THE

INDIAN FORESTER;

A MONTHLY MAGAZINE

OF

FORESTRY,

AGRICULTURE, SHIKAR & TRAVEL

EDITED BY

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Index 1894.

VOL. XXI.

I.—ORIGINAL ARTICLES AND TRANSLATIONS. *Page.*

II.—CORRESPONDENCE.

III.—Official Papers and Intelligence.

IV.—Reviews.

V.—Shikar and Travel.

VI.—Extracts, Notes and Queries.

ERRATA.

January No.—p. 36, line 5, *for* 'face' *read* 'fall."
February No.—p. 50, line 18, *for*, Forest law calls 'tolerance' *read* 'French law calls 'tolérance'.'
p 51, line 17, *for* 'destructive' *read* 'distinctive.'
p. [illegible]line 22, *for* 'mere' *read* 'some'; and line 31 *for* 'or' *read* 'on'
p. 54, last line but 6, *after* 'taxed' *insert* 'and'; and, last line but 5, *after* 'to' *insert* 'be.'

ERRATA.

JUNE No.

p. 223, at the end of the Article, *insert* 'O. C.'
p. 236, Article Heading *for* 'Napur' *read* 'Nagpur.'
p. 240, line 13 *for* 'are seriously ill' *read* 'one seriously ill.'

From a Negative, by J. W. Oliver.

TIMBER CART USED IN THE FORESTS OF BURMA.

"The Calcutta Phototype Co."

INDIAN FORESTER.

Vol. XXI.] January, 1895. [No. 1

A Burmese Timber Cart.

The illustration, which serves as a frontispiece to Vol. XXI of the *Indian Forester* and which has been reduced from a negative taken by Mr. J. W. Oliver, Conservator of Forests, Upper Burma, by the Calcutta Phototype Company, shows one of the timber carts used for the transport of large teak logs in Upper Burma. It will carry logs up to to 30 feet long and even 8 ft. in girth, The axle of the cart is of iron, and is bent twice at right angles, so as to allow of a large log being transported with a comparatively small pair of wheels. The axle is square in section except where the naves of the wheels bear on it. The central portion of the axle is 18 inches above the portions on which the wheels rotate and is 3½ feet long. The wheels are 6 ft. in diameter, the nave being made of ironwood strengthened by four iron rings, each 4 inches wide. The spokes, 14 in number, are made of pyinkado and the felloes are of teak. An iron tyre six inches wide, and half an inch thick, is shrunk on to the wheel and is also fastened to it by screws.

The body of the cart consists of a block of pyinkado 3 ft. 4 in. long, 10 inches deep and 8 inches wide, and a groove rectangular in section is cut in its lower surface, so as to receive the central higher portion of the axle. The body of the cart is strengthened by the addition of two iron plates, one placed on either side of the block of wood and it is firmly bolted on to the axle.

The shaft which is 16 ft. long, 6 inches wide and 5 inches deep, is tenoned into the body of the cart and is further secured to it by two iron stays 20 inches long, 2 inches wide and ¼ in. thick. These stays are bolted through the iron plates on the body of the cart and also through the shaft. A strong iron bar ending in a hook is let into the upper side of the shaft so that the hook projects a little behind the body of the cart. This bar is 4 inches wide and 1½ inches thick, and including the hook, 46 inches long, the hook being 8 inches in length. The end of the bar is slightly turned up and is fixed to the shaft by means of an iron stirrup which passes over it, just in front of the turned up end.

The method by which the yoke is attached to the shaft is very ingenious and requires a little explanation. An iron stirrup 2½ ft. long, 2 inches wide and ½ an inch thick is bolted on to the free

end of the shaft. Two iron loops, with an internal diameter of ¾ inch, are welded on to the stirrup, one (the plane of which is parallel to the direction of the length of the stirrup) is 3 inches from the end of the shaft and the other (whose plane is at right angles to the length of the stirrup) is 20 inches from the end of the shaft. The strong ring bolt which is fastened to the latter loop, and the rest furnished with two carved arms which works on it, stand out very distinctly against the side of the further buffalo.

An iron bar, 27 inches long, 3 inches wide, and ¾ of an inch thick, bent so as to receive the yoke, is fitted with an iron hook. The bend in which the yoke fits being quite close to the hook, a slot 5 inches long is cut in the bar at a distance of 3 inches from the other end.

The hook fits into the loop on the stirrup which is nearest to the end of the shaft, while the slot is passed over the ring bolt, and secured in position by the nut mentioned above. The top end of the hook in the illustration is in high light just above the end of the shaft.

The log is suspended from the iron by means of strong chains, the centre of gravity of the log being immediately below the hook from which it hangs, a chain is passed round the log near the front end and is fastened to the shaft, so as to prevent the log from swinging.

The cart is loaded in the following way. The cart is brought over the log so that the hook may be as nearly as possible above the centre of gravity of the latter. The free end of the shaft is then raised and the hook is thus lowered until it is just above the log. Chains are then passed round the log and fastened to the hook. The free end of the shaft is brought again to its proper position and the log is thus raised off the ground. The centre of gravity of the log is found experimentally in each case, and experienced cart-men can usually guage very approximately the place where the chain should be fastened and very little time is consequently required to attach the log to the cart.

