Consequent on Mr. Caccia's reversion from Conservatorship.
Mr. J. Donald ...	Officiating Deputy Conservator, 4th grade.	Assistant Conservator, 1st grade.		

No. 606—A. L. No. 26.—*Notification.*—The following change has taken place in the list of Forest Officers in the Associated Provinces, with effect from the date specified :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. C. A. Von B. Malcolm.	Officiating Deputy Conservator, 4th grade.	Assistant Conservator, 1st grade.	16th November 1905.	Consequent on the return from leave of Mr. Blascheck.

No. 610.—A. L. No. 27.—*Examination.*—Mr. C. G. Trevor, Assistant Conservator of Forests, passed the prescribed examination in Hindustani by the Higher Standard on the 25th October 1905.

No. 614.—A. L. No. 28.—*Promotion.*—Mr. C. G. Trevor, Assistant Conservator of Forests, 2nd grade, having passed the examinations prescribed in Section 72 of the Forest Department Code, is promoted to Assistant Conservator, 1st grade, provisional substantive, with effect from 26th October 1905.

No. 691.—A. L. No. 29.—*Notification.*—The following officers, appointed by His Majesty's Secretary of State for India as Assistant Conservators of Forests in the 2nd grade and posted to the Punjab, reported their arrival at Bombay on the forenoon of 10th November 1905 and at Lahore on the afternoon of 17th idem, and are posted as follows with effect from the latter date :—

Mr. R. N. Parker is attached to the Rawalpindi Forest Division.

Mr. R. Parnell is attached to the Kangra Forest Division.

Mr. M. R. K. Jerram is attached to the Direction Division.

15th December 1905.—No. 630.—A. L. No. 30.—*Notification.*—Mr. A. D. Blascheck, Assistant Conservator of Forests, on return from leave, took over charge of the Simla Forest Division on the forenoon of the 16th November 1905, relieving Mr. Mayes, Deputy Conservator of Forest, who will on and from that date remain in charge of the Kangra Division only.

7.—BURMA GAZETTE.

24th November 1905.—No. 547 (*Forests*).—Mr. R. McIntosh, Deputy Conservator of Forests, has been granted by His Majesty's Secretary of State for India, leave on medical certificate for six months in continuation of the furlough granted to him in this Department Notification No 170 (*Forests*), dated the 31st March 1905.

This Department Notification No. 518 (*Forests*), dated the 13th November 1905, is cancelled.

22nd November 1905.—No. 30.—With reference to Revenue Department Notification 484 (Forests), dated the 19th October 1905, Mr. J. C. Murray, Deputy Conservator of Forests, relieved Mr. J. G. F. Marshall, Extra Deputy Conservator of Forests, of the charge of the West-Salween Division, on the afternoon of the 9th November 1905.

No. 31.—With reference to Revenue Department Notification No. 585 (*Forests*), dated the 19th October 1905, Mr. G. F. R. Blackwell, Deputy Conservator of Forests, assumed charge of the Kado and Agency Divisions, relieving Mr. J. C. Murray, Deputy Conservator of Forests, on the afternoon of the 14th November 1905.

28th November 1905.—No. 32.—With reference to Revenue Department Notification No. 541 (*Forests*), dated the 20th November 1905, Mr. W. H. Craddock, Extra Assistant Conservator of Forests, relinquished charge of his duties as Personal Assistant to the Conservator of Forests, Tenasserim Circle, on the afternoon of the 22nd November 1905, and assumed charge of the Railway Revenue Range, Tenasserim Circle, on the afternoon of the 24th November 1905.

No. 33.—With reference to Revenue Department Notification No. 543 (*Forests*), dated the 22nd November 1905, Mr. E. V. Ellis, Assistant Conservator of Forests, reported himself for duty at Toungoo on the forenoon of the 16th November 1905.

2nd December 1905.—No. 553 (*Forests*).—Under the provisions of Article 336 of the Civil Service Regulations, leave on medical certificate for three months is granted to Mr. W. G. Cooper, Extra Assistant Conservator of Forests, in continuation of the leave granted in this Department Notification No. 433 (Forests), dated the 28th August 1905.

No. 554 (*Forests*).—This Department Notification No. 525 (*Forests*), dated the 13th November 1905, is cancelled.

No. 555 (*Forests*).—On return from leave Mr. A. Rodger, Officiating Deputy Conservator of Forests, is posted to the charge of the Rangoon Forest Division

This Department Notification No. 534 (*Forests*), dated the 20th November 1905, is hereby cancelled.

No. 556 (*Forests*).—On relief by Mr. A. Rodger, Officiating Deputy Conservator of Forests, Mr. D. H. Allan, Extra Deputy Conservator of Forests, is transferred from Rangoon and is posted to the charge of the Myittha Forest Division, in place of Mr. R. E. Marsden, transferred.

This Department Notification No. 519 (*Forests*), dated the 13th November 1905, is hereby cancelled.

No. 557 (*Forests*).—Mr. J. C. Hopwood, Officiating Deputy Conservator of Forests, is transferred from Toungoo and is posted to the charge of the Upper Chindwin Forest Division, in place of Mr. L. C. Davis, Officiating Deputy Conservator of Forests, transferred.

No. 558 (*Forests*).—On relief by Mr. J. C. Hopwood, Mr. L. C. Davis, Officiating Deputy Conservator of Forests, is posted to Working Plans duty in the Upper Chindwin Forest Division.

This Department Notification No. 535 (*Forests*), dated the 20th November 1905, is hereby cancelled.

No. 559 (*Forests*).—On return from leave Mr. W. T. T. McHarg, Deputy Conservator of Forests, is posted to the charge of the Katha Forest Division.

No. 560 (*Forests*).—On relief by Mr. W. T. T. McHarg, Deputy Conservator of Forests, Mr. G. R. Jeffery, Officiating Deputy Conservator of Forests, is posted to the charge of the Myitkyina Forest Division.

3rd December 1905.—No. 561 (*Forests*).—Mr. H. Jackson, Deputy Conservator of Forests, has been permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

5th December 1905.—No. 15.—On return from the privilege leave granted to him in Revenue Department Notification No. 421 (Forests), dated the 24th August 1905, Mr. A. Rodger, Deputy Conservator of Forests, resumed charge of the Rangoon Forest

Division on the afternoon of the 30th November 1905, relieving Mr. D. H. Allan, Extra Deputy Conservator of Forests.

30th November 1905.—No. 21.—(*Forests*).—With reference to Revenue Department Notification No. 527 (Forests), dated the 13th November 1905, Mr. R. C. A. Pinder, Extra Assistant Conservator of Forests, reported himself for duty in the Mu Division on the forenoon of the 23rd November 1905.

5th December 1905.—No. 22.—(*Forests*).—With reference to Revenue Department Notification No. 499 (Forests), dated the 2nd November 1905, Mr. P. E. Plunkett, Extra Assistant Conservator of Forests, made over, and Mr. W. F. L. Tottenham, Deputy Conservator of Forests, received charge of the Bhamo Division on the afternoon of the 30th November 1905.

8th December 1905.—No. 23.—(*Forests*).—With reference to Revenue Department Notification No. 517 (Forests), dated the 13th November 1905, Mr. C. H. Philipp, Assistant Conservator of Forests, reported himself for duty in the Katha Division on the forenoon of the 20th November 1905, and assumed charge of the Myadaung sub-division on the afternoon of the 26th November 1905.

11th December 1905.—No. 24.—(*Forests*).—With reference to Revenue Department Notification No. 557 (Forests, dated the 2nd December 1905, Mr. L. C. Davis, Officiating Deputy Conservator of Forests, made over, and Mr. J. C. Hopwood, Officiating Deputy Conservator of Forests, received charge of the Upper Chindwin Division on the afternoon of the 5th December 1905, Mr. Davis assuming charge of the Working Plans work in the Upper Chindwin Division from the same date.

18th December 1905.—No. 595.—(*Forests*).—Mr. W. T. T McHarg, Deputy Conservator of Forests, has been permitted by his Majesty's Secretary of State for India to return to duty within the period of his leave.

19th December 1905.—No. 34.—Mr. F. Dalton, Forest Ranger, is transferred to the Toungoo Division on girdling duty with headquarters at Toung.

He relinquished charge of the duties of the River Range, Shwegyin Division, on the afternoon of the 2nd December and reported his arrival to the Divisional Forest Officer, Toungoo, on the forenoon of the 4th December 1905.

No. 35.—With reference to Revenue Department Notification No. 557 (Forests), dated the 2nd December 1905, Mr. J. C. Hopwood, Officiating Deputy Conservator of Forests, was relieved of the charge of Toungoo sub-division by Mr. H. W. A. Watson, Deputy Conservator of Forests, on the forenoon of the 27th November 1905.

18th December 1905.—No. 25.—(*Forests*).—With reference to Revenue Department Notification No. 520 (Forests), dated the 13th November 1905, Mr. R. E. Marsden, Officiating Deputy Conservator of Forests, made over, and Mr. D. H Allan, Extra Deputy Conservator of Forests, received charge of the Myittha Division on the forenoon of the 11th December 1905, Mr. Marsden assuming charge of the Working Plans work in the Myittha Division from the afternoon of the same date.

27th December 1905.—No. 622.—(*Forests*).—Mr. J. C. Murray, Deputy Conservator of Forests, West Salween Division, is posted as a temporary measure, to the charge of the Kado and Agency Forest Division in addition to his own duties, in place of Mr. G. F. R. Blackwell, Deputy Conservator of Forests, who continues in charge of the Thaungyin Forest Division.

18th December 1905.—No. 16.—With reference to Revenue Department Notification Nos. 569 and 570 (Forests), dated the 6th December 1905, Mr. A. Rodger, Deputy Conservator of Forests, assumed charge of the Depôt and Agency Division, Rangoon, in addition to his own duties, on the forenoon of the 18th December 1905, relieving Mr. H. B. Anthony, Deputy Conservator of Forests, who proceeded on privilege leave for one month from the same date.

17th December 1905.—No. 25.—With reference to Revenue Department Notification No. 524 (Forests), dated the 13th November 1905, Mr. H. L. P. Walsh, Officiating Deputy Conservator of Forests, assumed charge of his duties as Working Plans Officer in the Ruby Mines Division on the forenoon of the 4th December 1905.

9.—Eastern Bengal and Assam Gazette.

5th December 1905.—No. 1570*F*.—The following Notification by the Government of India in the Department of Revenue and Agriculture (*Forests*), is published :—

18th November 1905.—No. 1389.—305-3*F*.—Mr. C. C. Hatt, Deputy Conservator of Forests, Bengal, is transferred to Eastern Bengal and Assam.

5th December 1905.—No. 1571*F.*—Mr. C. C. Hatt, Deputy Conservator of Forests, on return from leave, is appointed to hold charge of the Buxa Forest Division.

7th December 1905.—No. 1619*F.*—Mr. W. A. R. Doxat, Deputy Conservator of Forests, on return from leave, is appointed to hold charge of the Garo Hills Forest Division.

7th December 1905.—No. 1620*F.*—Babu Nil Kanta Mukerjee, Extra Assistant Conservator of Forests, in charge of the Garo Hills Forest Division, on relief by Mr. Doxat, is attached temporarily to that Division.

7th December 1905.—No. 1621*F.*—Mr. D. P. Copeland, Deputy Conservator of Forests, on return from leave, is placed temporarily in charge of the Kheddah operations in the Kamrup district.

7th December 1905.—No. 1646*F.* Furlough for one day, under Article 308 (*b*) of the Civil Service Regulations, is granted to Mr. C. C. Hatt, Deputy Conservator of Forests, Buxa Division, in extension of the combined leave for six months granted by the Government of Bengal in Revenue Department Notification No. 714T.R., dated the 15th May 1905.

12th December 1905.—No 1778*F.*—The following Notification by the Government of India in the Department of Revenue and Agriculture (Forests is republished —

30th November 1905.—No. 1439.—251-5*F.*—Mr. E. S. Carr, Conservator of Forests, 2nd grade, on return from the leave granted to him in the Notification of this Department, No. 600F., dated the 8th May 1905, is appointed to the charge of the Eastern Bengal and Assam Forest Circle, with effect from the 5th November 1905, the date on which he relieved Mr. C. E. Muriel, Officiating Conservator, 3rd grade.

20th December 1905.—No. 1966*F.*—In supersession of Notification No. 1088G., dated the 29th December 1904, Mr. E. M. Coventry is appointed to be Deputy Conservator of Forests, 3rd grade, with effect from the 10th April 1904. His service from the 27th October 1903 to the 9th April 1904 will be reckoned as sub. *pro tem.*

10.—MYSORE GAZETTE.

8th December 1905.—No. R. 6975—Ft. 115-05-3.—Mr. M. Srinivasa Rao, Sub-Assistant Conservator of Forests, on special duty in the Shimoga District, is granted three months' leave on medical certificate from the 15th November 1905, under Article 218 of the Mysore Service Regulations

18th December 1905.—No. R 7469—Ft. 40 of 05-5.—Under Article 188 of the Mysore Service Regulations, Mr. C. Appaiya, Assistant Conservator of Forests, under orders of transfer to the Tumkur District is granted privilege leave of absence for three months from the date of his relief from the Mysore District Forest Office.

2. Mr. H. Ramaiya, Sub-Assistant Conservator of Forests, Kadur District, will act as District Forest Officer of Tumkur during the absence of Mr. Appaiya on leave or until further orders.

TIMBER AND PRODUCE TRADE.

DENNY, MOTT AND DICKSON, LIMITED.

Wood Market Report.

London, 1st December 1905.

Teak.—The landings in the docks in London during November consisted of 331 loads of logs and 74 loads of planks and scantlings, or a total of 405 loads, as against 1,133 loads for the corresponding month of last year. The deliveries into consumption were 804 loads of logs and 551 loads of planks and scantlings—together 1,355 loads, as against 1,094 loads for November 1904.

The dock stocks at date analyse as follows:—

4,026 loads of logs,	as against	5,396 loads	at the same	date	last	year.
2,580 „ planks,	„	3,488	„	„	„	
Total 6,606 loads	„	8,884 loads	„	„	„	

As shown by the above figures, the imports continue to be very inadequate, having during November only amounted to some 30 per cent of the consumption. The demand continues to be checked by the still-advancing cost, but stocks in the hands of consumers have run so low that the necessity of providing for work in hand is driving unwilling buyers into the market, and probably the demand will continue to develop, whilst the supplies give no such promise—so far as Rangoon, Moulmein and Bangkok descriptions are concerned. The above conditions are giving a great impetus to shipments from Java, but the supply of this wood in merchantable sizes cannot be sufficient to compensate for the serious falling off in the shipments from Burma and Bangkok.

MARKET RATES FOR PRODUCTS.

Tropical Agriculturist.

1st November 1905

Cardamoms	...	...	...	per lb.	1s. 3d. to 1s. 5d.
Croton Seeds	...	...	...	„ cwt.	20s. to 25s.
Cutch „	...	...	...	„ „	24s. to 30s.
Gum Arabic	...	...	...	„ „	17s. 6d. to 25s. nom.
Do. Kino	..	...	...	„ „	7½d. to 1s. nom.
India-rubber, Assam	...	...	...	„ lb	2s. 9d. to 3s. 10d.
Do. Burma	...	...	...	„ „	1s. 6d. to 3s. 8d.
Myrobalans, Madras	...	...	...	„ cwt.	4s. 3d to 4s. 6d.
Do. Bombay	...	...	...	„ „	4s. to 6s.
Do. Jubbulpore		...	...	„ „	4s. to 6s.
Do. Bengal	...	...	...	„ „	3s. 6d. to 6d.
Nux Vomica	...	...	...	„ „	8s. 6d. to 10s.6d. nom.
Oil, Lemon Grass	...	...	...	„ lb.	7¾d to 8d.
Orchella Weed, Ceylon	...	..	...	„ cwt.	nom.
Seed Lac	...	...	..	„ „	110s. to 175s.
Tamarinds, Calcutta	...	...	...	„ „	7s. to 8s.
Do Madras	...	.	.	„ „	3s. 6d. to 4s. 6d.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

His Excellency the Viceroy and Governor General is pleased to confer the title of Rai Bahadur, as a personal distinction, upon—

Pandit Ram Dat, Extra Assistant Conservator of Forests, United Provinces.

19th January 1906.—No. 35—11-2.—Mr. Gurudas Chatterjee, Extra Assistant Conservator of Forests, Bengal, is transferred to Eastern Bengal and Assam, with effect from the 5th January 1906.

23rd January 1906.—No 67—150-20-F.—Mr. F. Beadon-Bryant, Chief Conservator of Forests, Burma, is granted extraordinary leave without allowances from the 19th to the 30th October 1905, in continuation of the leave granted to him in the notification of this Department No. 912-F.—150-9, dated the 14th July 1905.

2.—Madras Gazette.

21st December 1905.—No. 2.—

(1) Mr. John Sinclair Battie, to be Deputy Conservator of Forests, 1st grade, *vice* Mr. A. W. Lushington confirmed as Conservator of Forests, 3rd grade.

(2) Mr. Ernest Radcliffe Murray, to act as Deputy Conservator of Forests, 1st grade, *vice* Mr. F. A. Lodge acting as Conservator of Forests, 3rd grade.

(3) Mr. Claude duPre Thornton, to be Deputy Conservator of Forests, 2nd grade. To fill the appointment newly created in that grade—*vide* Government Order No. 1060 Revenue, dated 31st October 1905.

(4) Mr. Arthur Bushe Jackson, to be Deputy Conservator of Forests, 2nd grade, *vice* No. (1).

(5) Mr. Charles Mortimer Hodgson, to act as Deputy Conservator of Forests, 2nd grade, *vice* No. (2).

(6) Mr. George Frederick Fischer Foulkes, to act as Deputy Conservator of Forests, 2nd grade, *vice* Mr. C. du P. Thornton, on furlough.

(7) Mr. Stephen Cox, to be Deputy Conservator of Forests, 3rd grade. To fill the appointment newly created in that grade—*vide* Government Order No. 1060 Revenue, dated 31st October 1905.

(8) Mr. Hugo Francis Andrew Wood, to be Deputy Conservator of Forests, 3rd grade, *vice* No. 3.

(9) Mr. Henry Tireman, to be Deputy Conservator of Forests, 3rd grade, *vice* No. (4).

(10) Mr. Cecil Ernest Claude Fischer, to act as Deputy Conservator of Forests, 3rd grade, *vice* Mr. H. Tireman, on furlough.

(11) Mr. Henry FitzGerald Arbuthnot, to act as Deputy Conservator of Forests, 3rd grade, *vice* No. (5).

(12) Mr. James Stewart Scot, to act as Deputy Conservator of Forests, 3rd grade, *vice* No 6.

(13) Mr. Bernard Henry Barlow-Poole, to be Deputy Conservator of Forests, 4th grade, *vice* No 9).

11th December 1905.—*Transfers.*—The following transfers are ordered :—

(1) Ranger Mehr Chand, Bellary district, to East Kurnool.

(2 Ranger K Rama Row, East Kurnool, to Bellary. To join on relief by No. 1.

20th December 1905.—*Leave without allowances.*—To M.R.Ry. C. Balayya Naidu, Acting Ranger, 6th grade, sub. *pro tem.*, South Arcot district, for three days from 1st December 1905, under article 339 of the Civil Service Regulations.

21st December 1905.—*Extension of Privilege Leave.*—To M.R.Ry. S. Lakshimipathy Naidu, Ranger, 5th grade, Cuddapah district, by one month in continuation of that already granted to him.

2nd January 1906.—*Transfer.*—The transfer of Ranger K. Rama Row from Kurnool East is cancelled. Ranger E. M. Crothers is posted to Bellary district—to

join at once—*vice* Ranger Mehr Chand who had proceeded on leave on medical certificate.

6th January 1906.—*Privilege Leave.*—To Mr. H. W. A. Gaudoin, Ranger, 4th grade, acting, South Salem, from 23rd December 1905, for one month under article 260 of the Civil Service Regulations.

17th January 1906.—No. 48.—

(1) Mr. Charles Adolphus Eber Hardie, to be Extra Deputy Conservator of Forests, 4th grade (*Seconded*).

(2) M. R. Ry. Vemuru Alwar Chetti Garu, B.A., to be Extra Deputy Conservator of Forests, 4th grade (*Seconded*).

(3) M. R. Ry. Mattada Rama Rao Avargal, to be Extra Deputy Conservator of Forests, 4th grade (*provisional substantive*).

(4) Mr. Henry Joshua McLaughlin, to be Extra Assistant Conservator of Forests, 2nd grade; to fill an existing vacancy.

(5) Mr. Nicholas Manuel Rego, to be Extra Assistant Conservator of Forests, 2nd grade, *vice* No. (4).

(6) Mr. Henry O'Neill, to be Extra Assistant Conservator of Forests, 3rd grade, *vice* No. (4).

(7) Mr. James Tapp, to be Extra Assistant Conservator of Forests, 3rd grade, *vice* No. (5).

(8) M. R. Ry. K. Aswatham Nayudu, Forest Ranger, 2nd grade and acting in the 1st grade, to be Extra Assistant Conservator of Forests, 4th grade, on probation for one year.

Note.—Appointments Nos. (1) to (7) will take effect from the 10th September 1905.

No. 49.—The following probationary Extra Assistant Conservators of Forests 4th grade, are confirmed in their appointments with effect from October 21st, 1904:—

(1) Mr A. G. Van Haeften.

(2) M. R. Ry. P. Ananda Rao Garu.

(3) Mr. G. W. Thompson.

22nd January 1906.—*Leave on Medical Certificate.*—To M. R. Ry. K. R. Manicka Mudaliar, Ranger, 5th grade, South Arcot, for three months from date of relief.

3.—BOMBAY GAZETTE.

29th December 1905.—No. 10616.—Mr. A. F. Gonsalves, L. C. E., Extra Assistant Conservator of Forests, 4th grade, and Sub-Divisional Forest Officer, Satara, passed an examination in Marathi according to the Lower Standard on the 19th December 1905.

24th January 1906.—No. 698.—Mr. W. F. D. Fisher, Deputy Conservator of Forests, 3rd grade, and Divisional Forest Officer, North Thana, is granted privilege leave of absence for three months in combination with furlough for three months and twenty days.

4.—BENGAL GAZETTE.

6th January 1906.—No. 75.—Consequent on the placing of the services of Mr. W. F. Lloyd, Deputy Conservator of Forests, 3rd grade, and officiating 2nd grade, at the disposal of the Government of India in Notification No. 2067 T. R., dated 1st August 1905, for service in Siam, the following promotions are ordered with effect from the 8th August 1905:—

Mr. F. Trafford, Deputy Conservator of Forests, 3rd grade, sub *pro tem.* and officiating in the 2nd grade, to be Deputy Conservator of Forests, 3rd grade, provisionally substantive, and to continue to officiate as Deputy Conservator of Forests, 2nd grade.

Mr. E. P. Stebbing, Deputy Conservator of Forests, 4th grade and officiating in the 3rd grade, to be Deputy Conservator of Forests, 3rd grade sub. *pro tem*, and to officiate as Deputy Conservator of Forest, 2nd grade.

Sir H. A. Farrington, Bart., Deputy Conservator of Forests, 4th grade and officiating in the 3rd grade, to be Deputy Conservator of Forests, 3rd grade, sub. *pro tem.*, and to officiate as Deputy Conservator of Forests, 2nd grade, *vice* Mr. Stebbing, seconded.

Mr. J. L. Baker, Deputy Conservator of Forests, 4th grade, sub. *pro tem.*, to be Deputy Conservator of Forests, 4th grade, provisionally substantive, and to officiate as Deputy Conservator of Forests, 3rd grade.

This cancels Notification No. 2485 T. R., dated the 19th August 1905.

19th January 1906.—No. 361 *Forests.*—The services of Mr. W. R. LeG. Jacob, Assistant Conservator of Forests Bengal, are placed at the disposal of the Government of India, Revenue and Agricultural Department, for employment in Eastern Bengal and Assam.

5.—United Provinces Gazette.

8th January 1906.—No. 104—II/23-1905.—Mr. F. F. R. Channer, Assistant Conservator of Forests, on return from leave, to the Direction Division, Eastern Circle.

15th January 1906. No. 209—II/14-1906.—Mr G. O. Coombs, Extra Assistant Conservator of Forests, from the Direction Division of the Eastern Circle, to the Kumaun Forest Division of the same circle

19th January 1906.—No. 292—II/24-1906.—The services of Mr. T. Carr, Assistant Conservator of Forests, in charge of the Dehra Dun Forest Division of the Western Circle, are hereby placed temporarily at the disposal of the Government of India, Department of Revenue and Agriculture.

19th January 1906.—No. 296—II/109-1905.—With effect from the 1st January 1906 Pandit Ram Narain, Extra Assistant Conservator of Forests, 4th grade, provisionally substantive, to revert as Forest Ranger.

No. 297—II/109-1905.—With effect from the 1st January 1906, Mr. H. B. Gawke, Extra Assistant Conservator of Forests, 4th grade, sub. *pro tem.*, to be provisionally substantive in that grade.

No. 298—II/109-1905.—With effect from the 1st January 1906, Hukum Chand, Forest Ranger, to be Extra Assistant Conservator of Forests, 4th grade, sub. *pro tem.*, and to be attached to the Dehra Dun Forest Division, Western Circle.

6.—Punjab Gazette.

13th January 1906.—No. 28—A. L. No. 1.—Notification.—The following change has taken place in the list of Forest Officers in the Associated Provinces with effect from the date specified :—

Name.	Present grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. V. G. Morgan.	Officiating Deputy Conservator, 4th grade.	Assistant Conservator of Forests, 1st grade.	15th December 1905.	Consequent on Mr. A. Dunbar-Brander's return from combined leave.

16th January 1906.—No. 36—A. L. No. 2.—Notification.—Mr. M. R. K. Jerram, Assistant Conservator of Forests, Direction Division, is transferred to the Basbahr Division.

18th January 1906.—No. 39.—*Notification.*—His Honour the Lieutenant-Governor of the Punjab is pleased to make the following promotion :—

Munshi Imam-ud-din, Extra Assistant Conservator of Forests, 4th grade, provisionally substantive on probation, to be provisionally substantive in that grade and provisionally substantive in the 3rd grade with effect from the 7th of October 1905.

7.—Central Provinces Gazette.

20th January 1906.—No. 498 —*Erratum* —In Order No. 7570, dated the 22nd November 1905, granting privilege leave for two months and seven days combined with furlough for one year to Mr. Ganga Parshad Khatri, Extra Assistant Conservator of Forests, *for* the words "two months and seven days" *read* "two months and five days."

8.—BURMA GAZETTE.

2nd January 1906.—No. 1.—With reference to Revenue Department Notification No. 618 (*Forests*), dated the 22nd December 1905, Mr. A. E. Ross, Deputy Conservator of Forests, on return from leave, reported his arrival at Tharrawaddy on the afternoon of the 28th December 1905, and is placed on special duty in the Tharrawaddy Division from the same date.

2nd January 1906.—No. 1.—With reference to Revenue Department Notification No. 622 (*Forests*), dated the 27th December 1905, Mr. G. F. R. Blackwell, Deputy Conservator of Forests, made over, and Mr. J. C. Murray, Deputy Conservator of Forests, received, charge of the Kado and Agency Divisions on the 26th December 1905, afternoon.

2nd January 1906.—No. 1 (*Forests*).—With reference to Revenue Department Notification No. 559 (*Forests*), dated the 2nd December 1905, Mr. G. R. Jeffery, officiating Deputy Conservator of Forests, made over, and Mr T. T. McHarg, Deputy Conservator of Forests, received, charge of the Katha Division on the forenoon of the 23rd December 1905.

9.—EASTERN BENGAL AND ASSAM GAZETTE.

Nil.

10.—MYSORE GAZETTE

Nil.

TIMBER AND PRODUCE TRADE.

CHURCHILL AND SIM'S WOOD CIRCULAR.

1st January 1906.

EAST INDIA TEAK.—The importation of Timber and Planks has been :—

	Loads.	Deliveries.
1899	12,835	17,017
1900	15,024	11,053
1901	12,860	13,807
1902	8,762	12,598
1903	14,658	11,888
1904	7,992	10,293
1905	9,880	11,965

The Teak market has again been characterised in 1905 by a fair volume of demand, wholly inadequate supplies and very high prices. Probably no prices are prohibitive for the quantity and quality of this wood required in the naval and shipbuilding yards of this and other countries; but for much of the general market demand prices are now prohibitive, and this condition of affairs has lasted so long that much of this demand is being permanently satisfied from other channels. To London the total supply looks fairly respectable, but it is made up largely of wood very different in quality, and still more so in specification, from what we used to know by the proud name of Teak. This supply has again fallen far short of the consumption, as was also the case in 1904, and the dock stock carried over into the New Year is the smallest we have record of for very many years past. The shipments from Java have been growing in volume, and to some extent in favour. The nature and quality of the wood compares well with the older shipments, but the small scantling, and still more the excessively short lengths in which it is shipped here, militate greatly against its market value. Perhaps with the prevailing fashion for small sizes in wood generally this objection may pass away by degrees, but it would cerainly be advisable for the Dutch shippers to mend it in this respect, so far as they can, in the meanwhile.

ROSEWOOD.—East India Rosewood in the pianoforte trade together account for the reduced demand for Brazil wood. Stocks are practically exhausted, but only

small shipments should be made. Prices remained at the low level of from £7 to £12 for Rio, and from £6 to £10 per ton for Bahia according to size and condition.

SATINWOOD.—EAST INDIA. There was a slightly increased import and the consumption also improved, so that stocks were reduced and are now not excessive. The chief demand was either for really finely-figured logs or straight, sound plain wood of fair size, but logs of an intermediate character, which are usually overvalued by shippers, were difficult to sell. Prices have kept fairly steady, and range from 7d. upwards for plain logs, and from 1s. to 5s. per foot for figury to choice logs.

EBONY.—EAST INDIA.—There was a largely increased import, most of which passed into consumption, yet the demand was not active, and low prices had to be accepted. Only prime, large wood should now be sent. Quotations are from £6 to £9 per ton.

DENNY, MOTT & DICKSON, LIMITED.

WOOD MARKET REPORT.

London, 1st January 1906.

TEAK.—Unprecedentedly high as prices were at the commencement of 1905, the cost of Teak at the shipping ports continued to rise all through the year. Notwithstanding the efforts in all directions to curtail the use of such expensive material, the demand for naval and commercial shipbuilding combined with that for the increased building of rolling-stock both for at home and abroad, caused a consumption for Europe exceeding that of 1904 by some ten per cent. The natural outcome of this state of things was to stimulate the shipment not only of Java timber, but also of second-class wood of all descriptions of specifications, to supplement the ordinary good merchantable supplies from Burmah and Siam, with the result that the record small import of 1904 was exceeded in 1905 by some five per cent.; but even this forcing on the market of shipments of inferior wood still left the imports of Teak to Europe below the actual consumption. The net result of the position is that the stocks of Teak in Europe at the beginning of 1906 will stand at only some 15,000 loads of logs and conversions—good, bad and indifferent in respect to quality and specification. This is the smallest stock of Teak on hand *for all Europe* for at least 15 years back, and must be quickly augmented if further serious difficulty to both merchants and consumers is to be avoided. In considering the next twelve months' supplies, the amount of Teak afloat is not only insignificant but practically all sold to consumers, so that merchants have to look for the renewal of their present dwindled stocks to the supplies now actually in Rangoon, Moulmein and Bangkok, as the rainy season in India and Siam is now practically closed so far as it affects the floating down of timber from the forests to the above shipping ports. The largest shippers report that the season's supplies of timber of "European quality" have been very small, the rafts which have come to hand yielding a very much smaller percentage of such quality than used to be the case before the stricter Government policy as to the regulations for the preservation of the Indian and Siamese forests came into force In respect to the developing supplies from Java, whilst it is certain that this source of supply will continue to be developed, and increasingly find its way into consumption—however much it may be objected to for not being so light or mild as Burma wood, it must be recognised that the want of length in this wood unfits it for much of the high-class construction in which Teak is required. This drawback in respect to length chiefly arises from the conditions of growth in Java as compared with those in Burmah and Siam and cannot therefore be greatly modified by better supervision of the shipments.

The prospects of consumption during the present year should be good, seeing the continued activity both in the shipbuilding and rolling-stock industries; and it is much to be deplored in the sound interests of all concerned that the difficulties of supply threaten to further cripple so interesting and important a branch of the timber trade as the Teak industry, seeing that the appreciation of the high qualities of Teak has steadily increased during the last ten years, and the consequent demand for its use in domestic construction was rapidly expanding when the fact of short supplies and unprecedentedly high prices stopped the engineer and architect from specifying it for any construction where its use was not imperative.

In respect to London *per se*, the imports into and deliveries from the London docks during the 12 months ending 31st December 1905, show as follows :—

Logs ... 6,033 loads imported, against 7,131 loads delivered into consumption.
Planks and Coverings .. 3,044 " " 4,031 " " "
Total ... 9,077 " " 11,162 " " "

NOTE.—The above figures deal only with *landed* stocks and are exclusive of the overside deliveries, which although very important, are not noted by the dock companies.

The Dock stock at date analyse as follows :—

Logs.—Burma and Siam ... 2,814
Java ... 1,169
3,983 loads, as against 5,081 loads at the same date last year.

PLANKS.—Burma and Siam .. 1,649
Java ... 852
2,501 " " 3,488 " " "
Total ... 6,484 8,569

C. LEARY AND CO.'S LONDON MARKET REPORT.

REVIEW OF THE YEAR 1905.

EAST INDIA TEAK.—The following are the statistics of the last three years :—

		1905. *Loads.*		1904. *Loads.*		1903. *Loads.*	
		Timber.	*Planks.*	*Timber.*	*Planks.*	*Timber.*	*Planks.*
Imports	Moulmein ...	1,515	218	288	722	1,695	455
	Rangoon ...	2,499	1,208	2,054	1,943	4,599	2,599
	Bangkok ...	1,022	329	58	154	769	313
	Other Countries	997	1,289	1,223	876	1,732	1,845
	Total ...	6,033	3,044	3,623	3,695	8,795	5,212
Deliveries	Moulmein ...	1,325	404	1,197	529	2,620	685
	Rangoon ...	3,558	2,116	2,986	2,166	3,118	1,992
	Bangkok ...	804	337	623	108	652	287
	Other Countries	1,444	1,174	688	1,318	847	1,040
	Total ...	7,131	4,031	5,494	4,121	7,237	4,004
Stock 30th Dec.	Moulmein ...	1,214	609	1,024	795	1,933	602
	Rangoon ...	970	683	2,029	1,591	2,961	1,814
	Bangkok ...	630	357	412	365	977	319
	Other Countries	1,169	852	1,616	737	1,081	1,179
	Total ...	3,983	2,501	5,081	3,488	6,952	3,914

TIMBER.—An examination of the above figures shows the year's trade to have exceeded that of 1904, but to have been smaller than that of 1903 by no less than 31 per cent as regards imports but only 1 per cent in consumption. Stocks are 22 per cent less than the figures at the same date last year, themselves a decline of 27 per cent below those of 1903, and constitute a record for more than twenty years.

The sailing tonnage afloat is 3,109 tons, whilst under charter to load there are 2,172 tons, compared with 5,755 tons and 2,472 tons, respectively, last year.

With the exception of a short time during the summer, there has been no lack of demand, but it was in the last few months that the enquiry was strongest; business generally has been on a smaller scale than in what we may call normal years, and it is probable this restriction will continue until the supply again attains larger proportions and prices return to a more reasonable level. Moreover, the demand in the East itself, not only for second, but also for first-class timber, has greatly increased

and it must not be forgotten that whilst for some classes of work Teak is indispensable, the present high prices will increasingly have the effect of driving buyers to the use of substitutes, even though the latter be less suitable to their purpose; the above statistics of consumption show that Java Teak has already made considerable progress.

Reviewing the year 1905 itself, we find that the upward course of prices has made rapid and uninterrupted progress, but although present values constitute a record it is to be feared we have even now not reached high water mark, as there is no present sign of the demand diminishing. The most rapid advance was in the first half of the year, but in the last quarter prices stiffened further, due partly to the publishing of the Admiralty requirements for the coming year, and partly to an improved demand for general shipbuilding work. Attempts to introduce second-class timber have met with some success, and if the experiment is satisfactory to consumers regular shipments will doubtless follow. Timber of such large sizes as the trial parcels have been must surely offer attractions to buyers at prices so much lower than those required for ordinary quality.

PLANKS.—The landings, consumption, and stock, in comparison with 1904, all show a decrease, the percentages being 18 per cent, 2 per cent, and 28 per cent, respectively.

Moderate imports and a steady, if somewhat spasmodic, demand characterised the first half of the year: prices, however, did not vary greatly. After the summer holidays the demand revived materially, accompanied by a steady increase in values, which even now do not seem to have reached the upward limit. It is a remarkable fact that quotations for plank specifications did not for a long time advance in sympathy with those of timber, and though we have now passed the highest point reached in 1903, values are cheap compared with log prices: even flitch specifications, values of which have been almost stationary for several years, are now distinctly dearer. The high quotations for Burma and Siam wood afforded an excellent opportunity for Java Teak, and though hewn flitches have not greatly appreciated, sawn planks, of which large quantities were imported, have considerably advanced. The consumption of this wood has been much assisted by the improved specifications shippers are able to offer, and current rates for the better lengths of sawn Java planks are now almost on a par with those at which Burma wood of similar specification was selling early in the year; much of the business was for overside delivery and hence does not figure in the above statistics.

PADOUK.—There has been an utter lack of animation in the demand, and though the stocks were, until recently, very small, they were inferior and proved hard to place, low figures having finally to be accepted to effect a clearance. Stocks now consist of a few small parcels of EAST INDIA, but we do not at present advise further shipments of either this or the AFRICAN variety.

MARKET RATES FOR PRODUCTS.

TROPICAL AGRICULTURIST.

Cardamoms	... ...	per lb	1s. to 2s.
Croton seeds	... ...	,, cwt.	20s. to 25s.
Cutch do.	... ...	,, ,,	24s. to 30s
Gum Arabic	... ...	,, ,,	18s. to 25s.
Do. Kino	... ...	,, ,,	7½d. to 1s
India-rubber, Assam	... ...	,, lb.	2s 9d. to 3s. 10d.
Do. Burma	... ...	,, ,,	1s. 6d. to 3s. 8d.
Myrobalans, Madras	... ...	,, cwt.	4s. 3d. to 4s 6d.
Do. Bombay	... ...	,, ,,	4s. to 6s.
Do. Bengal	... ...	,, ,,	3s. to 6s.
Nux Vomica, Cochin	... ...	,, ,,	8s. 6d. to 10s. 6d.
Do. Bengal	... ...	,, ,,	8s to 8s 6d.
Oil, Lemon grass	... ...	,, ,,	7¾d. to 8d
Orchella Weed, Ceylon	... ...	,, ,,	nom.
Seed lac	... ...	,, ,,	110s to 175s.
Tamarinds, Calcutta	... ...	,, ,,	14s.
Do. Madras	... ...	,, ,,	16s. to 18s.

GAZETTE NOTIFICATIONS.

1.—GAZETTE OF INDIA.

30th January 1906.—No. 87—68-2-*F*.—Mr. W. R. LeG. Jacob, Assistant Conservator of Forests, Bengal, is transferred to Eastern Bengal and Assam.

6th February 1906.—No. 114—311-4 *F*.—Mr. H A. Hoghton, Conservator of Forests, 3rd (officiating 2nd) grade, United Provinces, is granted privilege leave for one month and eight days combined with leave on urgent private affairs for four months and twenty-two days, with effect from the 18th January 1906.

From the same date the following promotions are made :—

(i) Mr. L. Mercer, Conservator, 3rd grade, United Provinces, to officiate as Conservator, 2nd grade.

(ii) Mr. H. Jackson, Deputy Conservator, 1st grade, Burma, on return from leave, is appointed to officiate as Conservator of Forests, 3rd grade, in charge of the Eastern Circle, United Provinces, of which he relieved Mr. Hoghton on the afternoon of the 17th January 1906.

23rd February 1906.—No. 159—98-2-*F*.—Mr. G. T. Wrafter, Extra Assistant Conservator of Forests, 2nd grade, Andamans, is granted, under Article 260 of the Civil Service Regulations, privilege leave for one month from the 29th January 1906 or the subsequent date on which he may avail himself of it.

2.—MADRAS GAZETTE.

3rd February 1906.—*Privilege Leave.*—To Mr. H. W. A. Gaudoin, Acting Ranger, 4th grade, South Salem Division, for one month and eight days in continuation of the leave already granted to him.

Privilege Leave—To M. R. Ry. S. Lakshmipathy Naidu, Ranger, 5th grade, Cuddapah district, for one month in continuation of the leave already granted to him.

25th January 1906—*Leave and Transfer.*—(1) Shaik Rahamtulla Sahib, Ranger, 4th grade, Kurnool East, is granted one month's privilege leave and six months furlough from date of relief.

(2) K. A. Chengappa, Ranger, 6th grade, Godavari district, is transferred to Kurnool East. No. (2) should relieve No. (1).

3.—BOMBAY GAZETTE.

31st January 1906.—No 3734.—Messrs. A. F. Gonsalves, Extra Assistant Conservator of Forests, and G. R. Duxbury, Deputy Conservator of Forests, respectively delivered over and received charge of the Sub-Division Forest office, Satara, on the afternoon of the 10th January 1906.

24th January 1906.—No. 2574. Mr. K. B. Gokhale, Extra Assistant Conservator of Forests, 4th grade, lately attached to the Working Plans Division of the Northern Circle, has been attached to the Panch Mahals Division He made over the former duties on 8th January 1906 and took charge of the new ones on 17th idem

3rd February 1906. No. 3815.—Mr. W. G. Betham, Deputy Conservator of Forests, handed over charge of the Ahmednagar Divisional Forest office to Mr. G. M. Bhatkal, Extra Assistant Conservator of Forests, on the afternoon of the 25th January 1906, and proceeded on privilege leave for one month.

6th February 1906.—No. 3851.—Mr. G. M Bhatkal, Extra Assistant Conservator of Forests delivered over and Mr. G. M. Ryan, Deputy Conservator of Forests, received charge of the Poona Sub-Division office on the afternoon of the 24th January 1906.

16th February 1906.—No. 2695.—Mr. W. F. D. Fisher, Deputy Conservator of Forests, delivered over and Mr. C. E. L. Gilbert, Assistant Conservator of Forests, received charge of the office of the Divisional Forest Officer, North Thana, on the 31st January, in the afternoon.

4.—BENGAL GAZETTE

Nil.

5.—U. P. of Agra and Oudh Gazette.

7th February 1906.—No. 491—II 24-19 6.—Lala Madho Parshad, Extra Assistant Conservator of Forests, attached to the Dehra Dun Forest Division, Western Circle to hold charge of that Division, *vice* Mr. T. Carr, on deputation.

6.—Punjab Gazette.

26th January 1906.—No. 59.—Lala Devi Ditta, Extra Assistant Conservator of Forests, attached to the Hazara Forest Division, North-West Frontier Province, has been granted one month's privilege leave, with effect from the afternoon of the 17th December 1905.

12th February 1906—No. 78—A. L. No. 3.—*Notification.*—Mr. P. C. Corbould, Assistant Conservator of Forests, 2nd grade, having passed the examinations prescribed in Section 72 of the Forest Department Code, is promoted to Assistant Conservator of Forests, 1st grade, sub. *pro tem.*, with effect from the 15th January 1906.

7.—Central Provinces Gazette.

26th January 1906.—No. 632.—On return from the leave granted him by Order No. 159-A, dated the 10th January 1905, Mr. A. St. V. Beechey, Deputy Conservator of Forests, is posted to the charge of the Nagpur-Wardha Division.

No. 633.—On being relieved of the charge of the Nagpur-Wardha Division by Mr. Beechey, Rai Bahadur Mansukh Rai, Extra Deputy Conservator of Forests, will remain attached to that Division.

No. 635.—Mr. Ganga Parshad Khatri, Extra Assistant Conservator of Forests, 3rd grade, sub. *pro tem.*, on making over charge of the North Chanda Division to Mr. L. K. Martin, Extra Assistant Conservator of Forests on the forenoon of the 27th November 1905, remained attached to that Division up to the 2nd December 1905, and proceeded on the combined leave granted him by Order No. 7570, dated the 22nd November 1905, on the afternoon of the 2nd idem.

No. 651.—In consequence of the return of Mr. R. C. Thompson Extra Assistant Conservator of Forests, 1st grade, from deputation to Siam, the following reversions are ordered with effect from the 20th November 1905:—

Name.	Reversion.	
	From	To
L. K. Martin ...	Extra Assistant Conservator of Forests, 1st grade, sub. *pro tem.*	Extra Assistant Conservator of Forests, 2nd grade.
S. R. Parsons ...	Extra Assistant Conservator of Forests, 2nd grade, sub. *pro tem.*	Do. do. 3rd grade.
B. Inamati Sham Rao ...	Extra Assistant Conservator of Forests, 3rd grade, sub. *pro tem.*	Do. do. 4th grade
Dhanji Shah N. Avasia ...	Extra Assistant Conservator of Forests, 4th grade, sub. *pro tem.*	Forest Ranger, 1st grade.
J. F. Langhorne ...	Forest Ranger, 1st grade, sub. *pro tem.*	Do. 2nd grade.
Lala Gauri Shankar ...	Do. 1st do.	Do. 2nd grade.
Chintaman V. Sarvati .	Do. 2nd do.	Do. 3rd grade.
Govind G Sapre ..	Do. 3rd do.	Do. 4th grade.
Prithvi Singh ...	Do. 4th do.	Do. 5th grade.
Diwakar B. Burhampuri ...	Do. 5th do.	Do. 6th grade.

12th February 1906.—Mukund Raoji, Deputy Ranger, 1st grade, of the Wun Division Berar Forest Circle, is promoted to the Class of Forest Rangers, 6th grade, with effect from the 10th February 1906 (in place of H. Papannah, the late Ranger, deceased).

8. - BURMA GAZETTE.

1st February 1906.—No 72 (*Forests*.— The following promotions and reversions are ordered in the Forest Department:—

(1) With effect from the 4th December 1905, consequent on the return from leave of Mr. H L. P. Walsh, Assistant Conservator, 1st grade:

Mr. H. L. P. Walsh, Assistant Conservator, 1st grade, to officiate as Dputye Conservator, 4th grade.

(2) With effect from the 18th December 1905, consequent on the departure on privilege leave of Mr. H. B. Anthony, Deputy Conservator, 1st grade:

Mr G. R Long, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade.

Mr. C. R. Dun, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. H. L. P. Walsh, Assistant Conservator, 1st grade Officiating Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

(3) With effect from the 23rd December 1905, consequent on the return from leave of Mr. W. T. T. McHarg, Deputy Conservator, 3rd grade:

Mr. W. T. T. McHarg, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade

Mr. C. R. Dun, Deputy Conservator, 3rd grade Officiating Deputy Conservator, 2nd grade), to revert to his substantive appointment.

Mr. H. L. P. Walsh, Assistant Conservator, 1st grade (officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator 4th grade.

(4) With effect from the 29th December 1905, consequent on the return from leave of Mr. A. E. Ross, Deputy Conservator, 4th grade:

Mr. A. E. Ross, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. H. C. Walker, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

9.—EASTERN BENGAL AND ASSAM GAZETTE

Nil.

10.—MYSORE GAZETTE.

Nil.

TIMBER AND PRODUCE TRADE.

C. LEARY AND CO.'S LONDON MARKET REPORT.

1st to 28th February, 1906.

EAST INDIA TEAK.—*Timber.*—The market has suffered almost all the month from a distinct want of keenness on the part of Buyers, but Sellers are under no necessity to force sales and are consequently still able to command the extreme prices recently paid. *Planks.*—Here also a sluggish tone has been noticeable, but a considerable business has nevertheless been done. Quotations, according to specification, are for Timber £12 10s. to £19, for Flitches £16 to £20 and for Planks £13 10s. to £19 10s. per load on c.i.f. terms.

The arrivals of Timber were 287 loads from Burma, 76 from Bangkok and 81 from Java. The analysis of deliveries and stocks is as follows :—

	Deliveries for Feb.		Deliveries to 28th Feb.		Dock Stock.	
	Timber.	Plank.	Timber.	Plank.	Timber.	Plank.
1906 ...	327	345	1,783	658	4,260	3,046
1905 ...	419	363	1,217	820	4,886	3,401
1904 ...	505	283	903	675	6,653	4,109

PADOUK.—There is scarcely any demand and shipments cannot at present be advised.

MARKET RATES FOR PRODUCTS.

TROPICAL AGRICULTURE.

Cardamoms	...	...	...	per lb.	1s. 3d. to 1s. 5d.
Croton Seeds	...	...	...	,, cwt.	20s. to 25s.
Cutch ,,	...	...	...	,, ,,	24s. to 27s. 6d.
Gum Arabic	...	...	...	,, ,,	15s. to 22s.
Do. Kino	...	...	...	,, lb	7½d. to 1s.
India-rubber, Assam	...	...	...	,, ,,	2s. 9d. to 3s. 9¾d.
Do. Burma	...	...	...	,, ,,	1s. 6d. to 3s. 8d.
Myrabolans, Madras	...	...	...	,, cwt.	4s. 3d to 4s. 6d.
Do. Bombay	...	...	...	,, ,,	4s. to 6s.
Do. Bengal	...	...	...	,, ,,	3s. 6d. to 5s. 6d.
Nux Vomica, Cochin	...	...	...	,, ,,	8s.6d.to10s.6d. nom.
Do. Bengal	...	...	...	,, ,,	8s. to 8s. 6d.
Oil, Lemon Grass	...	...	...	,, ,,	8d. to 8½d.
Orchella Weed, Ceylon	...	...	...	,, ,,	nom.
Seed Lac	...	...	...	,, ,,	110s. to 170s.
Tamarind, Calcutta	...	...	...	,, ,,	7s. to 8s.
Do. Madras	...	...	...	,, ,,	3s. 6d.to 4s. 6d.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

The following promotion and reversions are ordered with effect from the 31st October 1905 :—

21st February 1906.—Mr. E. P. Stebbing, Deputy Conservator of Forests, 3rd grade, sub. *pro tem*, and Officiating Deputy Conservator of Forests, 2nd grade, (on deputation), reverted to Deputy Conservator of Forests, 3rd grade, sub. *pro tem.*

23rd February 1906.—No. 159-98-2—F.—Mr. G. T. Wrafter, Extra-Assistant Conservator of Forests, 2nd grade, Andamans, is granted under Article 260 of the Civil Service Regulations, privilege leave for one month from the 29th January 1906 or the subsequent date on which he may avail himself of it.

28th February 1906.—No 185-99-3-F.—Mr. F. B. Manson, Conservator of Forests, 1st grade, on leave, is permitted to retire from the service of Government, with effect from the 2nd January 1906.

From the same date Mr. J. H. Lace, Conservator of Forests, 2nd (Officiating 1st) grade, is confirmed in the latter grade.

9th March 1906.—No. 212-*For.*—The services of Mr. F. H. Todd, Deputy Conservator of Forests, 4th (Officiating 3rd) grade, Burma, are placed temporarily at the disposal of the Superintendent of Port Blair from the 12th November 1905, for employment in the Andamans. Mr. Todd will continue to be borne on the Burma establishment while so employed

21st March 1906.—No 296-F.—Mr. C. P. Fisher, Conservator of Forests, 3rd grade, Central Provinces, is granted privilege leave for 14 days combined with furlough for 11 months and 16 days under Articles 233 (ii), 260 and 308 (*a*), Civil Service Regulations, with effect from the 28th March 1906 or the subsequent date on which he may be relieved.

26th March 1906.—No. 306—128-11-*F.*—Mr. E. S. Carr, Conservator of Forests, Eastern Bengal and Assam, is granted privilege leave for 13 days combined with furlough on medical certificate for 8 months and 17 days under Articles 233 and 311 of the Civil Service Regulations, with effect from the 3rd April 1906, or the subsequent date on which he may avail himself of the leave.

2.—Madras Gazette.

15th March 1906.—No 114—Mr. D. T. Barry, Assistant Conservator of Forests, to act as District Forest Officer, Tinnevelly, during the absence of Mr. R. D. Richmond on leave or until further orders.

26th March 1906—No 130.—Under articles 260, 233 and 308 (*b*) of the Civil Service Regulations, Mr. J S Battie, District Forest Officer, North Arcot, is granted combined privilege leave and furlough for seven months from 15th April 1906.

3.—Bombay Gazette.

22nd February 1906—No. 4077.—Mr. J. Dodgson, Deputy Conservator of Forests, handed over and Mr A F Gonsalves received charge of the East Khandesh Subdivisional Forest office on the afternoon of the 18th January 1906.

27th February 1906—No. 4165—Mr. A F. Gonsalves, Extra-Assistant Conservator of Forests, East Khandesh, is transferred to do duty as Sub-Divisional Forest Officer, Working Plans, C. C.

7th March 1906—No. 2863.—Mr. D. N. Damle, Extra Assistant Conservator of Forests, 4th grade, lately attached to the Nasik Division, joined his new duty in North Thana on the forenoon of the 28th February 1906.

8th March 1906—No. 4284—Messrs. G. M. Bhatkal, Extra-Assistant Conservator of Forests, and W. G Betham, Deputy Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, Ahmednagar, on the afternoon of the 24th February 1906

13th March 1906.—No. 4361. Mr. D. N. Damle, Extra-Assistant Conservator of Forests, and Mr. L. S. Osmaston, Deputy Conservator of Forests, respectively delivered over and received charge of the Sub-Divisional Forest office, Nasik, on the afternoon of the 26th February 1906.

4.—BENGAL GAZETTE.

12th March 1906.—No. 1359-*For.*—The services of Mr. F. Trafford, Deputy Conservator of Forest, Bengal, are placed at the disposal of the Government of India, Revenue and Agricultural Department, for employment in the Andamans

13th March 1906.—No. 1380-*For.*—Mr. E. E. Slane, Extra-Assistant Conservator of Forests, is, on return from the furlough granted to him in the Gazette Notification No. 1277-For., dated the 29th February 1904, posted to the Singhbhum Division as an Attached Officer.

16th March 1906.—No. 1506-*For.*—Furlough on medical certificate for 24 days is granted to Mr. R. Kirkpatrick, Assistant Conservator of Forests, attached to the Singhbhum Division, under article 311 of the Civil Service Regulations from the 4th to the 27th January, both days inclusive

5.—UNITED PROVINCES OF AGRA AND OUDH GAZETTE.

6th February 1906.—No. 114—311-4-F.—Mr. H. A. Hoghton, Conservator of Forests, 3rd (Officiating 2nd) grade, United Provinces, is granted privilege leave for 1 month and 8 days, combined with leave on urgent private affairs for 4 months and 22 days with effect from the 18th January 1906.

From the same date the following promotions are made :—

(i) Mr. L. Mercer, Conservator, 3rd grade, United Provinces, to officiate as Conservator, 2nd grade.

(ii) Mr. H. Jackson, Deputy Conservator, 1st grade, Burma, on return from leave, is appointed to officiate as Conservator of Forests, 3rd grade, in charge of the Eastern Circle, United Provinces, of which he relieved Mr. Hoghton on the afternoon of the 17th January 1906.

2nd March 1906—No. 874—II-24-1906.—Mr. E. A. Courthope, Assistant Conservator of Forests, in charge of the Saharanpur Forest Division, Western Circle, to hold charge of the Siwalik Forest Division in the same circle.

8th March 1906—No. 975—II-14-1906.—Mr. G. O. Coombs, Extra-Assistant Conservator of Forests, from the Kumaun Forest Division, Eastern Circle to the Kheri Forest Division in the same circle.

13th March 1906—No. 1037—II-126-1906—Mr. F. Canning, Assistant Conservator of Forests, in charge of the Bahraich Forest Division, Eastern Circle, on being relieved to be attached to that Division.

13th March 1906.—No. 1036—II-126-1906.—Mr. J. C. Tulloch, Deputy Conservator of Forests, on return from leave, to hold charge of the Bahraich Forest Division, Eastern Circle.

6.—PUNJAB GAZETTE.

2nd March 1906—*No.* 101.—*Notification.*—Lala Atma Ram, Officiating Extra Assistant Conservator of Forests, attached to the Lahore Forest Division, is granted two months' privilege leave, of which he availed himself with effect from the afternoon of the 17th January 1906.

13th March 1906.—*No.* 125.—*A. L. No.* 4—*Notification.*—Mr. A. V. Monro, Deputy Conservator of Forests, and Lala Devi Ditta, Extra-Assistant Conservator of Forests, respectively made over and received charge of the Hazara Forest Division, North-West Frontier Province, on the afternoon of the 19th February 1906, consequent on the former's departure on privilege leave for six weeks.

15th March 1906—No. 133.—A. L. No 5.—*Notification*—Mr. R. Parnell, Assistant Conservator of Forests, was relieved of his duties in the Kangra Division on the afternoon of the 5th February 1906 on transfer to the Direction Division to which he has been attached with effect from the afternoon of the 6th idem.

16th March 1906.—No. 141.—A. L. No. 6—*Erratum.*—In Notification No. 92 A. L. No. 4 of 17th February 1905 read—

"With effect from 6th November 1904" instead of "with effect from 15th December 1904."

And Notification No. 78 A. L. No. 3 of 12th February 1906, read—

"With effect from 24th October 1905" instead of "with effect from 18th January 1906."

20th March 1906. No. 140.—*Leave.*—Munshi Imam-ud-din, Extra-Assistant Conservator of Forests, attached in the Chamba Forest Division, is granted 1 month and

15 days' privilege leave, of which he availed himself with effect from the afternoon of the 1st March 1906.

No. 154—A. L. No. 7.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the date specified against each :—

Name.	Present grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. D. O. Witt ...	Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade.	12th February 1906.	Consequent on Mr. Beechey's return from leave.
Mr. A. D. Blascheck	Officiating Deputy Conservator, 4th grade.	Assistant Conservator, 1st grade.		

No. 158.—A. L. No. 8.

Mr. A. St. V. Beechey	Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.	20th February 1906.	Consequent on the departure of Mr. A. V. Monro on 6 weeks' privilege leave.
Mr. D. O. Witt ...	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.		
Mr. A. D. Blascheck	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.		

7.—Central Provinces Gazette.

12th February 1906.—No. 18.—Mr. Nirmal Chandra Chatterjee, Forest Ranger, 2nd grade, Bhandara Division, is granted one month's privilege leave with effect from the afternoon of the 5th January 1906.

25th February 1906.—Diwakar Balwant, Forest Ranger, Burhampuri, is promoted, sub. *pro tem*, from the 6th to the 5th grade, with effect from the 29th December 1905 (in place of H. Papannah, late Ranger, deceased).

15th March 1906.—No. 1681.—Privilege leave for three months combined with furlough for one year and four months, under Articles 233 (*f*), 260, and 308 (*b*) of the Civil Service Regulations, is granted to Mr. C. M. McCrie, Deputy Conservator of Forests, in charge of the Mandla Forest Division, with effect from the 15th March 1906, or the subsequent date on which he may avail himself of it.

Mr. R. C. Thompson, Extra-Assistant Conservator of Forests, is posted to the charge of the Mandla Forest Division, during the absence on leave of Mr. McCrie, or until further orders.

8.—Burma Gazette.

5th March 1906.—No. 129 (*Forests.*)—On return from leave Mr. F. C. Purkis, Extra-Assistant Conservator of Forests, is posted to duty in the Pyinmana Forest Division.

1st March 1906.—No. 4.—With reference to Revenue Department Notification No. 116 Forests), dated the 9th February 1906, Mr. W. J. G. Cooper, Extra-Assistant Conservator of Forests, reported his return to duty at Toungoo on the forenoon of the 28th February 1906.

9.—Assam and Eastern Bengal Gazette.

2nd March 1906.—No. 1428-F.—The following reversions are made with effect from the 20th January 1906, the date on which Mr. D. P. Copeland, Deputy Conservator of Forests, 1st grade, returned to duty :—

Mr. E. M. Coventry, Officiating Deputy Conservator of Forests, 1st grade, to officiate as Deputy Conservator of Forests, 2nd grade.

Mr. W. F. Perrée, Officiating Deputy Conservator of Forests, 2nd grade, to officiate as Deputy Conservator of Forests, 3rd grade.

Mr. A. R. Dicks, Officiating Deputy Conservator of Forests, 3rd grade, to revert to his substantive appointment of Deputy Conservator of Forests, 4th grade.

2nd March 1906.—No. 1429-F.—The services of Mr. W. F. Trafford, Deputy Conservator of Forests, are placed at the disposal of the Government of India in the Department of Revenue and Agriculture.

21st March 1906.—No. 1939-F.—Mr. W. R. L. Jacob, Assistant Conservator of Forests, who is attached to the Buxa Forest Division, is also attached to the Jalpaiguri Forest Division, with effect from the 6th March 1906.

21st March 1906.—No. 1974-F.—Mr. G. M. Townshend, Assistant Conservator of Forests, 2nd grade (officiating 1st grade) is appointed to officiate as Deputy Conservator of Forests, 4th grade, with effect from the 1st October 1905.

10.—MYSORE GAZETTE

Nil.

TIMBER AND PRODUCE TRADE.

C. LEARY AND CO.'S LONDON MARKET REPORT.

1st to 31st March 1906.

EAST INDIA TEAK.—*Timber.*—The business transacted during the past month has been unimportant; the hindrance has been, not so much divergence between Sellers' and Buyers' ideas of price as lack of interest on the part of the latter in the parcels offered for sale, moderate in quantity though they have been. *Planks.*—A dull demand led to a temporary and slight weakening of values, but a subsequent improvement in the enquiry has enabled the lost ground to be recovered. Quotations, according to specification, are for Timber £12 10s. to £19, for Flitches £16 to £20 and for Planks £13 10s. to £19 10s per load on c.i.f. terms.

The arrivals of Timber were 284 loads from Burmah and 180 from Java. The analysis of deliveries and stocks is as follows:—

	Deliveries for March.		Deliveries to 31st March.		Dock Stock.	
	Timber.	*Plank.*	*Timber.*	*Plank.*	*Timber.*	*Plank.*
1906 ...	480	505	2,263	1,163	3,983	2,820
1905 ...	729	411	1,946	1,231	4,400	3,221
1904 ...	443	454	1,346	1,129	6,366	4,010

DENNY, MOTT & DICKSON, LIMITED.

WOOD MARKET REPORT.

London, 1st March 1906.

TEAK.—The landings in the docks in London during February consisted of 874 loads of logs and 634 loads of planks and scantlings, or a total of 1,508 loads, as against 1,755 loads for the corresponding month of last year. The deliveries into consumption were 327 loads of logs and 345 loads of planks and scantlings—together 672 loads, as against 1,769 loads for February, 1905.

The dock stocks at date analyse as follows:—

4,260 loads of logs, as against	3,713 loads	at the same date	last	year.
3,046 " planks, "	2,757 "	"	"	
Total 7,306 loads "	6,470 loads	"	"	

The welcome feature in the above figures is the maintenance of the better supplies which commenced during January. It must, however, be recognized that whilst an appreciable portion of both the logs and planks consist of Java wood, the quality of some of the shipments from Burmah leaves something to be desired, and the dock stocks of first-class quality and specification are still very inadequate—although the unprecedentedly high prices now ruling naturally restrict the demand. It is, however, increasingly clear that first-class teak must be highly paid for all this year, the only alternative being the taking of second-class wood at a lower price, which, if a dangerous is perhaps a necessary, experiment in the present state of abnormally short supplies of good wood both in Burmah and Siam.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

26th March 1906.—No. 306—128-11-F.—Mr. E. S. Carr, Conservator of Forests, Eastern Bengal and Assam, is granted privilege leave for 13 days combined with furlough on medical certificate for 8 months and 17 days under Articles 233 and 311 of the Civil Service Regulations, with effect from the 3rd April 1906, or the subsequent date on which he may avail himself of the leave.

19th April 1906.—No. 392-F.—With reference to the Notification of this Department, No. 296-F, dated the 21st March 1906, Mr. G. S. Hart, Deputy Conservator of Forests, 1st grade, Punjab, is appointed to officiate as Conservator of Forests, 3rd grade, and to hold charge of the Southern Circle, Central Provinces, of which he relieved Mr. C. P. Fisher, Conservator of Forests, 3rd grade, on the afternoon of the 5th April 1906.

27th April 1906.—No. 411-F.—The following transfers are made in the interests of the public service:—

(i) Mr. B. B. Osmaston, Deputy Conservator of Forests, from the Andamans to Bengal.

(ii) Mr. F. Trafford, Deputy Conservator of Forests, from Bengal to the Andamans.

2.—Madras Gazette.

6th April 1906.—*Privilege Leave.*—To M. R. Ry. C. Subramania Aiyar, Ranger, 1st grade, Nellore district, under Article 260 of the Civil Service Regulations for two and a half months from date of relief.

13th April 1906.—*Leave on medical certificate.*—To M. R. Ry. T. Arumuga Mudaliar, Ranger, 2nd grade, Chingleput district, for one year from date of relief under Article 336 of Civil Service Regulations.

8th April 1906.—*Appointments.*—In modification of Service Order No. 37 of 1906, dated 13th March 1906, Ranger Relly will join the Nilgiri district at once, Ranger Nazareth will join South Malabar district on the termination of his special duty.

4th April 1906.—No. 168.—Saiyid Burhan-ud-din Sahib Bahadur, Extra Assistant Conservator of Forests, 3rd grade, to act as District Forest Officer, North Arcot, during the absence of Mr. J. S. Battie on leave, or until further orders.

17th April 1906.—No. 179.—Mr. Charles Mortimer Hodgson, Deputy Conservator of Forests, to be District Forest Officer, South Cuddapah.

No. 180.—Mr. Henry Joshua McLaughlin, Extra Assistant Conservator of Forests, to be District Forest Officer, North Cuddapah.

No. 181.—Mr. James Tapp, Extra Assistant Conservator of Forests, to be District Forest Officer, West Cuddapah, to join on relief by Mr. Aitchison in Vizagapatam.

No. 182.—M. R. Ry. Appolos Vedamanikkam Stephen Pillai, Sub-Assistant, Madras Survey, to be in charge of No. III Party, Kurnool Resurvey, during the absence of Mr. J. C. C. MacHutchin on privilege leave or until further orders.

3.—Bombay Gazette.

24th March 1906.—No. 4567.—Mr. J. Dodgson, Deputy Conservator of Forests, received charge of the East Khandesh Sub-Division office from A. F. Gonsalves, Extra Assistant Conservator of Forests, on the forenoon of 13th March 1906.

3rd April 1906.—No. 21.—Mr. A. F. Gonsalves, Extra Assistant Conservator of Forests, 4th grade, reported himself for duty to the Divisional Forest Officer, Nasik, on the forenoon of the 22nd March 1906.

16th April 1906.—No. 26.—Mr. G. M. Bhatkal, Extra Assistant Conservator of Forests and Sub-Divisional Forest Officer, is transferred from Poona to the East Khandesh Division.

23rd April 1906.—No. 205.—Messrs. G. R. Takle and K. B. Gokhale, Extra Assistant Conservators of Forests, respectively delivered over and received charge of the Sub-Division Forest office, Panch Mahals, on the 19th April 1906, in the forenoon.

19th April 1906.—No. 3784.—Mr. H. Murray, Conservator of Forests, Southern Circle, is granted such privilege leave as may be due to him on 1st June 1906 in combination with furlough for such period as may bring the combined period of absence up to six months.

24th April 1906.—No. 3967.—Mr. W. A. Talbot, Conservator of Forests, Central Circle, is granted privilege leave of absence for one month and seventeen days from 29th April 1906, or the subsequent date on which he may avail himself of it.

No. 3968.—His Excellency the Governor in Council is pleased to appoint Mr. G. M. Ryan to hold charge of the office of Conservator of Forests, Central Circle, in addition to his own duties, during the absence on privilege leave of Mr. W. A. Talbot, or pending further orders.

25th April 1906.—No. 343.—Mr. G. R. Duxbury delivered over and Mr. J. H. Irani received charge of the Sub-Division Forest office, Satara, on the 13th April 1906 in the forenoon.

4.—BENGAL GAZETTE.

21st April 1906.—No. 1959-F.—Mr T. H. Monteath, Deputy Conservator of Forests, was attached to the Sundarbans Division from the forenoon of the 28th March to the afternoon of the 5th April 1906.

5.—U. P. OF AGRA AND OUDH GAZETTE.

9th April 1906.—No. 1481—II-301-1906.—The services of Pandit Kesho Nand, Extra Assistant Conservator of Forests, 1st grade, are hereby placed at the disposal of the Government of India, Department of Revenue and Agriculture, for employment in the Kashmir State.

25th April 1906.—No. 1664—II-282-1905.—The services of Mr. J. M. Blanchfield, Extra Deputy Conservator of Forests, in charge of the Bundelkhand Forest Division, Eastern Circle, are placed at the disposal of the Agent to the Governor-General in Central India for employment in the Bundelkhand States with effect from the date on which he relinquishes charge of his present duties.

25th April 1906.—No. 1665—II-282-1905.—Mr. G. O. Coombs, Extra Assistant Conservator of Forests, attached to the Kheri Forest Division, Eastern Circle, to hold charge of the Bundelkhand Forest Division in the same circle, *vice* Mr. J. M. Blanchfield, on deputation.

6.—PUNJAB GAZETTE.

3rd April 1906.—*No.* 181—*A. L. No.* 9—*Notification.*—Messrs. C. G. Trevor and R Parnell, Assistant Conservators of Forests, respectively made over and received charge of the Direction Division and the duties of Personal Assistant to the Conservator of Forests, Punjab, on the afternoon of the 24th March 1906, consequent on the former's transfer to the Bashahr Forest Division.

No. 186.—*Notification.*—Mr. Fazal ud-din, Extra Assistant Conservator of Forests, returned from his deputation to the Patiala State with effect from 1st March 1906 and took over charge of the Shahpur Forest Division on the forenoon of the 9th idem, relieving Khan Bahadur Munshi Fazal Din, Extra Deputy Conservator of Forests, who will, on and from the said date, remain in charge of the Chenab Division only.

No 189.—*Notification.*—The following changes have taken place in the list of Forest Officers of the Provincial Forest Service in the Punjab, North-West Frontier Province and Baluchistan, with effect from the date specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	REMARKS.
Bhai Sadhu Singh...	Extra Assistant Conservator, 1st grade, sub. *pro tem.*	Extra Assistant Conservator, 2nd grade, provisional.	1st March 1906.	Consequent on return from deputation of Mr. Fazal-ud din.
Pandit Gokal Das ...	Extra Assistant Conservator, 2nd grade, sub. *pro tem.*	Extra Assistant Conservator, 3rd grade.		
Lala Atma Ram ...	Extra Assistant Conservator, 4th grade, sub. *pro tem.*	Forest Ranger, 1st grade, provisional.		

12th April 1906.—*No.* 217—*A. L. No.* 12,—*Notification.*—Messrs. G. S. Hart, Deputy Conservator of Forests, and C. G. Trevor, Assistant Conservator of Forests, respectively made over and received charge of the Bashahr Forest Division on the afternoon of the 28th March 1906, consequent on the former's transfer to Southern Circle, Central Provinces, as Officiating Conservator of Forest.

23rd April 1906. *No.* 234—*A. L. No.* 13. *Notification.*—The following changes have taken place in the list of Forest Officers in the Associated Provinces, consequent on Mr. G. S. Hart's transfer to the Central Provinces as Officiating Conservator, with effect from the 29th March 1906: –

Mr. A. V. Monro, on leave, from Deputy Conservator, 2nd grade, to Officiating, 1st grade.

Mr. A. M. F. Caccia, from Deputy Conservator, 2nd grade, to Officiating, 1st grade.

Mr. W. Mayes, from Deputy Conservator, 3rd grade, to Officiating, 2nd grade.

Mr. A. J. Gibson, on leave, from Deputy Conservator, 4th grade, *sub. pro tem.*, to Officiating, 3rd grade.

Mr. A. P. Percival from Officiating Deputy Conservator, 4th grade, to Officiating, 3rd grade.

Mr. C. A. Von B. Malcolm, from Assistant Conservator, 1st grade, to Officiating Deputy Conservator, 4th grade.

No. 238—*A. L. No.* 14—*Notification.* - On return from the privilege leave granted him in Punjab Government Notification No. 125—A. L. No. 4, dated 13th March 1906, Mr. A. V. Monro, Deputy Conservator of Forests, took over charge of the Hazara Forest Division on the forenoon of the 3rd April 1906, relieving Lala Devi Ditta, Extra Assistant Conservator of Forests, who will remain attached to the Division.

No. 242 - *A. L. No.* 15. –*Notification* —The following changes have taken place in the list of Forest Officers in the Associated Provinces, with effect from the date specified against each:

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. A. M. F. Caccia	Officiating Deputy Conservator of Forests, 1st grade	Deputy Conservator of Forests, 2nd grade.	3rd April 1906.	Consequent on return from leave of Mr. A. V. Monro, Deputy Conservator of Forests, 1st grade.
Mr. W. Mayes ...	Officiating Deputy Conservator of Forests, 2nd grade.	Deputy Conservator of Forests, 3rd grade.		
Mr A. J. Gibson, on leave.	Deputy Conservator of Forests, 4th grade, sub. *pro tem.*, and Officiating Deputy Conservator of Forests, 3rd grade.	Deputy Conservator of Forests, 4th grade, sub. *pro tem.*		
Mr. A. P. Percival	Officiating Deputy Conservator of Forests, 3rd grade.	Officiating Deputy Conservator of Forests, 4th grade.		
Mr C. A. Von B. Malcolm.	Officiating Deputy Conservator of Forests, 4th grade.	Assistant Conservator of Forests, 1st grade		

7.—Central Provinces Gazette.

21st April 1906.—No. 1.—Muhammad Haniff Siddiqui, Forest Ranger, 5th grade, Raipur Division, is granted three months' sick leave on half pay, with effect from the 2nd February 1906.

5th April 1906. - The following promotions of Forest Rangers in the Central Provinces are made with effect from the 11th February 1906, in consequence of the retirement of Forest Ranger Totaram Jankiram.

(1) Shiam Sundar is confirmed in the 3rd grade.
(2) Govind Gangadhar Sapre is promoted from the 4th to the 3rd grade, sub. *pro tem.*
(3 Prithvi Singh is promoted from the 5th to the 4th grade, sub. *pro tem.*
(4) Naryan Chandar Dutt is confirmed in the 5th grade (*vice* Papannah, deceased).
(5) Rajaram Bhargava is confirmed in the 5th grade.
(6 Mahadeo Krishna Dandekar is promoted from the 6th to the 5th grade, sub. *pro tem.*

8.—BURMA GAZETTE.

29th March 1906.—No 6.—Mr. C. H. Hearsey, Ranger, 2nd grade, was relieved of the charge of the Martaban Range, West Salween Division, on the forenoon of the 19th February 1906, and received charge of the Papun Range. West Salween Division, on the forenoon of the 8th March 1906.

17th April 1906.—No. 1.—With reference to Revenue Department Notification No 129 (Forests, dated the 5th March 1906, Mr. F. C. Purkis, Extra Assistant Conservator of Forests, assumed charge of his duties in the Pyinmana Division on the forenoon of the 6th March 1906.

No. 2.—With reference to Revenue Department Notification No 200 (Forests), dated the 11th April 1906, Mr. F. C. Purks, Extra Assistant Conservator of Forests, relinquished charge of his duties in the Pyinmana Division on the afternoon of the 8th April 1906.

14th April 1906.—No 5 With reference to Revenue Department Notification No. 31 (Forests), dated the 11th January 1906, Mr. A. E. Ross, Deputy Conservator of Forests, received charge of the Zigon Division on the afternoon of the 2nd April 1906.

19th April 1906.—No. 204.—Forests.—Mr. P. E. Plunkett, Extra Assistant Conservator of Forests, is transferred from Shwegu and is posted to the charge of the Bhamo Division, in place of Mr. W. F. L. Tottenham, appointed to officiate as Conservator.

25th April 1906.—No. 215—(Forests).—Under the provisions of Articles 233, 246, 260 and 308 (*b* of the Civil Service Regulations, privilege leave for three months and furlough in continuation thereof for nine months is granted to Mr. G. F. R. Blackwell, Deputy Conservator of Forests, with effect from the date on which he may avail himself of the privilege leave.

20th April 1906.—No. 6.—With reference to Revenue Department Notification No. 182 (Forests, dated the 28th March 1906, Mr. J. G. F. Marshall, Extra Deputy Conservator of Forests, reported himself for special duty in the Tharrawaddy Division on the 31st March 1906.

9.—EASTERN BENGAL AND ASSAM GAZETTE.

Nil.

10.—MYSORE GAZETTE.

Nil.

TIMBER AND PRODUCE TRADE.

DENNY, MOTT & DICKSON, LIMITED.

Wood Market Report.

London, 2nd April 1905.

Teak.—The landings in the docks in London during March consisted of 203 loads of logs and 279 loads of planks and scantlings, or a total of 482 loads, as against 474 loads for the corresponding month of last year. The deliveries into consumption were 480 loads of logs and 505 loads of planks and scantlings—together 985 loads, as against 1,140 loads for March 1905.

The dock stocks at date analyse as follows :—

	3,983	loads of logs,	as against	4,400	loads at the same date last year.		
	2,820	„ planks,	„	3,221	„	„	„
Total	6,803	loads	„	7,621	loads	„	„

The above figures for March sufficiently indicate the "dragging" condition of the market. In face of the difficulties in securing sufficient supplies holders have no reason to force sales, whilst consumers hold on tenaciously to the last moment before paying prices which they reasonably deem to be unnaturally high. It is to be noted that the deliveries of logs into consumption during the first quarter of the year have been precisely the same as the quantity landed, *viz.*, 2,263 loads landed, and 2,263 loads delivered. This coincidence is not only curious, but suggestive of the peculiarly hand-to-mouth character of the business done, the merchant here being perhaps more timid in respect to heavy forward sale committals, than the Rolling-stock and Shipbuilding consumers in respect to purchasing against their foreseen need.

GAZETTE NOTIFICATIONS.

1—Gazette of India.

Nil.

2—Madras Gazette.

21st April 1906.—Deputy Ranger T. D'Souza, having obtained the Higher Standard Certificate at the Dehra Dun Forest School, is promoted to Ranger, 4th grade, with effect from 31st March 1906.

24th April 1906.—M. Srinivasa Aiyangar, Ranger, 6th grade, South Coimbatore, is granted privilege leave, under Article 260 of the Civil Service Regulations on medical certificate for six weeks from date of relief.

1st May 1906.—The transfer of Mr. J. Tapp, Extra Assistant Conservator of Forests, from Vizagapatam to Bellary ordered in this Office Service Order No. 69 of 1906, dated 16th April 1906, is cancelled.

2nd May 1906.—H. Rama Row, Deputy Ranger, 2nd grade, and Mr. Kohlhoff, stipendiary student, are appointed Probationary Rangers, 6th grade, from 31st March 1906.

23rd April 1906.—S. V. Venkatramana Aiyar, Ranger, 5th grade, Madura district, is granted six months leave on medical certificate under Article 336 of the Civil Service Regulations from date of relief.

26th April 1906. The following promotions are ordered with effect from 31st March 1906:—

(1) A. Penchal Reddy, Deputy Ranger, 2nd grade, acting sub. *pro tem.*, North Salem district, to be Ranger, 6th grade.

(2) T. D. Kuppuswami Aiyar, stipendiary student from the Forest School and now in the Trichinopoly district, to be Ranger, 6th grade, on probation for six months.

(3) K. Ramayya, stipendiary student from the Forest School and now in the North Arcot district, to be Ranger, 6th grade, on probation for six months.

(4) S. Raja Rao, stipendiary student from the Forest School and now in the South Arcot district, to be Ranger, 6th grade, on probation for six months.

4th May 1906.—M. R Ry. K. R. Manickka Moodeliar, Ranger, 5th grade, from the Nellore district to the North Arcot district. To join on the expiry of his leave.

30th April 1906.—No. 207.—Under Article 260 of the Civil Service Regulations, M. R. Ry. T. M. Nallaswami Nayudu Garu, District Forest Officer, Nellore, is granted privilege leave for three months from or after the 1st May 1906.

28th April 1906.—No. 209.—Mr. Balcombe Languidge Seaton Winton, Assistant Conservator of Forests, on return from leave, is posted to North Coimbatore to do duty under the District Forest Officer.

3rd May 1906.—No. 210.—Mr. Herbert Charles Bennet, Assistant Conservator of Forests, to act as District Forest Officer, Nellore, during the absence of M. R. Ry. Rao Sahib T. M. Nallaswami Nayudu Garu on leave or until further orders.

5th May 1906.—M. R Ry. C. Rajagopaul Naidu, Ranger, 3rd grade, Chingleput district, to the 4th grade, from date of joining the Chingleput district for six months.

9th May 1906.—The six months' leave granted to M. R. Ry. S. Eggia Narayana Sastri, Ranger, Bellary district, in this Office Service Order Nos. 199 and 235 of 1905, is further extended by six months.

3rd May 1906.—M. Panchapakesa Aiyar, Ranger, 1st grade, (sub. *pro tem.*), is granted privilege leave, under Article 260 of the Civil Service Regulations, for two months from date of relief.

Sub. *pro tem.* Ranger, 3rd grade, Mr. H. E. Kelly's transfer ordered in this Office S. O. No. 59, dated 8th April 1906, deferred till the expiry of Ranger Panchapakesa Aiyar's leave.

8th May 1906.—K Gajaraja Mudaliyar, Forest Ranger, 4th grade, South Coimbatore Division, is granted privilege leave (on medical certificate), under Article 260 of the Civil Service Regulations, for three months from date of relief.

10th May 1906.—No. 239.—Mr. A B. Myers. Forest Ranger, 1st grade, to be Extra Assistant Conservator of Forests, 4th grade, on probation for one year.

14th May 1906.—The privilege leave for fifteen days, granted to Mr. J. S. Scot, District Forest Officer, South Coimbatore, in Board's Proceedings, Forest No. 52-Mis., dated 22nd January 1906, is extended by two days.

3.—Bombay Gazette.

16th May 1906.—No. 4802.—Mr. A. D. Wilkins, Deputy Conservator of Forests, 1st grade, has been allowed by His Majesty's Secretary of State for India, an extension of leave on medical certificate for three months and five days.

No. 4804.—Mr. G. P. Millett, Deputy Conservator of Forests, 2nd grade, has been allowed by His Majesty's Secretary of State for India an extension of furlough for one month.

4th May 1906.—No. 477.—Mr. W. A. Talbot delivered over and Mr. G. M. Ryan received charge of the Divisional Forest Office, Working Plans, Central Circle, on the afternoon of the 1st May 1906.

No. 5007. - The leave granted to Mr. C. S. McKenzie, Divisional Forest Officer, Jerruck, Sind Circle, in Government Notification No. 4324, dated 2nd May 1906, published at page 542 of the *Bombay Government Gazette* of the 3rd idem, Part I, is cancelled at his own request.

23rd May 1906.—No. 5022.—Mr. G. P. Millett, Deputy Conservator of Forests, 2nd grade, has been allowed by His Majesty's Secretary of State for India to return to duty within the period of his leave.

No. 5029.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. G. P. Millett, on return to duty, to act as Conservator of Forests, 3rd grade, *vice* Mr. H. Murray on leave, and to be in charge of the Sind Circle.

Mr. T. R. D. Bell, on relief, to be Deputy Conservator of Forests in charge of the Southern Circle.

Mr. O. H. L. Napier to hold charge of the office of Conservator of Forests, Southern Circle, in addition to his own duties, from date of receiving charge from Mr. H. Murray, pending relief by Mr. T. R. D. Bell.

No. 5042. - Mr. S. J. Murphy, I.C.S., Assistant Collector, Ahmednagar, is granted privilege leave for two months.

No. 5045.—Mr. Firozeshah Pestanji Jehanjir, Assistant to the Commissioner, Central Division, is allowed privilege leave for three months.

No. 5046.—His Excellency the Governor in Council is pleased to appoint Mr. G. DeLuna, B.A., to act as Assistant to the Commissioner, Central Division, during the absence on leave of Mr. Firozeshah Pestanji Jehangir, or pending further orders.

19th May 1906.—No. 452.—Mr. E. M. Hodgson, Acting Deputy Conservator of Forests, 3rd grade, delivered over and Mr. C. G. Dalia, Extra Assistant Conservator of Forests, 2nd grade, received charge of the office of the Divisional Forest Officer, Surat, on the 12th May 1906, in the afternoon.

22nd May 1906.—No. 685.—Mr. J. H. Irani delivered over and Mr. G. R. Duxbury received charge of the Sub-Division Forest Office, Satara, on the afternoon of the 26th April 1906.

No. 686.—Mr. G. R. Duxbury delivered over and Mr. J. H. Irani received charge of the Sub-Division Forest Office, Satara, on the forenoon of the 14th May 1906.

No. 1348.—Mr. G. R. Mane, Extra Assistant Conservator and Sub-Divisional Forest Officer, Kanara N. D., is allowed privilege leave of absence for thirty days from 19th April 1906.

30th May 1906.—No. 5264.—Mr. R. S. Pearson, Deputy Conservator of Forests, 4th grade, and Divisional Forest Officer, Panch Mahals is granted privilege leave of absence for three months in combination with furlough on medical certificate for twelve months.

26th May 1906.—No. 741.—Mr. G. M. Ryan delivered over and Mr. S. P. Limaye received charge of the Sub-Division Forest Office, Poona, on the forenoon of the 21st May 1906.

4.—Bengal Gazette.

7th May 1906.—No. 1976.—Mr. R. Kirkpatrick, Assistant Conservator of Forests, attached to the Singhbhum Division, is transferred as an Attached Officer to the Darjeeling and Kurseong Divisions.

5.—United Provinces Gazette.

1st May 1906.—No. 1758—II/113-1906.—Mr. F. F. R. Channer, Officiating Deputy Conservator of Forests, attached to the Direction Forest Division of the Eastern Circle, to hold charge of the Kumaun Forest Division of that circle, in addition to his other duties, *vice* Mr. E. R. Stevens, granted leave.

1st May 1906.—No. 1757—II/113-1906.—Mr. E. R. Stevens, Assistant Conservator of Forests, in charge of the Kumaun Forest Division, Eastern Circle, privilege leave, combined with special leave on urgent private affairs, for a total period of six months, from 23rd May 1906.

27th April 1906.—No. 1684—II/24-1906—Mr. T. Carr, Assistant Conservator of Forests on return from deputation, to the Sewalik Forest Division of the Western Circle.

No. 1703—II/126-1906.—In supersession of Notification No. 1036—II/126-1906, dated 13th March 1906, Mr. J. C. Tulloch, Deputy Conservator of Forests, was on return from leave, attached to the Direction Forest Division of the Eastern Circle, from the 6th to the 12th March 1906.

27th April 1906.—No. 1704—II/126-1906—Mr. J. C. Tulloch, Deputy Conservator of Forests, from the Direction Forest Division of the Eastern Circle, to the charge of the Bahraich Forest Division of the same circle.

10th May 1906—No 1881—II/24-1906.—Mr. T. Carr, Assistant Conservator of Forests, from the Sewalik Forest Division of the Western Circle to the Jaunsar Forest Division of the same circle.

30th April 1906.—No. 433-F.—Mr. H. A. Hogton, Conservator of Forests, 3rd, (officiating 2nd) grade, United Provinces, is confirmed in the latter grade, with effect from the 31st October 1905.

No. 439-F.—Mr. T. J. Campbell, Deputy Conservator of Forests, 1st grade, United Provinces, is appointed Conservator of Forests, 3rd grade, with effect from the 2nd January 1906. Mr. Campbell's position on the list of Conservators will be immediately below Mr. J. Copeland.

14th May 1906.—No 1942—II/301-1905.—Saiyid Mahdi Hasan, Extra Assistant Conservator of Forests, on return from foreign service, to the Direction Forest Division of the Western Circle.

6.—Punjab Gazette.

26th April 1906.—No. 257.—*Leave.*—With reference to Notification No. 149, dated 20th March 1906, Munshi Imam-ud-din, Extra Assistant Conservator of Forests, attached to the Chamba Forest Division, returned from leave on the afternoon of the 1st April 1906.

The unexpired portion of his leave is hereby cancelled.

No. 260. *Notification.*—The privilege leave granted to Lala Atma Ram, Officiating Extra Assistant Conservator of Forests, in Notification No. 101 of 2nd March 1906,

is extended by 15 days. He returned to duty on the afternoon of 1st April 1906 and is re-attached from that date to Lahore Forest Division.

No. 263.—Notification. The following changes have taken place in the list of Forest Officers of the Provincial Forest Service in the Punjab, North-West Frontier Province and Baluchistan list, with effect from the date specified against each:—

Name.	Present grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. Fazl-ud-din ...	Extra Assistant Conservator, 1st grade.	Extra Deputy Conservator, Forests, 4th grade.	1st April 1906.	Consequent on the retirement of Munshi Fazl Din, Khan Bahadur, Extra Deputy Conservator of Forests, 4th grade.
Lala Daulat Ram (on deputation).	Extra Assistant Conservator, Forests, 2nd grade.	Extra Assistant Conservator, Forests, 1st grade.		
Bahi Sadhu Singh...	Extra Assistant Conservator, Forests, 2nd grade, Provisional.	Extra Assistant Conservator, Forests, 2nd grade, and Extra Assistant Conservator, Forests, 1st grade, Provisional.		
Pandit Gokal Das ...	Extra Assistant Conservator, 3rd grade.	Extra Assistant Conservator, Forests, 2nd grade, Provisional.		
Lala Sundar Das (on deputation.	Extra Assistant Conservator, Forests, 3rd grade Provisional.	Extra Assistant Conservator, Forests, 3rd grade.		
Lala Jai Kishen ...	Extra Assistant Conservator, Forests, 4th grade, Provisional, and Extra Assistant Conservator, Forests, 3rd grade, Provisional.	Extra Assistsnt Conservator, Forests, 4th grade, and Extra Assistant Conservator, Forests, 3rd grade, Provisional.		
Lala Atma Ram ...	Ranger, 1st grade, Provisional.	Extra Assistant Conservator, 4th grade, Provisional on probation.		

No. 266.—*Notification.*—Munshi Fazl Din, Khan Bahadur, Extra Deputy Conservator of Forests, and Mr. Fazl-ud-din, Extra Assistant Conservator of Forests, respectively made over and received charge of the Chenab Forest Division on the afternoon of the 31st March 1906, consequent on the former's retirement from service from the same date.

Mr. Fazl-ud-din will hold charge of the Chenab Division in addition to that of the Shahpur Division.

22nd May 1906.—No. 289—A. L. No 16—*Notification.*—Messrs. C. G. Trevor, Assistant Conservator of Forests, and B O. Coventry, Deputy Conservator of Forests, respectively made over and received charge of the Bashahr Forest Division on the afternoon of the 19th April 1906 consequent on the former's transfer to the Kulu Forest Division.

No. 293.—A. L. No. 17.—*Notification.*—Messrs. B. O. Coventry, Deputy Conservator of Forests, and C. G. Trevor, Assistant Conservator of Forests, respectively, made over and received charge of the Kulu Forest Division on the afternoon of the 19th April 1906, consequent on the former's transfer to the Bashahr Forest Division.

No. 297.—*Appointment.*—Mr. B. O. Coventry, Deputy Conservator of Forests, in charge of Bashahr Division, is, with effect from the afternoon of 19th April 1906, appointed Political Assistant to the Superintendent of Hill States, Simla, *vice* Mr. G. S. Hart, Deputy Conservator of Forests, transferred.

No. 300—A. L. No. 18.—*Leave.*—Mr. A. V. Monro Deputy Conservator of Forests, 2nd grade, in charge Hazara Forest Division, is granted privilege leave for 1 month and 8 days, combined with furlough of 10 months and 22 days, under articles 233, 260 and 308 of the Civil Service Regulations, with effect from such date as he may be relieved of the charge of the Hazara division.

No. 304 —*Notification.*—Lala Mulráj, Extra Assistant Conservator, and Lala Atma Ram, Forest Ranger, respectively made over and received charge of the Lahore Forest Division on the afternoon of 30th April 1906 consequent on the former's transfer to the Multan Forest Division.

No. 307.—A. L. No. 19.—Notification.—Messrs. A. D. Blascheck and W. Mayes, Deputy Conservators of Forests, respectively made over and received charged of the Simla Forest Division on the afternoon of 26th April 1906, consequent on the former's transfer to the Hazara Forest Division (North-West Frontier Province).

Mr. Mayes will hold charge of the Simla Forest Division in addition to the Kangra forest division.

No. 311.—*Notification* — Mr. C. F. Rossiter, Extra Deputy Conservator of Forest, and Lala Mulráj, Extra Assistant Conservator of Forest, respectively made over and received charge of the Multan Forest Division on the afternoon of the 2nd May 1906, consequent on the former's transfer to the Kangra division.

29th May 1906.—No. 324.—A. L. No. 20.—*Notification* — Messrs. A. V. Monro and A. D. Blascheck, Deputy Conservators of Forest, respectively made over and received charge of the Hazára Forest Division, North-West Frontier Province, on the afternoon of the 7th May 1906, consequent on the former's departure on combined leave.

No. 328—A. L. No. 21.—*Notification*—Mr. C. F. Rossiter, Extra Deputy Conservator of Forests, on transfer from the Multan Division, took over charge of the Kangra Forest Division on the forenoon of the 10th May 1906, relieving Mr. W. Mayes, Deputy Conservator of Forests, who will, on and from the said date, remain in charge of the Simla Division only.

7.—Central Provinces Gazette.

24th April 1906.—No. 2.—Under the authority conferred by Article 31, clause (1) of the Forest Department Code, 5th Edition, the undermentioned stipendiary students, who were deputed to the Imperial Forest School, Dehra Dun, and have duly obtained the Higher Standard Certificate of the School, are appointed Rangers, 6th grade, on Rs. 50 per mensem, on probation for six months, with effect from the 1st April 1906, and are posted to the Divisions specified opposite their names:—

(1) Baokat Ram Sahai, Balaghat.

(2) Anant Govind Jog, South Chanda.

24th April 1906.—No. 16.—Under the authority conferred by Article 31, clause (1) of the Forest Department Code, the following stipendiary students of the Imperial Forest School, Dehra Dun, who have duly obtained the Higher Standard Certificate of the School, are appointed, on probation, as Rangers, 6th grade, on Rs. 50 per mensem, with effect from the 1st April 1906, and are posted to the Division mentioned against each:—

Krishnaji Ramkrishna Date, Seoni Forest Division.

Charu Chander Bose, Saugor Forest Division.

1st May 1906.—No. 3022.—So much of Order No. 651, dated the 26th January 1906, as relates to the reversion of Mr. Dhanji Shah N. Avasia from Extra Assistant Conservator of Forests, 4th grade, sub. *pro tem.*, to Forest Ranger, 1st grade, is hereby cancelled.

24th April 1906.—No. 3.—With the Chief Commissioner's sanction Abdul Karim, Deputy Ranger, 1st grade, North Chanda Division, is reduced to Forester, 1st grade, with effect from the 1st February 1906.

From the same date, Sant Singh, Deputy Ranger, 2nd grade, and Officiating in the 1st grade, is confirmed in the latter grade.

19th May 1906.—No. 3441.—The Honourable James W. Best, Assistant Conservator of Forests, attached to the Balaghat Forest Division, is transferred to the Direction Division, Southern Circle, with effect from the 15th June 1906.

22nd May 1906.—No. 3521.—Privilege leave for six weeks, under Article 260 of the Civil Service Regulations, is granted to Mr. C. Somers-Smith, Deputy Conservator of Forests, Saugor Forest Division, with effect from the 30th May 1906, or the subsequent date on which he may avail himself of it

Mr. P. S. Carbould, Assistant Conservator of Forests, attached to the Saugor Forest Division is appointed to act as Forest Divisional Officer, Saugor, during the absence on leave of Mr. C. Somers-Smith.

8.—BURMA GAZETTE.

30th April 1906.—No. 223 (Forests).—Mr. A. Lawrance, Assistant Conservator of Forests, has been permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

No. 224 (Forests).—Under the provision of Articles 233, 260 and 308 (*b*) of the Civil Service Regulations, privilege leave for three months and furlough in continuation thereof for three months, is granted to Mr H. W. A. Watson, Deputy Conservator of Forests, with effect from the date on which he may avail himself of the privilege leave.

No. 225 (Forests).—Mr. C. W. Allan. Extra Deputy Conservator of Forests, is transferred from Pegu and is posted to the charge of the Toungoo Forest Division, in place of Mr. H. W. A. Watson, proceeding on leave.

No 226 Forests).—Mr. F. W. Collings, Officiating Deputy Conservator of Forests, is transferred from Gangaw and is posted to the charge of the Pegu Forest Division, in place of Mr. C. W. Allan, transferred.

7th May 1906.—No. 250—In supersession of this Department Notification No. 317, dated the 28th June 1905, Mr. E. T. W. Skinner, Probationer of Land Records, is appointed to the charge of the Supplementary Survey in the Mingin Sub-division.

No. 251 (*Forests*).—On return from leave Mr R. McIntosh, Deputy Conservator of Forests, is posted to the charge of the Thaungyin Forest Division, in place of Mr. G. F. R. Blackwell, Deputy Conservator of Forests, proceeding on leave.

No. 252 (*Forests*).—Mr. G. K. Parker, Deputy Conservator of Forests, is placed in charge of the current duties of the Office of the Deputy Conservator of Forests, Thaungyin Forest Division, in addition to his other duties, pending the arrival of Mr. R McIntosh, Deputy Conservator of Forests.

No. 259 (*Forests*).—Under the provisions of Articles 233, 260 and 336 of the Civil Service Regulations, privilege leave for three months and leave on medical certificate for five months in continuation thereof is granted to Mr. J. D. Hamilton, Extra Assistant Conservator of Forests, with effect from the date on which he availed himself of the privilege leave.

No. 260 (*Forests*).—Mr. J. L. Hefferman, Extra Assistant Conservator of Forests, is posted to the charge of the Revenue Range, Tharrawaddy Forest Division, in place of Mr. J. D. Hamilton, Extra Assistant Conservator of Forests, proceeding on leave.

No. 261 (*Forests*).—Mr. J. G. F. Marshall, Extra Deputy Conservator of Forests, is posted to the charge of the South Tharrawaddy Sub-division, in place of Mr. J. L. Hefferman Extra Assistant Conservator of Forests, transferred.

No. 262 (*Forests*).—Mr. S. F. Hopwood, Assistant Conservator of Forests, is transferred from Kyaukse and is posted to the charge of the Bassein-Myaungmya Forest Division, in place of Mr. A. H. M. Lawson, Deputy Conservator of Forests, proceeding on leave.

No. 263 (*Forests*).—Mr. H. R. Blanford, Assistant Conservator of Forests, is transferred from Pyinmana and is posted to the charge of the Kyaukse Sub-division Mandalay Forest Division, in place of Mr. S. F. Hopwood, transferred.

No. 264 (*Forests*.—Under the provisions of Articles 233, 246, 260 and 308 (*b*) of the Civil Service Regulations, privilege leave for three months and furlough in continuation thereof for nine months, is granted to Mr. G. F. R. Blackwell, Deputy Conservator of Forests, with effect from the date on which he may avail himself of the privilege leave.

This Department Notification No. 215, dated the 25th April 1906, is hereby cancelled.

No. 265 (*Forests*).—Under the provisions of Articles 233, 246, 260, and 308 (*b*) of the Civil Service Regulations, privilege leave for two months and twenty-eight days and furlough in continuation thereof for three months and two days, is granted to Mr. A. H. M. Lawson, Deputy Conservator of Forests, with effect from the date on which he may avail himself of the privilege leave.

No. 266 (*Forests*).—Under the provisions of Articles 233, 246, 260 and 308, (*b*) of the Civil Service Regulations, privilege leave for three months and furlough in continuation thereof for nine months is granted to Mr. T. W. Forster, Extra Assistant Conservator of Forests, with effect from the date on which he may avail himself of the privilege leave.

8th May 1906.—No. 8.—With reference to Revenue Department, Notifications Nos. 241 and 242 (Forests), dated the 2nd May 1906, Mr. J. D. Clifford, Assistant Conservator of Forests, assumed charge of the Nawin Sub-division on the afternoon of the 6th April 1906, relieving Maung Tha Ka Do, K. S. M., Extra Assistant Conservator of Forests, proceeding on leave.

14th May 1906.—No. 9.—With reference to Revenue Department Notifications Nos. 259 and 260 (Forests), dated the 9th May 1906, Mr. J. L. Hefferman, Extra Assistant Conservator of Forests, assumed charge of the Revenue Range, Tharrawaddy Forest Division, on the afternoon of the 24th April 1906, relieving Mr. J. D. Hamilton, Extra Assistant Conservator of Forests, proceeding on leave.

No. 10.—With reference to Revenue Department Notification No. 261 (Forests) dated the 9th May 1906, Mr. J. L. Hefferman, Extra Assistant Conservator of Forests, and Mr. J. G. F. Marshall, Extra Deputy Conservator of Forests, respectively made over and received charge of the South Tharrawaddy Sub-division on the afternoon of the 2nd May 1906

12th May.—No. 267 (*Forests*) —Under the provisions of Article 260 of the Civil Service Regulations, privilege leave for three months is granted to Mr. C. W. A. Bruce, Deputy Conservator of Forests, with effect from the 15th June 1906, or the subsequent date on which he may avail himself of it.

Mr. Bruce is permitted to overstay his leave by fifteen days under Article 251 (*ii*) of the Civil Service Regulations.

No 268 (*Forests*).—Mr. H. L. P. Walsh, officiating Deputy Conservator of Forests, is transferred from Working-plans duty and is posted tot he charge of the Ruby Mines, Forest Division, in place of Mr. C. W. A. Bruce, proceeding on leave.

23rd May 1906 —No. 287 (*Forests*).—Mr. R. C. A. Pinder, Extra Assistant Conservator of Forests, is transferred from the Upper Chindwin Forest Division, and is posted to duty in the Mu Forest Division.

14th May 1906.—No 5 (*Forests*).—Mr. B. R. Hutchins, Ranger, 3rd grade, is transferred from the Mu Forest Division and is posted to the charge of the Pyinmana, Revenue Range.

9.—Eastern Bengal and Assam Gazette

Nil.

10.—Mysore Gazette.

12th May 1906.—14661—*Ft.* 52-05-8.—Under Article 188 of the Mysore Service Regulations, Mr. B. Heera Singh, Deputy Conservator of Forests in the Kadur District, is granted privilege leave of absence for fifteen days, with effect from the 7th May 1906, or date of availment.

TIMBER AND PRODUCE TRADE.

DENNY, MOTT & DICKSON, LIMITED.

Wood Market Report.

London, 2nd May 1906.

Teak.—The landings in the docks in London during April, consisted of 47 loads of logs and 205 loads of planks and scantlings, or a total of 252 loads, as against 320 loads for the corresponding month of last year. The deliveries into consumption were 308 loads of logs and 201 loads of planks and scantlings—together 509 loads, as against 924 loads for April 1906.

The dock stocks at date analyse as follows :—

	3,722	loads of logs,	as against	3,922	loads at the same date	last year.
	2,824	„ planks,	„	3,095	„	„	„
Total	6,546	loads	„	7,017	loads	„	„

Although as shown above the consumption for April doubled the import, the demand was of a very restricted character. Prices were, nevertheless, firmly maintained, especially for logs—seeing that the abnormally small landed stock of 3,722 loads includes nearly 1,000 loads of Java logs, which are of very poor average length, so that the stock of Burmah and Siam logs which alone can be relied on to give the length and quality demanded is reduced to about 2,700 loads—a figure significant of the restricted state of the supplies and the absence of a healthy state of business. The stock of planks is more adequate, but very moderate if the Java description is excluded. It must, however, be recognized that Java conversions are more acceptable to the consumer than the Java logs; and business in carefully shipped Java planks and flitches continues to soundly develop, now that the knowledge of reliable shipments of good character is spreading and such first-class shipments are escaping confusion with shipments of a second-class character which are not suitable to this market.

C. LEARY AND CO'S. LONDON MARKET REPORT.

1st to 31st May 1906.

East India Teak.—*Timber.*—The arrivals were again considerable, but sales have been restricted, as the demand continues dull and sellers remain very firm in their ideas of value. *Planks.*—The business done has not been extensive, as shippers are already committed for some time to come and for further business they are inclined to require an advance in price, which is scarcely obtainable in the present slackness of the demand. Quotations, according to specification, are for Timber £12 10s. to £19, for flitches £16 to £20 and for planks £13 10s. to £19 10s per load on c.i.f. terms.

The arrivals of timber were 379 loads from Burma, 637 loads from Bangkok and 168 from Java. The analysis of deliveries and stocks is as follows :—

	Deliveries for May.		Deliveries to 31st May.		Dock Stock.	
	Timber.	Plank.	Timber.	Plank.	Timber.	Plank.
1906 ...	314	393	2,885	1,757	5,179	2,814
1905 ...	301	260	2,810	1,852	4,941	2,980
1904 ...	200	183	1,696	1,717	6,915	4,212

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

Nil.

2.—Madras Gazette.

20th June 1906.—To M. R. Ry. P. V. Alagiriswami Naidu, Ranger, 5th grade, South Salem district, for three months on medical certificate with effect from 12th May 1906.

The following promotions are ordered with reference to Board's Proceedings, Forest Mis. No. 836, dated 9th June 1906:—

(1) M. R. Ry. V. Subramania Aiyar, Ranger, 2nd grade, North Salem district, to be Ranger, 1st grade, with effect from 1st April 1906.

(2) M. Abdul Rahiman Sahib, Ranger, 6th grade, Cuddapah district, to be Ranger, 5th grade, sub. *pro tem*, *vice* Mr. A. H. Simpson under suspension.

To M. R. Ry. T. S. Tiruvenkatachary, Probationary Ranger, 6th grade, South Salem district, for one month under article 260 of the Civil Service Regulations, with effect from 29th May 1906.

25th May 1906.—Owing to the promotion of Mr. A. B. Myers to the class of Extra Assistant Conservators, the following modification in transfers are ordered:—

(1) Ranger M. Panchapakesa Aiyar's transfer to Tinnevelly (S. O. 40 of 18th March 1906) is cancelled.

(2) Ranger J. P. Nazareth's transfer to South Malabar (S. O. 59 of 8th April 1906) is cancelled.

(3) Extra Assistant Conservator Mr. A. B. Myers is transferred from South Canara to Tinnevelly.

3.—Bombay Gazette.

7th June 1906.—No. 625.—Mr. R. S. Pearson, Acting Deputy Conservator of Forests, 3rd grade, delivered over and Mr. K. B. Gokhale, Extra Assistant Conservator of Forests, 4th grade, received charge of the office of the Divisional Forest Officer, Panch Mahals, on the 1st June 1906, in the afternoon.

13th June 1906.—No. 1075.—Mr. G. M. Ryan, Deputy Conservator of Forests, 2nd grade, delivered over and Mr. W. A. Talbot, Conservator of Forests, 1st grade, received charge of the office of the Conservator of Forests, Central Circle, on the forenoon of the 12th June 1906.

15th June 1906.—No. 1102.—Mr. G. M. Ryan, Deputy Conservator of Forests, 2nd grade, handed over and Mr. W. A. Talbot, Conservator of Forests, 1st grade, received charge of the Divisional Forest office, Working Plans, Central Circle, on the forenoon of the 12th June 1906.

16th June 1906.—No. 2260.—Mr. G. J. Rege, Extra Assistant Conservator of Forests, delivered over and Mr. O. H. L. Napier, Deputy Conservator of Forests, received charge of the Sub-Divisional Forest office, Belgaum, on the afternoon of the 11th June 1906.

No. 2270.—Mr. R. R. Hattangadi, who was appointed in Government Notification No. 5755, dated 13th instant, as Acting Extra Assistant Conservator of Forests, with effect from 10th April 1906, *vice* Mr. G. R. Mane on leave, is posted to the Kanara Southern Division as Sub-Divisional Forest Officer.

No. 2272.—Mr. Hari Anant Bhadbhade, Acting Extra Assistant Conservator of Forests, appointed to do duty in the Southern Circle as per Government Notification No. 5754, dated 13th instant, is posted to the Kanara Northern Division as Sub-Divisional Officer.

20th June 1906.—No. 1220.—Mr. L. S. Osmaston, Deputy Conservator of Forests, 3rd grade, delivered over and Mr. D. N. Damle, Extra Assistant Conservator of

Forests, 4th grade, received charge of the Sub-Division Forest office, Nasik, on the afternoon of the 12th June 1906

25th June 1906.—No 1269.—Mr. R. V. Pethe, Acting Extra Assistant Conservator of Forests, appointed to do duty in the Central Circle, as per Government Notification No. 5754, dated 13th instant, is posted to the Khandesh Division on special duty as a temporary measure.

2. Mr. Pethe reported himself for duty to the Divisional Forest Officer, East Khandesh, on the forenoon of the 20th current.

1st June 1906.—No. 1891 —Mr. H Murray, Conservator of Forests, 3rd grade, delivered over and Mr. O. H. L. Napier, Deputy Conservator of Forests, received charge of the office of the Conservator of Forests, S. C., on the afternoon of 31st May 1906.

2nd June 1906.—No. 1899.—Mr. W. A. Wallinger, Extra Deputy Conservator of Forests, delivered over and Mr. L. S. Koppikar, Extra Assistant Conservator of Forests, received charge of theKolaba Forest Division, on the afternoon of the 20th May 1906.

No. 1900.—Mr. E. G. Oliver, Deputy Conservator of Forests, delivered over and Mr. W. A. Wallinger, Extra Deputy Conservator of Forests, received charge of the Dharwar Forest Division, on the afternoon of the 23rd May 1906.

4.—Bengal Gazette.

Nil.

5.—United Provinces Gazette.

5th June 1906.—No. 641—158-9-F.—The services of Pandit Keshavanand, Extra Assistant Conservator of Forests, 1st grade, United Provinces are placed at the disposal of the Foreign Department, with effect from the 23rd April 1906, for employment in the Kashmir State.

9th June 1906.—No. 2460—II/24-1906.—Mr. T. Carr, Assistant Conservator of Forests, from the Siwalik Forest Division, Western Circle, to the Direction Forest Division of the same circle.

No. 2461—II/24-1906.—Mr T. Carr, Assistant Conservator of Forests attached to the Direction Forest Division of the Western Circle, to the charge of, the Bundelkhand Forest Division of the Eastern Circle.

22nd June 1906.—No. 2673—II/215-1906.—Mr R. C. Milward, Deputy Conservator of Forests in charge of the Garhwal Forest Division, Western Circle, to hold charge of the Naini Tal Forest Division of the same circle, in addition to his other duties during the absence of Mr. W. H. Lovegrove, on deputation.

25th May 1906.—No. 2191—II/224-1906.—Ranger Ram Swarup to be an Extra Assistant Conservator of Forests, 4th grade, sub. *pro. tem.*, and to be posted to the Kheri Forests Division, Eastern Circle.

6.—Punjab Gazette.

19th June 1906.—No 361.—*Appointment.*—Lala Devi Ditta, Extra Assistant Conservator of Forests, while on transfer from the North-West Frontier Province, to the Andamans, having been recalled and appointed to the Punjab Province, is hereby attached to the Direction Division, Punjab, with effect from the afternoon of 16th May 1906.

7.—Central Provinces Gazette.

25th May 1906.—No. 3595.—Mr. R. H. Cole, Forest Ranger, 1st grade, is appointed to officiate as Extra Assistant Conservator, 4th grade, on probation, with effect from the 27th November 1905, in the vacancy caused by the absence on leave of Mr. Ganga Parshad Khatri, Extra Assistant Conservator of Forests.

31st May 1906.—No 3735.—Rai Bahadur Mansukh Rai, Extra Deputy Conservator of Forests, is posted to the charge of the Basim Forest Division.

On relief by Rai Bahadur Mansukh Rai, Mr. Pandurang Narayan, Extra Assistant Conservator of Forests, is transferred to the charge of the Wun Forest Division.

On relief by Mr. Pandurang Narayan, Mr. S. Srinivasalu Naidu is granted privilege leave for three months, with effect from the 15th June 1906, or the subsequent date on which he may avail himself of it.

2nd June 1906.—No. 5-XIV.—Mr. C. F. Bell, Assistant Conservator of Forests, attached to the Nimar Forest Division, is transferred to the Direction Division, Berar Circle.

19th June 1906.—No. 76.—*Erratum.*—In Order No. 3595, dated the 25th May 1906, appointing Mr. R. H. Cole, Forest Ranger, 1st grade, to officiate as Extra Assistant Conservator, 4th grade, on probation, with effect from the 27th November 1905, in the vacancy caused by the absence on leave of Mr. Ganga Parshad Khatri, Extra Assistant Conservator of Forests, *for* the words "27th November 1905," *read* 3rd December 1905."

12th June 1906.—No. 75.—Privilege leave for three months, under Article 260 of the Civil Service Regulations, is granted to Mr. C. A. Von B. Malcolm, Assistant Conservator of Forests in charge of the Direction Division and Personal Assistant to the Conservator of Forests, Berar Circle, with effect from the 30th instant, or the subsequent date on which he may avail himself of it.

No. 76.—Mr. C. F. Bell, Assistant Conservator of Forests, attached to the Direction Division, is appointed to be Personal Assistant to the Conservator of Forests, Berar Circle, during the absence on leave of Mr. Malcolm, or until further orders.

27th June 1906.—No. 173.—Mr. R. H. Cole, Officiating Extra Assistant Conservator of Forests, attached to the Jubbulpore Forest Division, is transferred to Chhindwara and will remain attached to that Division.

No. 174.—Privilege leave for two months and twenty-four days, under Article 260 of the Civil Service Regulations, is granted to Mr. G. F. Taylor, Deputy Conservator of Forests, Chhindwara Forest Division, with effect from the 15th July 1906, or the subsequent date on which he may avail himself of it.

No. 175.—Mr. R. H. Cole, Officiating Extra-Assistant Conservator of Forests, attached to the Chhindwara Forest Division, is appointed to act as Forest Divisional Officer, Chhindwara, during the absence on leave of Mr. Taylor, or until further orders.

8—BURMA GAZETTE.

28th May 1906.—No. 11.—With reference to Revenue Department Notification No. 265 (Forests), dated the 9th May 1906, Mr. A. H. M. Lawson, Deputy Conservator of Forests, and Mr. S. F. Hopwood, Assistant Conservator of Forests, respectively made over and received charge of the Bassein-Myaungmya Division on the afternoon of the 26th May 1906.

24th May 1906.—No. 4.—With reference to Revenue Department Notification No. 181 (Forests), dated the 26th March 1906, Mr. F. A. Leete, Deputy Conservator of Forests, made over and Mr. R. L. Pocock, Extra Assistant Conservator of Forests, received charge of the Minbu Division on the afternoon of the 19th May 1906.

29th May 1906.—No. 6 (*Forests*).—With reference to this office Notification No. 5, dated the 14th May 1906 Mr. B. R. Hutchins, Ranger, 2nd grade, was relieved of his duties on the afternoon of the 24th May 1906.

1st June 1906.—No. 5.—Mr. B. R. Hutchins, Forest Ranger, 2nd grade, on his transfer from Mu Division, reported his arrival at Pyinmana on the forenoon of the 27th May 1906.

6th June 1906.—No. 10.—Mr. F. T. Dalton, Forest Ranger, on completion of girdling duty in the Toungoo Division, assumed charge of the River Range on the forenoon of the 30th May 1906, with headquarters at Shwegyin.

7th June 1906.—No. 11.—With reference to Revenue Department Notification No. 252 (Forests), dated the 7th May 1906, Mr. G. K. Parker, Deputy Conservator of Forests, received charge of the Thaungyin Forests Division from G. F. R. Blackwell, Deputy Conservator of Forests, on the afternoon of the 31st May 1906.

No. 12.—With reference to Revenue Department Notification No. 264 (Forests) dated the 9th May 1906, Mr. G. F. R. Blackwell, Deputy Conservator of Forests, availed himself of the privilege leave for three months and furlough in continuation thereof for nine months, on the afternoon of the 31st May 1906.

7th June 1906.—No. 6.—With reference to Revenue Department Notification No. 226 (Forests), dated the 30th April 1906, Mr. F. W. Collings, Officiating Deputy Conservator

of Forests, relinquished charge of the Gangaw Subdivision, Yaw Division, on the forenoon of the 28th May 1906.

11th June 1906.—No 7.—With reference to Revenue Department Notification No. 263 (Forests), dated the 9th May 1906, Mr. H. R Blanford, Assistant Conservator of Forests, relinquished charge of his duties in the Pyinmana Division on the afternoon of the 16th May 1906 and received charge of the Kyaukse Subdivision, Mandalay Division, from Mr. S. F. Hopwood, Assistant Conservator of Forests, on the afternoon of the 17th May 1906.

18th June 1906.—No. 12.—With reference to Revenue Department Notification No. 226 (Forests, dated the 2nd May 1906, Mr. C. W Allan, Extra Deputy Conservator of Forests, and Mr. F. W. Collings, Officiating Deputy Conservator of Forests, respectively made over and received charge of the Pegu Forest Division on the afternoon of the 14th June 1906.

12th June 1906.—No. 7 (*Forests*).—With reference to Revenue Department Notification No. 287 (Forests), dated the 23rd May 1906, Mr. R. C. A. Pinder, Extra Assistant Conservator of Forests, made over charge of his duties in the Upper Chindwin Division on the afternoon of 1st June 1906 and assumed charge in the Mu Division on the afternoon of the 9th idem.

25th June 1906.—No. 13.—With reference to Revenue Department Notification No. 224 Forests), dated the 30th April 1906, Mr. H. W. A. Waston, Deputy Conservator of Forests, availed himself of the leave granted on the afternoon of the 16th June 1906.

No. 14.—With reference to Revenue Department Notification No. 225 (Forests), dated 30th April 1906, Mr. C. W. Allan Extra Deputy Conservator of Forests, received charge of the Toungoo Forest Division, from Mr. H. W. A. Watson, Deputy Conservator of Forests, on the afternoon of the 16th June 1906.

9.—EASTERN BENGAL AND ASSAM GAZETTE.

Nil.

10.—MYSORE GAZETTE.

Nil.

TIMBER AND PRODUCE TRADE.

C. LEARY AND CO.'S LONDON MARKET REPORT.

1st to 30th June 1906.

EAST INDIA TEAK.—*Timber.*—The imports this month have been considerably less than last and more than 50 °/₀ of the total was Java, for which prices continue depressed. There is no change in the position for Burmah or Siam, supplies being very limited and Sellers firm in their ideas of value. *Planks.*—The demand has not been great, but in the uncertainty as to the new season's supplies and with meagre stocks at shipping ports, Sellers seem disinclined to undertake further commitments unless at better prices, and these Buyers seem somewhat more disposed to pay, at least for the more current specifications. Quotations, according to specification, are for Timber £12. 10s to £19 for flitches £16 to £20, and for planks £13 10s. to £19 10s. per load on c.i.f. terms.

The arrivals of timber were 235 loads from Burma, 45 loads from Bangkok and 327 from Java. The analysis of deliveries and stocks is as follows :—

	Deliveries for June.		Deliveries to 30th June.		Dock Stock.	
	Timber.	Plank.	Timber.	Plank.	Timber.	Plank.
1906 ...	695	230	3,580	1,987	5,179	2,814
1905 ...	641	244	3,451	2,096	4,951	2,953
1904 ...	919	559	2,615	2,276	6,229	4,034

DENNY, MOTT & DICKSON, LIMITED.

WOOD MARKET REPORT.

London, 1st June 1906.

TEAK.—The landings in the docks in London during May consisted of 1,771 loads of logs and 383 loads of planks and scantlings, or a total of 2,154 loads, as against 1,465 loads for the corresponding month of last year. The deliveries into consumption were 314 loads of logs, and 393 loads of planks and scantlings—together 707 loads, as against 561 loads for May 1905.

The dock stocks at date analyse as follows :—

	5,179	loads of logs,	as against	4,941	loads at the same date	last year.
	2,814	„ planks,	„	2,980	„	„	„
Total	7,993	loads	„	7,921	loads	„	„

The stock remains practically on a level with the low stock of a year ago. The imports for the month show an increase of some 700 loads on those for May, 1905; but out of this quantity nearly 500 loads were in Java timber, principally logs, which have been coming forward too freely, and owing in many cases to the indifferent quality and poor specification, fail to find buyers. The consumption shewed some improvement upon the previous month, but still remains restricted, owing to the high prices of both logs and planks. The limited supplies at the shipping ports, however, cause shippers to decline business unless they obtain their full rates; and the consequence is that consumers only buy for their actual stock requirements.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

19th July 1901.—No. 902-247-9-F.—The following appointments are made on the staff of the Imperial Forest Research Institute and College at Dehra Dun.

(i) Mr. A. G. Hobart-Hampden, Director, Imperial Forest School, to be Imperial Silviculturist and Principal of the Forest College.

(ii) Mr. E. P. Stebbing, Forest Entomologist to the Government of India, to be Imperial Forest Zoologist.

(iii) Mr. H. H. Haines, Deputy Director, Imperial Forest School, to be Imperial Forest Botanist.

(iv) Mr. R. S Troup, Instructor, Imperial Forest School, to be Imperial Forest Economist.

The above appointments take effect from the 8th April 1906.

(v) Mr. A. M. F. Caccia, Deputy Conservator of Forests, Central Provinces, is appointed to be Imperial Superintendent of Working-Plans, and assumed charge of that office on the forenoon of the 11th July 1906.

No. 907—247-8-F.—Mr. A. G. Hobart-Hampden, Conservator of Forests, 2nd grade, and Imperial Silviculturist and Principal, Imperial Forest College, Dehra Dun, is granted privilege leave for one month and twenty-six days, combined with furlough for five months and four days, with effect from the forenoon of the 11th July 1906

From the same date, Mr. J. H. Lace, Conservator of Forests, 1st grade, Burma, is appointed to be Imperial Silviculturist and Principal of the Imperial Forest College, Dehra Dun.

2.—Madras Gazette.

22nd June 1906.—No. 296.—Mr. Theophilus Neville Hearsey, Extra Assistant Conservator of Forests, to act as District Forest Officer, Guntur, during the absence of Mr. C. B. Dawson on leave or until further orders.

1st July 1906.—*Leave.*—The privilege leave granted to M. R Ry. A P. Ramachendra Mudaliyar, Forest Ranger, 3rd grade, Nellore district, in this Office Service Order No 94 of 1906, is extended by one day, *i.e.*, up to and including the 8th July 1906.

4th July 1906.—M. R. Ry. V. Kalyanarama Aiyar, Ranger, 1st grade, is transferred to Bellary district, on return from leave.

6th July 1906.—The resignation of Ranger S. V. Venkataramana Aiyar, with effect from 17th April 1906, is accepted.

17th July 1906.—To M. R. Ry. A. N. Hanumantha Row, Ranger, 2nd grade, Trichinopoly district, under article 336 of the Civil Service Regulations for six months from 15th June 1906.

A. P. Singaravelu Mudaliar, 4th grade Ranger, is reduced to 5th grade, Coimbatore, from 12th July 1906.

13th July 1906.—This office S. O. No. 226 of 1905, dated 23rd November 1905, dispensing with the services of K. Aiyadurai Aiyangar is cancelled.

He is reinstated as Ranger, 6th grade, with effect from 14th July 1906 and is posted to Madura district.

He is considered to have been under suspension from 25th December 1905 to 13th July 1906.

3.—Bombay Gazette.

28th June 1906.—No. 1324.—Eighteen days' privilege leave enjoyed by Mr. J. H. Irani, acting Extra Assistant Conservator of Forests, Satara, from 26th April to 13th May 1906, both days inclusive, is sanctioned.

28th June 1906.—No. 2567—Messrs. L. S. Koppikar and A. C. Robinson, Extra Assistant Conservators of Forests, respectively delivered over and received charge of the Kolaba Forest Division on the afternoon of the 20th instant.

30th June 1906.—No. 2638.—Mr. R. R. Hattiangadi, acting Extra Assistant Conservator of Forests, who was posted to the Kanara Southern Division as Sub-Divisional Forest Officer, received charge of the Sub-Divisional office from Mr. Edie on the afternoon of the 18th instant.

No 2639 —Messrs. A. C. Robinson and G. J. Rege, Extra Assistant Conservators of Forests, respectively delivered over and received charge of the Bijapur Forest Division on the afternoon of the 18th instant.

14th July 1906.—No. 1563.—*Erratum.*—In Notifications No. 4567 and No. 21, dated 24th March 1906 and 3rd April 1906, respectively, published on page 458 of the *Bombay Government Gazette*, dated 5th April 1906, *read* "afternoon" *for* "forenoon."

11th July 1906 —No. 2882.—Mr. G. E. Marjoribanks, acting Deputy Conservator of Forests, delivered over and Mr. H. A. Bhadbhade, acting Extra Assistant Conservator of Forests, received charge of the Sub-Divisional Forest office, Kanara, Northern Division, on the forenoon of 3rd July 1906.

No. 2883 —Mr. O. H. L. Napier, Deputy Conservator of Forests, delivered over and Mr. P. E. Aitchison, Assistant Conservator of Forests, received charge of the Belgaum Division on the afternoon of 5th July 1906.

13th July 1906.—No. 2938 - Mr. O. H. L. Napier, Deputy Conservator of Forests, delivered over and Mr. P. E. Aitchison, Assistant Conservator of Forests received charge of the Belgaum Sub-Divisional Forest office on the afternoon of the 5th July 1906

24th July 1906.—No 7049.—Mr. D. A. Thomson, Deputy Conservator of Forests, 3rd grade, has been allowed by His Majesty's Secretary of State for India to return to duty within the period of his leave.

No. 7065.—His Excellency the Governor in Council is pleased to appoint Mr. H. L Newman, Divisional Forest Officer, Western Division, Kanara, to act as Divisional Forest Officer, Northern Division, Kanara, in addition to his own duties, during the absence of Mr. G. E. Marjoribanks on leave, or pending further orders.

4.—BENGAL GAZETTE.

3rd July 1906.—No. 803—199-11-F.—Mr.A. L. McIntire, Conservator of Forests, 2nd grade, Bengal, is granted privilege leave for three months, with effect from the afternoon of the 27th June 1906.

From the same date Mr. W. H. Lovegrove, Deputy Conservator of Forests, 2nd (officiating 1st) grade, United Provinces, is appointed to officiate as Conservator, 3rd grade, in charge of the Bengal Forest Circle.

25th June 1906.—No. 1246 T. R.—Mr. S. G. Pranjpe, Extra Deputy Conservator of Forests, in charge of the Sambalpur Forest Division, is granted privilege leave for three months, under article 260 of the Civil Service Regulations, with effect from the 15th August 1906, or from such subsequent date as he may avail himself of it.

Mr. E. R. Comber, Extra Assistant Conservator of Forests, attached to the Sunderbans Division, is transferred to the charge of the Sambalpur Division during Mr Pranjpe's absence on leave, or until further orders.

Mr W. Breakey, Extra Assistant Conservator of Forests, attached to the Singhbhum Division, on leave, is transferred to the Sunderbans Division as an attached officer, on the expiry of his leave.

5.—UNITED PROVINCES GAZETTE.

10th July 1906.—No. 2945—II/308-1906.—Mr. F. Canning, Assistant Conservator of Forests, attached to the Bahraich Forest Division, Eastern Circle, to the charge of the Kheri Forest Division of the same circle, *vice* Mr. P. H. Clutterbuck, granted leave.

6th July 1906.—No. 2885—II/224-1906.—Consequent on the promotion of Mr. T. J. Campbell to be Conservator of Forests—

Mr. W. H. Lovegrove, Deputy Conservator of Forests, 2nd grade, to be Deputy Conservator of Forests, 1st grade.

Mr. J. C Tulloch, Deputy Conservator of Forests, 3rd grade, to be Deputy Conservator of Forests, 2nd grade.

Mr. H. G. Billson, Deputy Conservator of Forests, 4th grade, to be Deputy Conservator of Forests, 3rd grade.

Mr. F. F. R. Channer, Assistant Conservator of Forests, 1st grade, to be Deputy Conservator of Forests, 4th grade.

Mr. E. A. Courthope, Assistant Conservator of Forests, 2nd grade, to be Assistant Conservator of Forests, 1st grade.

No. 2886—II/224-1906.—Consequent on the deputation to foreign service of Pand Kesho Nand—

Mr. E. L. Haslett, Extra Assistant Conservator of Forests, 2nd grade, to be Extra Assistant Conservator of Forests, 1st grade, sub. *pro tem.*

Lala Madho Parshad, Extra Assistant Conservator of Forests, 3rd grade, to be Extra Assistant Conservator of Forests, 2nd grade, sub. *pro tem.*

No. 2887—II/224-1906.—Consequent on the deputation to foreign service of Mr. J. M. Blanchfield—

Lala Har Sarup, Extra Deputy Conservator of Forests, 4th grade, to be Extra Deputy Conservator of Forests, 3rd grade, sub. *pro tem.*

Pandit Kesho Nand, *Pandit Sadanand Gairola*, Babu Nand Mal, } Extra Assistant Conservators of Forests, 1st grade, to be Extra Deputy Conservators of Forests, 4th grade, sub. *pro tem.*

Lala Gulab Rai, Extra Assistant Conservator of Forests, 2nd grade, to be Extra Assistant Conservator of Forests, 1st grade, sub. *pro tem.*

Mr. G. O. Coombs, Extra Assistant Conservator of Forests, 3rd grade, to be Extra Assistant Conservator of Forests, 2nd grade, sub. *pro tem.*

Ranger Ram Swarup to be Extra Assistant Conservator of Forests, 4th grade, sub. *pro tem.*

24th July 1906.—No. 3160—II/304-1906.—Mr. H. B. Gawke, Extra Assistant Conservator of Forests, attached to the Bahraich Forest Division, Eastern Circle, examination leave for three months from the date on which he avails himself of the leave.

6.—Punjab Gazette.

2nd July 1906.—No. 384.—Lala Sundar Das, Extra Assistant Conservator of Forests, on his reversion from deputation to the Kotah State, made over charge of his duties in that State on the afternoon of 12th May 1906 and reported himself at the office of the Conservator of Forests, Punjab, Lahore, on the forenoon of the 26th May 1906, and is posted to the Multan Forest Division, with effect from the afternoon of 30th May 1906.

No. 387.—Lala Mulraj and LalaSundar Das, Extra Assistant Conservators of Forests, respectively made over and received charge of the Multan Forest Division on the afternoon of 30th May 1906, from which date the services of Lala Mulraj are lent temporarily to the Native States of Partabgarh, Dungarpur and Banswara.

No. 390.—Consequent on the return from deputation to the Kotah State of Lala Sundar Das, Extra Assistant Conservator of Forests, Lala Atma Ram, Extra Assistant Conservator of Forests, 4th grade, provisional, on probation, is reverted to Forest Ranger, 1st grade, provisional, with effect from the forenoon of 13th May 1906.

Lala Atma Ram, Forest Ranger, 1st grade, provisional, is promoted to Extra Assistant Conservator of Forests, 4th grade, sub. *pro tem.*, on probation, with effect from the forenoon of 31st May 1906, *vice* Lala Mulraj, Extra Assistant Conservator of Forests, deputed temporarily to the Native State of Partabgarh, Dungarpur and Banswara.

7.—Central Provinces Gazette.

30th June 1906.—No. 4.—Muhamad Haniff Siddique, Forest Ranger, 5th grade, Raipur Division, is granted three months' sick leave on half pay in extension of the leave granted him in Departmental Order No. 1, dated the 21st April 1906.

No. 5.—Pandit Diwakar Balwant Burhanpuri, Forest Ranger, 5th grade, Raipur Division, was granted three months' privilege leave, with effect from the 14th March 1906.

No. 6.—Under the authority conferred by Article 32, clause 1 (*a*), of the Forest Department Code, 6th edition, Kesar Singh, a private student of the Imperial Forest School, who has duly obtained the Higher Standard Certificate of the school, is appointed to fill an existing vacancy as Ranger, 6th grade, on Rs. 50 per mensem, on probation for six months, with effect from the 17th May 1906, and is posted to the Balaghat Division.

No. 7.—Under the authority conferred by Article 32, clause 1 (*b*) of the Forest Department Code, 6th edition, Hanmant Jageshwar, Deputy Ranger, 1st grade, North

Chanda Division, is appointed to fill an existing vacancy as Ranger, 6th grade, on Rs. 50 per mensem, on probation for six months, with effect from the 1st May 1906.

14th July 1906.—No. 301.—Privilege leave for two months and twenty-eight days, under Article 260 of the Civil Service Regulations, is granted to Mr. J. Donald, Assistant Conservator of Forests, in charge of the South Chanda Forest Division, with effect from the 2nd proximo or the subsequent date on which he may avail himself of it.

No. 302.—Mr. L. K. Martin, Extra Assistant Conservator of Forests, in charge of the North Chanda Forest Division, is placed in charge of the South Chanda Forest Division, in addition to his own duties, during the absence on leave of Mr. Donald, or until further orders.

13th July 1906.—Privilege leave of absence for two months has been granted to Forest Ranger Mahadeo Krishna Dandekar, with effect from the 4th July 1906.

20th July 1906.—No. 8.—Pandit Vishnu Vasudeo Sathe, Forest Ranger, 4th grade, in the Bhandara Forest Division, is granted three months' privilege leave, with effect from the 11th July 1906.

No. 403.—Privilege leave for two months, under Article 260 of the Civil Service Regulations, is granted to Mr. R. C. Thompson, Extra Assistant Conservator of Forests, in charge of the Mandla Forest Division, with effect from the 2nd August 1906, or the subsequent date on which he may avail himself of it.

No. 404.—Mr. P. S. Corbould, Assistant Conservator of Forests, attached to the Direction Division, Northern Circle, is appointed to act as Forest Divisional Officer, Mandla, during the absence on leave of Mr. Thompson, or until further orders.

8.—Burma Gazette.

2nd July 1906.—No. 15.—With reference to Revenue Department Notification No. 335 (Forests), dated the 26th June 1906, Mr. A. S. Rencontre, Extra Assistant Conservator of Forests, reported his arrival at Toungoo on the 17th June 1906, and assumed charge of the Railway Revenue Range, Tenasserim Circle, on the afternoon of the 30th June 1906.

From the same date Mr. Forster availed himself of the leave granted him in Revenue Department Notification No. 266 (Forests), dated the 9th May 1906.

30th June 1906.—No. 9.—With reference to Revenue Department Notification No. 323 (Forests), dated the 19th June 1906, Mr. C. W. A. Bruce, Deputy Conservator of Forests, made over, and Mr. R. E. Marsden, officiating Deputy Conservator of Forests, received charge in addition to his duties as Officer in charge of Working Plans, Myittha Forest Division, of the Ruby Mines Forest Division, on the forenoon of the 15th June 1906.

7th July 1906.—No. 10.—With reference to Revenue Department Notification No. 336 Forests, dated the 26th June 1906, Mr. F. C. Purkis, Extra Assistant Conservator of Forests, assumed charge of his duties in the Pyinmana Division on the forenoon of the 2nd July 1906.

11th July 1906.—No. 13.—Privilege leave for three months is granted to Maung Pan U, Forest Ranger, 3rd grade, Zigon Division, with effect from the 20th June 1906.

17th July 1906.—No. 16.—With reference to Revenue Department Notification No. 349 (Forests), dated the 3rd July 1906, Mr. A. Lawrence, officiating Deputy Conservator of Forests, received charge of the West Salween Forest Division from Mr. J. C. Murray, Deputy Conservator of Forests, on the afternoon of the 14th July 1906.

25th June 1906.—No. 8.—Mr. T. W. Forster, Extra Assistant Conservator of Forests, made over, and Mr. B. R. Hutchins, Forest Ranger, received charge of the Revenue Range, Pyinmana Division, on the afternoon of the 22nd June 1906.

9.—Eastern Bengal and Assam Gazette.

Nil.

10.—Mysore Gazette.

Nil.

TIMBER AND PRODUCE TRADE.

DENNY, MOTT & DICKSON, LIMITED.

WOOD MARKET REPORT.

London, 2nd July 1906.

TEAK.—The landings in the docks in London during June consisted of 639 loads of logs and 178 loads of planks and scantlings, or a total of 817 loads, as against 868 loads for the corresponding month of last year. The deliveries into consumption were 695 loads of logs and 230 loads of planks and scantlings—together 925 loads, as against 885 loads for June, 1905.

The dock stocks at date analyse as follows:—

	5,123 loads of logs, as against		4,951 loads at the same date last year.			
	2,762	,, planks,	,,	2,953	,,	,,
Total ...	7,885 loads		,,	7,904 loads	,,	,,

The imports of Teak during the first half of the year have been as follows:—

From Burmah and Siam, Logs ...	..	3,848 loads
,, ,, Planks and Conversions...		1,353 ,,
Total ...		5,201 loads, against which
there has been a consumption of ...	...	4,315 loads.

The above figures are exclusive of the imports of logs and conversions from Java of which the high rates for Burmah and Siam would have encouraged an increased importation. The landings of 1,767 loads during the past half-year compare with 545 loads landed for the corresponding six months of 1905 but the consumption has not grown in proportion, being only 1,262 loads as against 1,054 loads for the same period. The want of length and the inferiority of conversion are largely responsible for the difficulty in selling this production. The former drawback arises from the conditions of growth, and therefore must continue to handicap Java logs in competition with the better descriptions of Teak from Burmah and Siam; but better conversion will come about as new machinery and better supervision are provided at the shipping ports, and the prospect is that whilst Java logs are little likely to displace the more expensive Burmah and Siam production, carefully-selected and well-sawn planks and conversions from Java will find a widening outlet for constructive work in which the texture and weight of Teak are not of first rate importance.

C. LEARY AND CO.'S LONDON MARKET REPORT.

1st to 31st July 1906.

EAST INDIA TEAK—*Timber*—Except from Java, which description is already in excessive supply, the imports were very small; the demand, however, continues quiet and the position is not likely to undergo any great change until after the summer holidays, but as the stocks contain only a small percentage of good character and specification, values are likely to be very firm. *Planks.*—Business which was of only moderate volume, might easily have obtained considerable proportions had sellers been prepared to make concessions in price, but the future will probably show them to have correctly gauged the situation. Quotations, according to specification, are for Timber £12 10s. to £19, for Flitches £16 to £20, and for Planks £13 10s. to £19 10s. per load, on c.i.f. terms.

The arrivals of Timber were 269 loads from Burmah and 483 from Java. The analysis of deliveries and stocks is as follows:—

	Deliveries for July.		Deliveries to 31st July.		Dock Stock.	
	Timber.	*Plank.*	*Timber.*	*Plank.*	*Timber.*	*Plank*
1906 ...	553	340	4,133	2,327	4,896	2,696
1905 ...	1,081	295	4,532	2,391	4,059	2,919
1904 ...	403	213	3,018	2,489	5,857	4,054

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

3rd August 1906.—No. 981--33c-1-F.—The following appointments are made on the staff of the Imperial Forest Research Institute and College at Dehra Dun :

Rai Sahib Upendra Nath Kanjilal, Extra-Assistant Conservator of Forests and Vernacular Instructor, Imperial Forest School, to be Assistant Instructor of the Forest College, with effect from the 8th April 1906.

Mr. G. O. Coombs, Extra-Assistant Conservator of Forests, United Provinces, to be Assistant Instructor of the Forest College, with effect from the forenoon of the 16th July 1906.

13th August 1906.—No. 1045—332-6-F.—The services of Mr. T. J. Campbell, Conservator of Forests, 3rd grade, are placed at the disposal of the Government of Ceylon, with effect from the 30th July 1906.

18th August 1906.—No. 1073—209-6-F.—Mr H. A. Hoghton, Conservator of Forests, 2nd grade, on leave, is permitted to retire from the service of Goverment, with effect from the 17th July 1906.

From the same date the following promotions are made :—

(i) Mr. T. J. Campbell, Conservator of Forests, 3rd grade, on deputation to Ceylon, to be Conservator of Forests, 2nd grade (*seconded*).

(ii) Mr. A. F. Gradon, Conservator of Forests, 3rd (officiating 2nd) grade, Central Provinces, to be Conservator of Forests, 2nd grade, sub. *pro tem.*

(iii) Mr. C. E Muriel, Deputy Conservator of Forests, Burma, on leave, to be Conservator of Forests, 3rd grade.

2.—Madras Gazette.

12th August 1906.—No. 356.--Mr. Denis Thurburn Barry, to be Assistant Conservator of Forests, 1st grade, and to act as Deputy Conservator of Forests, 4th grade, with effect from 4th January 1906.

Note.—This modifies so much of notification No. 269, published at page 607 of Part I of the *Fort St. George Gazette*, dated 12th June 1906, as relates to Mr. Barry's promotion.

13th August 1906.—No 355 —Mr. Charles Adolphus Eber Hardie, Extra Deputy Conservator of Forests, on reversion from the Jeypore estate, is posted to the Kurnool district to do duty under the orders of the Conservator of Forests, Northern Circle.

3.—Bombay Gazette.

Nil.

4.—Bengal Gazette.

Nil.

5.—United Provinces Gazette.

30th July 1906.—No. 3234—II/308-1906.—Mr. F. Canning, Assistant Conservator of Forests, in charge of the Bahraich Forest Division, Eastern Circle, held charge, in addition to his other duties, of the office of Working Plans Officer of that division, from the 19th October 1905.

30th July 1906 —No. 3235—II/308-1906.—To Notification No 1037—II/126-1906, dated 13th March 1906, reverting Mr. F. Canning from the charge of the Bahraich Forest Division, Eastern Circle, add the words "continuing as Working Plans Officer of that Division."

No. 3236.—II/308-1906.—To Notification No. 2045—II/308 1906, dated 10th July 1906, appointing Mr. F. Canning to hold charge of the Kheri Forest Division, Eastern

Circle, add the words "but to continue to hold charge of the office of Working Plans Officer of the Bahraich Forest Division, in addition to his other duties."

8th August 1906.—No. 3346—II/224-1906.—The services of Babu Nand Mal, Extra Deputy Conservator of Forests, sub. *pro tem.*, and of Mr. G O. Coombs, Extra Assistant Conservator of Forests, are hereby placed at the disposal of the Government of India, Department of Revenue and Agriculture.

22nd August 1906.—No. 3540—II/376-1906.—Lala Hukum Chand, Extra Assistant Conservator of Forests, from the Sewalik Forest Division, Western Circle, to the Direction Forest Division of the same circle.

6.—PUNJAB GAZETTE.

Nil.

7.—CENTRAL PROVINCES GAZETTE.

31st July 1906.—No. 487.—Order No. 363, dated the 19th July 1906, transferring Mr. R. S. Hole, Deputy Conservator of Forests, from Jubbulpore to Balaghat, is hereby cancelled.

No. 488.—The Hon. J. W. Best, Assistant Conservator of Forests, attached to the Direction Division, Southern Circle, is posted to the charge of the Nagpore-Wardha Forest Division.

No. 489.—On relief by the Hon. J. W. Best, Mr. A. St. V. Beechey, Deputy Conservator of Forests, in charge of the Nagpore-Wardha Forest Division, is transferred to the charge of the Balaghat Forest Division.

No. 490.—On relief by Mr. Beechey, Mr. A. P. Percival, Officiating Deputy Conservator of Forests, in charge of the Balaghat Forest Division, is transferred to the charge of the Hoshangabad Forest Division.

Order No. 364, dated the 19th July 1906, is hereby cancelled.

No. 491.—Mr. L. E. S. Teague, Assistant Conservator of Forests, attached to the Jubbulpore Forest Divison, is posted to the Direction Division, Northern Circle.

1st August 1906.—No. 310-XIV-3.—With effect from the 1st May 1906, Forest Ranger Pandurang Ram Chandra Joshi is promoted, sub. *pro. tem.*, from the 4th to the 3rd grade of Rangers.

From the same date Forest Ranger Govind Gangadhar Sapre reverts to the 4th grade of Rangers from the appointment held by him, sub. *pro. tem.*, in the 3rd grade.

29th July 1906.—With reference to the Notification of the 2nd July 1906, published at page 168 of the *Central Provinces Gazette* of the 21st July 1906, the promotions therein specified have been made sub. *pro. tem.* in respect of Forest Rangers Muhammad Siddiki and Bishan Das Madan.

10th August 1906.—No. 9.—Second grade Deputy Ranger Durga Parshad, in the Bilaspur Forest Division, is granted three months' leave on medical certificate with effect from the 3rd June 1906.

No. 10.—Second grade Deputy Ranger Sahib Ali, attached to the Balaghat Forest Division, is transferred to the Raipur Forest Division.

8.—BURMA GAZETTE.

28th July 1906.—No. 14.—With reference to Revenue Department Notification No. 333 (Forest), dated the 26th June 1906, Mr. Hatim Tai, Extra Assistant Conservator of Forests, and Maung Tun Tha, Ranger, respectively made over and received charge of the Assistant Instructor's duties at the Burma Forest School, Tharrawaddy, on the afternoon of the 21st July 1906.

17th July 1906.—No. 17.—Forest Ranger Maung Tun Tha made over charge of his duties in the Taungyin Division on the forenoon of the 7th July 1906 and proceeded to Tharrawaddy Forest School to join the appointment of Assistant Instructor.

7th August 1906.—No. 8.—Mr. J. C. Hopewood, officiating Deputy Conservator of Forests, made over charge of the Upper Chindwin Division to Mr. L. C. Davis, officiating Deputy Conservator of Forests, on the afternoon of the 27th July 1906 and proceeded on three and half months' privilege leave.

11th August 1906.—No. 19.—With reference to Revenue Department Notification No. 408 (Forests), dated the 30th July 1906, Mr. W. J. G. Cooper, Extra Assistant

Conservator of Forests, reported himself for duty in the Toungoo Division on the forenoon of the 28th November 1904.

Mr. Cooper was placed on special duty.

25th July 1906—No. 11.—With reference to Revenue Department Notification No. 378 (Forests), dated the 18th July 1906, Mr. G R. Long, Deputy Conservator of Forests, made over, and Mr. S. E. F. Jenkins, Extra Assistant Conservator of Forests, received charge of the Southern Shan States Division on the afternoon of the 17th July 1906.

9.—EASTERN BENGAL AND ASSAM GAZETTE.

Nil.

10.—MYSORE GAZETTE.

Nil.

TIMBER AND PRODUCE TRADE.

DENNY, MOTT & DICKSON, LIMITED.

WOOD MARKET REPORT.

London, 1st August 1906.

TEAK.—The landings in the docks in London during July consisted of 326 loads of logs and 274 loads of planks and scantlings, or a total of 600 loads, as against 450 loads for the corresponding month of last year. The deliveries into consumption were 553 loads of logs, and 340 loads of planks and scantlings, together 893 loads, as against 1,376 loads for July 1905.

The dock stocks at date analyse as follows :—

	4,896	loads of logs,	as against	4,059	loads at the same date	last year.
	2,696	„ planks,	„	2,919	„	„	„
Total	7,592	loads	„	6,978	loads	„	„

The most noticeable feature of the market has been the pressure to realise Java wood of inferior quality and specification. This description of wood has accumulated in stock, owing to unsuitable shipments having been rushed forward in the expectation that the high prices required for the reduced importations of Burman and Bangkok wood would ensure an outlet for any kind of cheap Teak. Teak, however, is now too expensive to be used for other than high-class work where suitable quality and sizes are imperative, and it is therefore bad policy for the shippers of a comparatively experimental wood like Java Teak to handicap its undoubtedly useful qualities by sending forward consignments both inferior in quality and specification to those shipments which originally made the wood well worth the consideration of consumers as at least usefully supplementing the abnormally reduced supplies from Burma and Siam. Rangoon and Moulmein importations for last month were small, and fell short of the consumption, which, however, was very restricted. Prices remain very firm for first-class wood, but second-class logs are difficult to sell and are inclined to weaken in price, as the same reasoning applies to inferior Indian wood as to the inferior Java wood—although of course in a lesser degree, because of the loss in converting second-class Burma wood being more easily estimated by practical converters than where the heavier and stronger Java wood is concerned.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

9th October 1906.—No. 1387-227—15-F.—Mr. V. Subramania Iyer, Forest Ranger, 1st grade, Madras, is appointed to be an Assistant Instructor on the staff of the Imperial Forest Research Institute and College, Dehra Dun, with effect from the 24th September 1906.

2.—Madras Gazette.

Appointment.—Mr. D. A. Stracey, Ranger, will be considered to have been on special duty in Kurnool West from 9th November 1905 to 15th November 1905, both days inclusive.

Privilege Leave—To M. R. Ry. S. Lakshmipathy Naidu, Ranger, 5th grade, Cuddapah North, under article 260 of the Civil Service Regulations, for one month from 13th September 1906.

17th October 1906.—*Leave on medical certificate*—To M. R. Ry. A. N. Venkatachalam Chetty, Forest Ranger, 4th grade, Trichinopoly district, under article 336 of the Civil Service Regulations, for three months, from 1st August 1906.

15th October 1906.—No. 454—The Right Honourable the Secretary of State for India has been pleased to grant Mr. J. S. Battie, Deputy Conservator of Forests, Madras, extension of furlough for one week and to permit him to return to duty within period of his leave.

26th October 1906—*Transfer.*—C. Krishnaswamy Mudaliar, Conditional Ranger, 6th, East Cuddapah to North : alem. To join on return from leave.

19th October 1906—No. 467.—Mr. Henry Tireman, Deputy Conservator of Forests, to be District Forest Officer, Godavari, Lower Division. To join on return from leave.

3.—Bombay Gazette.

20th October 1906.—No. 9938.—Mr. G. S. Hinge, Extra Assistant Conservator of Forests, 1st grade, and Sub-Divisional Forest Officer South Thana, is granted such privilege leave as may be due to him on 1st November 1906, or the date on which he may be relieved, in combination with furlough for such period as may bring the combined period of absence up to two years.

23rd October 1906.—No. 10031.—His Excellency the Governor in Council is pleased to appoint Mr E. M. Hodgson, on return to duty, to be Divisional Forest Officer, Surat.

No. 10033—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. A. D. Wilkins, on return to duty, to be Divisional Forest Officer, Satara.

Mr. G. R. Duxbury, on relief, to be Divisional Forest Officer in charge of Working Plans, Northern Circle.

No. 10065.—His Excellency the Governor in Council is pleased to direct that Messrs J. Hamilton and D. R. S. Bourke should be placed under the Conservator of Forests, Central Circle, and posted to Nasik and Satara Divisions respectively.

No 2008.—Mr. A. N. Master, Extra Assistant Conservator of Forests, 2nd grade, delivered over and Mr. W. F. D. Fisher, Deputy Conservator of Forests, 2nd grade, received charge of the North Thana Division on the forenoon of 19th October 1906.

4.—Bengal Gazette.

10th October 1906.—No. 2691 For.—Sir H. A. Farrington, Bart., Deputy Conservator of Forests, is, on return from combined leave, posted to the charge of the Sundarbans Division.

The services of Mr. T. H. Monteath, Deputy Conservator of Forests, in charge of the Sundarbans Division, are placed at the disposal of the Government of India for employment in the Province of Eastern Bengal and Assam from the date of his relief by Sir H. A. Farrington, Bart.

18th October 1906.—No. 2960 T.R.—The services of Mr. B. B. Osmaston, Deputy Conservator of Forests, Bengal, are placed at the disposal of the Government of India, Revenue and Agricultural Department, for employment in the Andamans.

19th October 1906.—No. 3000 T.R.—The date from which the promotion of Mr. F. Trafford as Officiating Deputy Conservator of Forests, 1st grade, should have effect, should be 25th March 1906, instead of 24th April 1906 as ordered in Notification No. 1556 T. R., dated 11th July 1906.

19th October 1906.—No. 3001 T. R.—The date from which the promotion of Mr. T. H. Monteath as Officiating Deputy Conservator of Forests, 2nd grade, should have effect, should be 6th April 1906 instead of 6th May 1906, as ordered in Notification No. 1556 T. R., dated 11th July 1906.

24th October 1906.—No. 3108 T. R.—Messrs. J. H. Waddingham and E. O. Shebbeare, appointed by His Majesty's Secretary of State to the Forest Department in Bengal as Assistant Conservators, 2nd grade, are posted to the Singhbhum and Sundarbans Forest Divisions, respectively, as Attached Officers.

5.—United Provinces Gazette.

2nd October 1906.—No. 4249. II-78-1906.—The following temporary promotions and reversions are notified for general information :—

Entry No.	With effect from	Consequent on	Name.	From	To
1	24th June 1906.	The deputation of Mr. W. H. Lovegrove to Bengal.	Mr. P. H. Clutterbuck.	Deputy Conservator of Forests, 2nd grade.	Officiating Deputy Conservator of Forests, 1st grade.
			,, H. G. Billson	Deputy Conservator of Forests, 3rd grade.	Officiating Deputy Conservator of Forests, 2nd grade.
			,, R. C. Milward	Deputy Conservator of Forests, 4th grade	Officiating Deputy Conservator of Forests, 3rd grade.
			,, *E. R. Stevens* ,, E. A. Courthope.	Assistant Conservators of Forests, 1st grade.	Officiating Deputy Conservators of Forests, 4th grade.
			,, F. Canning...	Assistant Conservator of Forests, 2nd grade.	Officiating Assistant Conservator of Forests, 1st grade.
2	25th July 1906.	The departure on leave of Mr. P. H. Clutterbuck.	,, J. C. Tulloch	Deputy Conservator of Forests, 2nd grade.	Officiating Deputy Conservator of Forests.
			,, R. C. Milward	Officiating Deputy Conservator of Forests, 3rd grade.	Officiating Deputy Conservator of Forests, 2nd grade.
			,, F. F. R. Channer.	Deputy Conservator of Forests, 4th grade.	Officiating Deputy Conservator of Forests, 3rd grade.
			,, R. St G. Burke.	Officiating Assistant Conservator of Forests, 1st grade.	Officiating Deputy Conservator of Forests, 4th grade.
			,, T. Carr ...	Assistant Conservator of Forests, 2nd grade.	Officiating Assistant Conservator of Forests, 1st grade.

15th October 1906. No. 1427—199-13-F.—Mr. A. L. McIntire, Conservator of Forests, 2nd grade, on return from the leave granted to him in the notification of this department, No. 803-F., dated the 3rd July 1906, resumed charge of the Bengal Forest Circle, relieving Mr. W. H. Lovegrove, Officiating Conservator of Forests, on the forenoon of the 2nd October 1906.

19th October 1906.—No. 4560-II-215-1906.—Mr. W. H. Lovegrove, Deputy Conservator of Forests, whose services have been replaced at the disposal of this Government by the Government of India, Department of Revenue and Agriculture, privilege leave for three months

19th October 1906.—No. 4547—II-224-1906.—Consequent on the deputation of Babu Nand Mal, Extra Deputy Conservator of Forests, 4th grade, sub. *pro tem.*

Mr. E. L. Haslett, Extra Assistant Conservator of Forests, 1st grade, sub. *pro tem.*, to be Extra Deputy Conservator of Forests, 4th grade, sub. *pro tem.*

Lala Madho Parshad, Extra Assistant Conservator of Forests, 2nd grade, sub. *pro tem.*, to be Extra Assistant Conservator of Forests, 1st grade, sub. *pro tem.*

Ranger Hari Datt Joshi, to be Extra Assistant Conservator of Forests, 4th grade, sub. *pro tem.*

6.—Punjab Gazette.

Nil.

7.—Central Provinces Gazette.

1st October 1906.—No. 1018.—Order No. 890, dated the 14th ultimo, re-posting Mr. L. E. S. Teague, Assistant Conservator of Forests, attached to the Direction Division, Northern Circle, to the Jubbulpore Forest Division, is hereby cancelled.

No 1020.—On return from the privilege leave granted him by Order No. 75, dated the 12th June 1906, Mr. C. A. Von B. Malcolm, Officiating Deputy Conservator of Forests, is posted to the charge of the Yeotmal Forest Division

No. 1021.—On relief by Mr. Malcolm, Mr. Pandurang Narayan, Extra Assistant Conservator of Forests, in charge of the Yeotmal Forest Division, is transferred to Melghat and will remain attached to that Division.

4th October 1906.—No. 1061.—On relief by Mr. G. F. Taylor of the charge of the Chhindwara Forest Division, on return from leave, Mr. R. H. Cole, Officiating Extra Assistant Conservator of Forests, will remain attached to that Division.

11th October 1906. No. 1093.—P. Shankarnath, Forest Ranger, 1st grade, Hoshangabad Division, held charge of the current duties of the office of the Divisional Forest Officer, Hoshangabad, from the 9th July to the 20th August 1906, both dates inclusive.

20th October 1906.—No. 1203-B.—Mr. R. H. Cole, Officiating Extra Assistant Conservator of Forests, attached to the Chhindwara Forest Division, is transferred to the charge of the Narsinghpur Forest Division.

No. 1203-C.—On relief by Mr. H. E. Bartlet of the charge of the Melghat Forest Division, on return from leave, Mr. A. A. Dunbar-Brander, Officiating Deputy Conservator of Forests, is transferred to the charge of the Hoshanagabad Forest Division

No. 1203-D.—Privilege leave for three months in combination with furlough for one year and three months, under Articles 233 (1), 260 and 308 (*b*) of the Civil Service Regulations, is granted to Mr. A. P. Percival, Officiating Deputy Conservator of Forests, in charge of the Hoshangabad Forest Division, with effect from the 20th November 1906, or the subsequent date on which he may avail himself of it.

8.—Burma Gazette.

4th October 1906.—No. 25.—With reference to Revenue (Forest) Department Notification No. 10, dated the 27th August 1906, Mr. W. R. French, Extra Assistant Conservator of Forests, availed himself of the leave granted him therein on the forenoon of the 1st October 1906.

17th October 1906.—No. 42.—Mr. J. Copeland, Conservator of Forests, was granted by His Majesty's Secretary of State for India leave on medical certificate for three months, in continuation of the leave mentioned in this Department Notification No. 32 (Forests), dated the 11th January 1906.

No. 43.—Mr. C. E. Muriel, Conservator of Forests, has been permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

12th October 1906. No. 17.—With reference to Revenue (Forest Department Notification No 15, dated the 3rd September 1906. Mr. C. W. Doveton, Deputy Conservator of Forests, and Mr. R. C. Marsden, officiating Deputy Conservator of Forests, respectively made over and received charge of the Prome Forest Division on the afternoon of the 8th October 1900.

13th October 1906.—No. 26.—With reference to Revenue Forest Department Notification No. 27, dated the 10th September 1906, Mr. J. W. Ryan, Extra Assistant Conservator of Forests, availed himself of the leave granted him therein on the afternoon of the 5th October 1906

18th October 1906.—No. 18.—Mr. J. G. F. Marshall, Extra Assistant Conservator of Forests, returned to duty in the Tharrawaddy Division on the forenoon of the 27th ultimo from the leave granted to him in Revenue Department Notification No. 445 Forests, dated the 6th August 1906.

19th October 1906.—No. 45 —On return from leave Mr. C. E. Muriel, Conservator of Forests, is posted to the charge of the Tenasserim Forest Circle.

No. 46.—On relief by Mr. C. E. Muriel, Conservator of Forests, Mr. F. J. Branthwaite, Deputy Conservator of Forests, is transferred from Rangoon and is posted to the charge of the Toungoo Forest Division, in place of Mr. C. W. Allan, transferred.

No. 47.— On relief by Mr. F. J. Branthwaite, Deputy Conservator of Forests, Mr. C. W. Allan, Extra Deputy Conservator of Forests, is transferred from Toungoo and is posted to duty in the Minbu Forest Division

No. 48 —On return from leave Mr. J. Copeland, Conservator of Forests, is posted to the charge of the Northern Forest Circle.

No. 49.—On relief by Mr. J. Copeland, Conservator of Forests, Mr. T. A. Hauxwell, Conservator of Forests, is transferred from Maymyo and is posted to the charge of the Pegu Forest Circle.

No. 50.—On relief by Mr. T. A. Hauxwell, Conservator of Forests, Mr. G. R. Long, Deputy Conservator of Forests, is transferred from Rangoon and is posted to the charge of the Southern Shan States Forest Division.

No. 51 —On relief by G. R. Long, Deputy Conservator of Forests, Mr. S. E. F. Jenkins, Extra Assistant Conservator of Forests, is transferred from Taunggyi and is posted to the charge of the Bampon Forest Sub-Division.

No. 52.—Mr. W. T. T. McHarg, Deputy Conservator of Forests, is posted to the charge of the Myitkyina Forest Division, in addition to his own duties as Divisional Forest Officer, Katha.

No 53.—On relief by Mr. W. T. T. McHarg, Deputy Conservator of Forests, Mr. G. R. Jeffery, Officiating Deputy Conservator of Forests, is posted to Working-plans duty in the Ruby Mines Forest Division

No 54.—On return from leave Mr. R. McIntosh, Deputy Conservator of Forests, is posted to the charge of the Minbu Forest Division, in place of Mr. R. L. Pocock, Extra Assistant Conservator of Forests, transferred.

No. 55.—On relief by Mr. R. McIntosh, Deputy Conservator of Forests, Mr. R. L. Pocock, Extra Assistant Conservator of Forests, is transferred from Minbu and is posted to the charge of the Magwe Forest Sub-Division

25th October 1906 —No. 57.—The following alterations in rank are ordered in the Provincial Forest Service :—

(1) With effect from the 31st October 1905, consequent on the rise of Pilot No. 1 to the 1st grade of Deputy Conservators and the abolition of the supernumerary appointment in the 4th grade of Extra Deputy Conservators :

Mr. E. M. Buchanan, Extra Deputy Conservator, 2nd grade, to be Extra Deputy Conservator, 1st grade.

Mr. C. W. Allan, Extra Deputy Conservator, 3rd grade, to be Extra Deputy Conservator, 2nd grade.

Mr. F. Ryan, Extra Deputy Conservator, 4th grade, to be Extra Deputy Conservator, 3rd grade.

(2) With effect from the 28th March 1906, consequent on the reduction of Mr. J. G. F. Marshall, Extra Deputy Conservator :

Mr. J. G. F. Marshall, Extra Deputy Conservator, 4th grade, to be Extra Assistant Conservator, 1st grade.

Mr. J. W. Ryan, Extra Assistant Conservator, 1st grade, to be Extra Deputy Conservator, 4th grade.

(3) With effect from the 12th May 1906, consequent on the removal of Mr. W. A. Hearsey, Extra Deputy Conservator, from the service of Government :

Mr. R. L. Pocock, Extra Assistant Conservator, 1st grade, to be Extra Deputy Conservator, 4th grade.

Mr. E. B. Powell, Extra Assistant Conservator, 2nd grade, to be Extra Assistant Conservator, 1st grade.

Mr. G T. Wrafter, Extra Assistant Conservator, 2nd grade, *prov. sub.*, to be confirmed in that grade.

Mr. C. V. Ryan, Extra Assistant Conservator, 3rd grade, to be Extra Assistant Conservator, 2nd grade, *prov. sub.*

Mr. A S. Rencontre, Extra Assistant Conservator, 3rd grade, *prov. sub.*, to be confirmed in that grade.

Hatim Tai, Extra Assistant Conservator, 3rd grade, sub. *pro. tem.*, to be *prov. sub.* in that grade.

Mr. R. C. A Pinder, Extra Assistant Conservator, 4th grade, to be Extra Assistant Conservator, 3rd grade, sub. *pro. tem.*

Mr. J. D. Hamilton, Extra Assistant Conservator, 4th grade, *prov. sub.*, to be confirmed in that grade.

Maung Kan Gyi, Extra Assistant Conservator, 4th grade, sub. *pro. tem.*, to be *prov sub.* in that grade.

Mr. C. C. Chill, Ranger, 1st grade, to be Extra Assistant Conservator, 4th grade, sub. *pro tem.*

(4) With effect from the 1st July 1906, consequent on the return of Mr. A. S. Recontre, Extra Assistant Conservator, 3rd grade, from deputation to the Andamans :

Mr. R C. A. Pinder, Extra Assistant Conservator, 3rd grade, sub. *pro tem.*, to revert to Extra Assistant Conservator, 4th grade.

Mr. C. C. Chill, Extra Assistant Conservator, 4th grade, sub. *pro. tem.*, to revert to Ranger, 1st grade.

(5) With effect from the 17th July 1906, consequent on the rise of Pilot No. IV to the 3rd grade of Deputy Conservators : and the creation of an appointment temporarily in the 3rd grade of Extra Deputy Conservators:

Mr C. H. H. Haldane, Extra Deputy Conservator, 4th grade, to be Extra Deputy Conservator, 3rd grade.

Mr. W. H. Craddock, Extra Assistant Conservator, 1st grade, to be Extra Deputy Conservator, 4th grade.

Maung Tha Ka Do, Extra Assistant Conservator, 2nd grade, to be Extra Assistant Conservator, 1st grade.

Mr. C. V. Ryan, Extra Assistant Conservator, 2nd grade, *prov. sub.*, to be confirmed in that grade.

Mr. P. E. Plunkett, Extra Assistant Conservator, 3rd grade, to be Extra Assistant Conservator, 2nd grade, *prov. sub.*

Hatim Tai, Extra Assistant Conservator, 3rd grade, *prov. sub.*, to be confirmed in that grade

Mr. R. C. A Pinder, Extra Assistant Conservator, 4th grade, to be Extra Assistant Conservator, 3rd grade, *prov. sub.*

Maung Kan Gyi, Extra Assistant Conservator, 4th grade, *prov. sub.*, to be confirmed in that grade.

Mr. C. C. Chill, Ranger, 1st grade, to be Extra Assistant Conservator, 4th grade, *prov. sub.*

(6) With effect from the 1st August 1906, consequent on the creation of a post in the 2nd grade of Extra Deputy Conservators for the Andamans :

Mr. R. M. Kavanagh, Extra Deputy Conservator, 3rd grade, to be Extra Deputy Conservator, 2nd grade.

Mr. D. H. Allan, Extra Deputy Conservator, 4th grade, to be Extra Deputy Conservator, 3rd grade.

Mr. C. E. Allen, Extra Assistant Conservator, 1st grade, to be Extra Deputy Conservator, 4th grade.

Mr. J. L. Hefferman, Extra Assistant Conservator, 2nd grade, to be Extra Assistant Conservator, 1st grade.

Mr. P. E. Plunkett, Extra Assistant Conservator, 2nd grade, *prov. sub.*, to be confirmed in that grade.
Mr. S. E. F. Jenkins, Extra Assistant Conservator, 3rd grade, to be Extra Assistant Conservator, 2nd grade, *prov. sub.*
Mr. R. C. A. Pinder, Extra Assistant Conservator, 3rd grade, *prov. sub.*, to be confirmed in that grade.
Mr. W. J. G. Cooper, Extra Assistant Conservator, 4th grade, to be Extra Assistant Conservator, 3rd grade, *prov. sub.*
Mr. C. C Chill, Extra Assistant Conservator, 4th grade, *prov. sub.*, to be confirmed in that grade.

9.—EASTERN BENGAL AND ASSAM GAZETTE.

Nil.

10.—MYSORE GAZETTE.

Nil.

TIMBER AND PRODUCE TRADE.

DENNY, MOTT & DICKSON, LIMITED.

WOOD MARKET REPORT.

London, 1st October 1906.

TEAK.—The landings in the docks in London during September consisted of 731 loads of logs and 464 loads of planks and scantlings, or a total of 1,195 loads, as against 979 loads for the corresponding month of last year. The deliveries into consumption were 341 loads of logs and 311 loads of planks and scantlings—together 652 loads, as against 1,196 loads for September 1905.

The dock stocks at date analyse as follows :—

	5,002 loads of logs, as against 4,184 loads at the same date last year.						
	2,693	,,	planks.	,,	3,147	,,	,, ,,
Total ...	7,695 loads			,,	7,331 loads	,,	,,

The above figures show a very moderate, but nevertheless a very welcome, addition to the landed stocks both of logs and planks. Seeing that of the total stocks of 7,695 loads a very full third consists of Java wood mostly of unsuitable dimensions, quite irrespective of the conflicting opinion as to the quality of this description of Teak, it will be recognised that the scope for selection where picked sizes or quality is required is embarrassingly small.

C. LEARY AND CO.'S LONDON MARKET REPORT.

1st to 31st October 1906.

EAST INDIA TEAK—*Timber*—The shipbuilding strike now in progress on the Clyde has not so far affected values by diverting excessive consignments to other markets; the scarcity of first-class timber at the shipping ports continues so marked that supplies are easily absorbed by current contracts, and Shippers consequently neither desire nor are forced to make consignments; Java is so little enquired for that resort has been had to a sale "without reserve." *Planks.*—Although the general

demand has been unimportant, buyers who require early delivery find considerable difficulty in covering their requirements; values continue firm. Prime sawn Java planks and hewn flitches are in fair request. Quotations, according to specification, are, for Timber £12 10s to £19, for Flitches £16 to £20, and for Planks £13 10s to £19 10s per load, on c.i.f. terms.

The arrivals of Timber were 642 loads from Burmah and 170 loads from Java. The analysis of deliveries and stocks is as follows:—

	Deliveries for October.		Deliveries to 31st October.		Dock Stock.	
	Timber	*Plank.*	*Timber.*	*Plank.*	*Timber.*	*Plank.*
1906 ...	614	389	5,577	3,278	4,672	2,563
1905 ...	270	342	5,908	3,210	4,499	3,057
1904 ...	641	349	4,370	3,393	5,044	3,801

MARKET RATES FOR PRODUCE.

TROPICAL AGRICULTURIST.

3rd October 1906.

Cardamoms	per lb.	1s. 3*d.* to 1s. 5*d*
Croton seeds	,, cwt.	25s. to 30s. nom.
Cutch do.	,, ,,	24s. to 30s.
Gum Arabic	,, ,,	17s. 6*d.* to 27s. 6*d.* nom.
Do. Kino	,, ,,	6*d.* to 1s 3*d.*
India-rubber, Assam	,, lb.	4s 4*d.*
Do. Burma	,, ,,	2s. 6*d.* to 3s. 7*d.*
Myrobalans, Madras	,, cwt.	4s. 6*d.* to 4s 9*d.*
Do. Bombay	,, ,,	4s. 9*d.* to 5s 6*d.*
Do. Calcutta	,, ,,	4s. 6*d* to 5s.
Nux Vomica, Cochin	,, ,,	8s. 6*d.* to 10s. 6*d.* nom.
Do. Bengal	,, ,,	7s to 8s
Oil, Lemon grass	,, ,,	6*d.* nom.
Orchella Weed, Ceylon	,, ,,	nom.
Seed—lac	,, ,,	130s to 180s.
Tamarinds, Calcutta	,, ,,	7s. 6*d.* to 10s nom
Do. Madras	,, ,,	3s. 6*d.* to 4s. 6*d.*

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

Nil.

2.—Madras Gazette.

1st September 1906.—No 373.—Mr. H. Tireman, Deputy Conservator of Forests, Madras, has been permitted to return to duty within the period of his leave.

Leave.—Under section 68 of the Madras Forest Department Code, the Board sanctions the grant of examination leave to Mr. B. L. Seaton Winton, Assistant Conservator of Forests, Coimbatore, for three months, with effect from 23rd September 1906.

30th August 1906.—No. 384.—Mr. Bernard Henry Barlow-Poole, to act as Deputy Conservator of Forests, 3rd grade, during the absence of Mr. J. S. Battie, on leave, with effect from the date of Mr. C. B. Dawson's departure on leave.

No. 385.—Mr Herbert Charles Bennett, to act as Deputy Conservator of Forests, 4th grade, with effect from 3rd July 1906, during the absence of Mr. J. S. Battie on leave.

Transfer.—Mr. Charles Joseph Woutersz, Extra Assistant Conservator of Forests, on return from leave, is transferred from the Central to the Northern Circle to do duty in the Bellary district.

20th September 1906.—No. 416.—The Right Honourable the Secretary of State for India has been pleased to permit Mr. H. F. Arbuthnot, Deputy Conservator of Forests, to return to duty before the expiry of his leave.

3.—Bombay Gazette.

30th August 1906.—No. 8338.—Mr. A. D. Wilkins, Deputy Conservator of Forests, 1st grade, has been allowed by His Majesty's Secretary of State for India to return to duty within the period of his leave.

6th September 1906.—No. 2268.—Mr. R. V. Pethe, acting Extra Assistant Conservator of Forests, 4th grade, appointed on special duty in Khandesh Division, was relieved of his duties on the 28th August 1906 in the afternoon and posted to the Satara Division as Sub-Divisional Officer.

18th September 1906.—No. 8939. Mr. W. F. D. Fisher, Deputy Conservator of Forests, 3rd grade, has been allowed by His Majesty's Secretary of State for India to return to duty within the period of his leave.

No. 8941.—Mr. E. M. Hodgson, Deputy Conservator of Forests, 4th grade, has been allowed by His Majesty's Secretary of State for India to return to duty within the period of his leave.

4.—Bengal Gazette.

12th September 1906.—No. 2171 T. R.—Consequent on the retirement from the service of Mr. W. M. Green, Deputy Conservator of Forests, 1st grade, on furlough, the following promotions are ordered with effect from the 1st August 1906:—

Mr. C. G. Rogers, F.C.H., Deputy Conservator of Forests, 2nd grade, on leave, to be Deputy Conservator of Forests, 1st grade.

Mr. H. H. Haines, F.C.H., Deputy Conservator of Forests, 3rd grade, and Officiating Deputy Conservator of Forests, 1st grade (on deputation), to be Deputy Conservator of Forests, 2nd grade, and to continue to officiate as Deputy Conservator of Forests, 1st grade, but to remain seconded.

Mr. W. F. Lloyd, Deputy Conservator of Forests, 3rd grade, on deputation to Siam, to be Deputy Conservator of Forests, 2nd grade, sub. *pro tem.*, but will remain seconded.

Mr. F. Trafford, Deputy Conservator of Forests, 3rd grade, and Officiating Deputy Conservator of Forests, 1st grade, to be Deputy Conservator of Forests, 2nd grade, sub. *pro tem.*, and to continue to officiate as Deputy Conservator of Forests, 1st grade.

Mr. E. P. Stebbing, F.L.S. Deputy, Conservator of Forests, 3rd grade, Prov. substantive, and Officiating Deputy Conservator of Forests, 2nd grade, to be Deputy Conservator of Forests, 3rd grade, and to continue to officiate as Deputy Conservator of Forests, 2nd grade, but to remain seconded.

Mr. J W. A Grieve, Deputy Conservator of Forests, 3rd grade, sub *pro tem.*, and Officiating Deputy Conservator of Forests, 2nd grade, to be Deputy Conservator of Forests, 3rd grade, Prov. substantive, and to continue to officiate as Deputy Conservator of Forests, 2nd grade.

Mr. T. H. Monteath, Deputy Conservator of Forests, 4th grade, Prov. substantive, and Officiating Deputy Conservator of Forests, 2nd grade, to be Deputy Conservator of Forests, 4th grade, and to continue to officiate as Deputy Conservator of Forests, 2nd grade.

Mr. H. King Robinson, Assistant Conservator of Forests, 1st grade, Prov. substantive, Deputy Conservator of Forests, 4th grade, sub. *pro tem.*, and Officiating Deputy Conservator of Forests, 3rd grade, to be Assistant Conservator of Forests, 1st grade, and Deputy Conservator of Forests, 4th grade, Prov. substantive and to continue to officiate as Deputy Conservator of Forests, 3rd grade.

Mr. P. Tinne, Assistant Conservator of Forests, 1st grade, Prov. substantive, and Officiating Deputy Conservator of Forests, 3rd grade, to be Deputy Conservator of Forests, 4th grade, sub. *pro tem.*, and to continue to officiate as Deputy Conservator of Forests, 3rd grade.

Mr. W. R. LeG. Jacob, Assistant Conservator of Forests, 1st grade, sub *pro tem.*, and Officiating Deputy Conservator of Forests, 4th grade, to be Assistant Conservator of Forests, 1st grade, Prov. substantive, and to officiate as Deputy Conservator of Forests, 3rd grade.

5.—United Provinces Gazette.

18th August 1906.—No. 1073—209-6-F.—Mr. H. A. Hoghton, Conservator of Forests, 2nd grade, on leave, is permitted to retire from the service of Government, with effect from the 17th July 1906.

* * * *

30th August 1906.—No. 1115—353-I-F.—The services of Babu Birbal, Extra Assistant Conservator of Forests, 4th grade, are replaced at the disposal of the Government of the United Provinces, with effect from the afternoon of the 14th August 1906.

18th September 1906.—No. 1208—227-14-F.—Mr. Nand Mal, Extra Assistant Conservator of Forests, 4th grade, United Provinces, is appointed to be an Assistant Instructor on the staff of the Imperial Forest Research Institute and College, Dehra Dun, with effect from the 1st September 1906.

22nd September 1906.—No. 4086—II-417-1906.—Babu Birbal, Extra Assistant Conservator of Forests, whose services have been replaced at the disposal of this Government by the Government of India, privilege leave, combined with furlough for a total period of fifteen months, from 15th August 1906.

6.—Punjab Gazette.

7th September 1906.—No. 521--A. L. No. 27.—Notification.—Mr. R. N. Parker, Assistant Conservator of Forests, was relieved of his duties in the Rawalpindi division on the forenoon of the 10th August 1906 on transfer to the Kangra division, to which he has been attached, with effect from the forenoon of the 15th idem.

14th September 1906.—No. 532.—A. L. No. 28.—Notification.—Mr. M. R. K. Jerram, Assistant Conservator of Forests, attached to the Bashahr Forest Division, has been granted, under article 70 of the Forest Department Code, three months' examination leave, with effect from the afternoon of the 17th August 1906.

7.—Central Provinces Gazette.

27th August 1906.—No. 763—Order No. 595, dated the 10th August 1906, granting combined leave for six months and twelve days, with effect from the 15th idem

to Mr. R. M. Williamson, Deputy Conservator of Forests, on deputation in Central India, is hereby cancelled

No. 813.—On return from the privilege leave granted him by Order No. 3735, dated the 31st May 1906, Mr. S Srinivasalu Nayadu, Extra Assistant Conservator of Forests, is posted to the charge of the Buldana Forests Division.

No. 739.—Privilege leave for six weeks, under Article 260 of the Civil Service Regulations, is granted to Mr. Dhanjishah N. Avasia, Officiating Extra Assistant Conservator of Forests, with effect from the 15th September 1906, or the subsequent date on which he may be permitted to avail himself of it.

30th August 1906.—Privilege leave of absence for six weeks has been granted to Forest Ranger Prithvi Singh of the Berar Circle, with effect from the 24th August 1906.

2nd September 1906.—Leave of absence on medical certificate for four months has been granted to Forest Ranger Mahadeo Krishna Dandekar, with effect from the 4th September 1906, in continuation of the privilege leave for two months granted to him from the 4th July 1906.

5th September 1906.—With effect from the 1st May 1906, the following Forest Rangers are confirmed in the appointments held by them sub. *pro tem*, in consequence of the retirement of Muhammad Sahib, late Forest Ranger :—

(*a*) L. B. Koti, confirmed in the fourth grade of Rangers

(*b*) Nazir Abbas, confirmed in the fifth grade of Rangers.

In consequence of the retirement of Totaram Jankiram, late Forest Ranger, with effect from the 11th February 1906, Forest Ranger Pandurang Ramchandra Joshi is confirmed from the same date in the fourth grade of Rangers, but continues to hold his present appointment, sub. *pro tem.*, in the third grade.

14th September 1906.—No. 889.—On relief by Mr. R. C. Thompson, of the charge of the Mandla Forest Division, on return from leave, Mr. P. S. Corbould, Assistant Conservator of Forests, is re-posted to the Direction Division, Northern Circle.

No. 890.—On relief by Mr. Corbould, Mr. L. E. S. Teague, Assistant Conservator of Forests, attached to the Direction Division, Northern Circle, is re-posted to the Jubbulpore Forest Division.

13th September 1906.—No. 10.—With the previous sanction of the Hon'ble the Chief Commissioner, the resignation of his appointment of 5th grade Ranger, tendered by Mr. C. Alberts, is accepted, with effect from the afternoon of the 9th August 1906.

15th September 1906.—No. 11.—Second grade Deputy Ranger Sahebali, under orders of transfer from Balaghat to Raipur Forest Division, is granted three months' privilege leave with effect from the 11th August 1906.

20th September 1906.—In consequence of the resignation of his appointmennt by Mr. C. Alberts, Forest Ranger, the following promotions are made with effect from the 10th August 1906 :—

(*a*) Ganpati Shankar Natheram Vaidya, Forest Ranger, 5th grade, sub. *pro tem*, is confirmed in that grade.

(*b*) Lala Sitaram, Forest Ranger, 6th grade, to be Forest Ranger, 5th grade, sub. *pro tem*.

8.—Burma Gazette.

3rd September 1906.—No. 13.—The headquarters of Mr. H. L. P. Walsh, Officiating Deputy Conservator of Forests, on Working-plans duty in the Ruby Mines Forests Division, were transferred, with effect from the 2nd June 1906, from Mogok to Maymyo.

No. 14.—Mr. H. L P. Walsh, Officiating Deputy Conservator of Forests, is transferred from Working-plans duty at Maymyo, and is posted to the charge of the Ruby Mines Forest Division.

No. 15.—On the completion of the Working-plans work on which he is engaged Mr. R E. Marsden, Officiating Deputy Conservator of Forests, is posted to the charge of the Prome Forest Division, in place of Mr. C. W. Doveton, proceeding on leave.

No. 16.—Under the provisions of Articles 233, 246, 260 and 308 (*b* of the Civil Service Regulations, privilege leave for three months and furlough in continuation thereof for ten months, is granted to Mr. C. W. Doveton, Deputy Conservator of Forests, with effect from the date on which he may avail himself of the privilege leave.

29th August 1906.—No. 12.—Mr. R. E. Marsden, Officiating Deputy Conservator of Forests, made over, and Mr. H. L. P. Walsh, Officiating Deputy Conservator of Forests, received, charge of the Ruby Mines Forest Division on the afternoon of the 25th August 1906.

10th September 1906.—No. 27.—Under the provisions of Article 260 of the Civil Service Regulations, privilege leave for two months and twenty-two days is granted to Mr. J. W. Ryan, Extra Assistant Conservator of Forests, with effect from the date on which he may avail himself of it.

No. 28.—Mr. F. Linnell, Deputy Conservator of Forests, has been permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

10th September 1906.—No. 15.—Mr. J. G. F. Marshall, Extra Assistant Conservator of Forests, availed himself, on the afternoon of the 4th September 1906, of the leave granted in Revenue Department Notification No. 445 (Forests), dated the 6th August 1906.

18th August 1906.—No. 1073—209-6-*F*.—Mr. H. A. Hoghton, Conservator of Forests, 2nd grade, on leave, is permitted to retire from the service of Government, with effect from the 17th July 1906.

From the same date the following promotions are made :—

* * * * *

(iii) Mr. C. E. Muriel, Deputy Conservator of Forests, Burma, on leave, to be Conservator of Forests, 3rd grade.

18th September 1906.—No. 20.—With reference to Revenue Department Notification No. 11 (Forests), dated the 29th August 1906, Mr. F. Ryan, Extra Deputy Conservator of Forests, availed himself of the leave granted him therein on the afternoon of the 14th September 1906.

19th September 1906.—No. 16.—With reference to Revenue Department Notification No. 12 Forests), dated the 29th August 1906, Mr. A. E. Ross, Deputy Conservator of Forests, relieved Mr. R. R. O'Hara, Extra Assistant Conservator of Forests, of the charge of the Zigón Sub-division (Zigón Division), on the afternoon of the 10th September 1906.

No. 21.—With reference to Revenue Department Notification No. 12 (Forests), dated the 29th August 1906, Mr. R. R. O'Hara, Extra Assistant Conservator of Forests, received charge of the South Tenasserim Division from Mr. F. Ryan, Extra Deputy Conservator of Forests, on the afternoon of the 14th September 1906.

18th September 1906.—No. 33.—On return from leave Mr. F. Linnell, Deputy Conservator of Forests, is posted to the charge of the Taungyin Forest Division, in place of Mr. G. K. Parker, Deputy Conservator of Forests, who continues in charge of the Ataran Forest Division.

No. 34.—Mr. J. Copeland, Conservator of Forests, has been permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

9.—Eastern Bengal and Assam Gazette.

Nil.

10.—Mysore Gazette.

Nil.

TIMBER AND PRODUCE TRADE.

C. LEARY AND CO.'S LONDON MARKET REPORT.

1st to 31st August 1906.

EAST INDIA TEAK.—*Timber.*—The month of August has been, as usual, a quiet one; there is, however, a rather better tone in some of the consuming trades, notably shipbuilding, and as the forecasts of the season's supplies point to a shortage, especially in the case of Bangkok, any hopes of easier prices which may have been formed seem unlikely to materialise. *Planks.*—Sales have been steady and values firm; latterly a few moderate enquiries which have come into the market have had a hardening effect on quotations, and it is certain that but little is needed to cause an advance. Quotations, according to specification, are for Timber £12 10s. to £10, for Flitches £16 to £20, and for Planks £13 10s. to £19. 10s. per load, on c.i.f. terms.

The arrivals of timber were 223 loads from Burma and 63 loads from Java. The analysis of deliveries and stocks is as follows:—

	Deliveries for August.		Deliveries to 31st August.		Dock Stock.	
	Timber.	Plank.	Timber.	Plank.	Timber.	Plank.
1906 ...	489	251	4,622	2,578	4,612	2,540
1905 ...	215	172	4,747	2,563	4,400	3,148
1904 ...	499	289	3,517	2,778	5,630	3,925

DENNY, MOTT & DICKSON, LIMITED.

WOOD MARKET REPORT.

London, 1st September 1906.

TEAK.—The landings in the docks in London during August consisted of 205 loads of logs and 95 loads of planks and scantlings, or a total of 300 loads, as against 957 loads for the corresponding month of last year. The deliveries into consumption were 489 loads of logs, and 251 loads of planks and scantlings—together 740 loads, as against 387 loads for August 1905.

The dock stocks at date analyse as follows:—

	4,612	loads of logs,	as against	4,400	loads at the same date	last year.
	2,540	„ planks,	„	3,148	„ „	„
Total	7,152	loads	„	7,548	loads „	„

The foregoing figures indicate clearly the restricted state of the market. Prices nevertheless have again stiffened, owing to the requirements at the shipbuilding rivers absorbing most of the available floating supplies, whilst advices from Burma and Siam continue to point to this season's supplies from the forests being disappointingly small, although later rains may still bring down fuller supplies than shippers at present dare to count upon. The position will be clearer towards the close of the year; and in the meantime all transactions forward must be on a very modest scale, and consumers would do well to cover their likely forward requirements, whilst the unduly small landed stocks here hold out.

Vol. XXXII DECEMBER, 1906 No. 12

EVERGREEN SHOLAS OF NORTH COIMBATORE.

ERRATA.

Vol. XXXII.

Page 482, line 6, for "Letta" *read* "Betta."
„ 483, „ 3, for "Agnosa" *read* "Aquosa."
„ „ „ 7, from bottom, for "Scoiopia" *read* "Scolopia."
„ 484, „ 10, for "Konigü" *read* "Königii."
„ „ „ 8, from bottom, for "Meorai" *read* "Morai."
„ 485, „ 7, for "Laurk" *read* "Lamk."
„ 486, „ 11, for "Gundunevavilleau" *read* "Gunduneravillenu."
„ „ „ 19, delete "unbranched."
„ „ „ 4, from bottom, for "Karavedi" *read* "Karavadi."
„ 487, „ 6, for "Pulau" *read* "Pulan."

BAMBUSOIDES.

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BAMBOOS IN MARTABAN.

ERRATA.

Vol. XXXII. Page 182, line 8, *for* Khulo *read* Klūlo.
" " " 3 from below, *for* glodose *read* globose.
" 185, " 7, *for* onger *read* longer.
" " " 8 and 9 from below, *for* tips *read* tip.
" 186, " 10, for *Wapya* read *Wapyu.*
" " " 16, *for* clear *read* clean.
" 237, " 7 from below, *for* tips *read* tip.
" 238, " 14, *for* hight *read* high.
" 242, " 5 from below, *for* vein *read* veins.
" 243, " 13 below, *for* net. ¼—½ in long. n. 2—21 *read* pet. ¼—½ in. long, n. 12—21.
" 291, " 8 from below, *for* BAMBUSIOIDES *read* BAMBUSOIDES.

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THE INDIAN FORESTER

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