C. G. R.

KALIANPUR,
November 29th, 1894.

An appeal to our Supporters.

The 'Indian Forester' has now sucessfully reached the close of its twentieth Volume; and in this, the first number of the twenty-first Volume, we think it right to make an appeal to our readers for more help and assistance in keeping up the standard of quality, which, after a successful career of twenty years, our Magazine ought to maintain.

Financially, the *Indian Forester* is doing well enough, thanks to a considerable increase of late in the number of our subscribers,

so that about 62 per cent of the officers on the Imperial Service now take in the Magazine, as well as a large and continually increasing number of those of the Provincial Service. The good state of the finances enables us to give occasional pictures, and we should be glad to give more if good papers were forthcoming which required illustration.

And this brings us to the object of our present remarks, which is to try to induce more officers of the Department to write for the Magazine and to send us their experience. When in 1874 the first Editor of the 'Forester,' Dr. W. Schlich, presented his first number before the Department, he and his coadjutor, Mr. B. H. Baden-Powell, wrote a 'Prologue' which we venture to reproduce once more, as it may not be in the hands of all our readers and as it expresses, better than we ourselves can put it, what it is that is wanted and what we hope our supporters will endeavour to give us.

To those of our readers who have had no experience of the troubles of an editor we would say—look at the numbers you have received and see how much of the matter in them is new, how much represents new and orginal experience, how much is mere translation, review or extract, and see if you cannot sympathize with the difficulty we have in finding material to fill our pages! It has often happened that the time of going to press has found us with extremely little of fresh interest to insert, that means that we have, partly ourselves, partly with the kind assistance of our nearest and most regular supporters, to write reviews, make translations and what not: and what that is to an editor who has already about enough to occupy him in his ordinary official work, only those who have tried it can realize.

We have, we are aware, many competitors for the help of those who write. There is the Indian daily press, always glad of good papers and especially of those on travel and shikar; there are the Proceedings of Scientific or Economical Societies and there are the semi-official publications, which in some Provinces, are such useful means of circulating information. But we submit that, without grudging these competitors their share of the favour of forest writers, forest officers in general might do more to support what we believe is the only Forest Magazine in the English language which has succeeded in keeping itself alive for so long a period.

To those, therefore, who have so constantly and so cordially given us their help, especially in the past four years, we tender our best acknowledgements; and to those who are content to read our pages only, we would say try if you cannot put together something of interest which will help to make the Magazine what we have done our best to make it, the equal in interest and in professional value of the Forest Magazines of France and Germany.

THE HONORARY EDITOR.

Prologue to Vol 1, 1874.—(*Reprinted.*)

At the commencement of our undertaking, it behoves us to offer an explanation of the principles which will guide us, and the objects we shall have in view, if we are fortunate enough to gain the public approval, and be elected to represent forest literature in the estate of the Public Press of India.

Our object is to supply a medium for the intercommunication of ideas and the record of observations and experiments, as well as to catch all stray fragments of information, all *facts* and *data*, and to supply the place of "Notes and Queries" to the Forest Service generally.

As to our principles, they are decidedly liberal and independent. We, and all who communicate with us are free to express what we think; we shall not repress any criticism on what we honestly believe to be wrong, or say anything that we do not believe to be true, to please *any one*. We shall endeavour to extenuate nothing, and we shall "set down nought in malice."

But free, full and unfettered discussion of every principle and practice is the very life of forest science and forest art.

That discussion it will be our endeavour to facilitate with all the means at our disposal. But this thing we will do—we will impress on ourselves and our contributors the absolute maintenance of courtesy and good temper in the thick of the hottest discussion, and we will banish from our pages everything that verges on personality or harshness of expression. Our criticism will be directed to measures not men, to the opinion and utterances of the impersonal office, not to the thoughts and deeds of individuals.

We are suppliants at the the shrine of every temple of Government; we ask for assistance, for the speedy communication of every report and every paper that deals with anything of theoretical or practical interest in forestry, as well as of all orders that bear on the organization and interest of the Forest service, but we confidently expect that no authority will desire in return for such assistance, other than the gratitude which courtesy commands and a hearty endeavour on our part to support warmly, where support is due, without abandoning our right to criticize, where we cannot approve.

In pursuance of the general principles enumerated, we do not propose to open our columns to personal grievances; but questions affecting the organization of the service, or a section of the service, are legitimately within our scope. We propose to allow ourselves the option of declining papers which are unsuited for publication, or which are based on absolutely unscientific grounds; but we trust that the exercise of this discretion will rarely need to be called into action.

We have now earnestly to address our supporters in behalf of this new scheme of an Indian forest periodical. Above all we

want steady contributors. Now many forest officers feel, and naturally so, that they have no time for writing. Others feel that they have no facility with the pen, and perhaps too modestly imagine that they can do nothing to help. With regard to this feeling we would offer a few remarks. In the first place, while every number ought to contain a fair proportion of leisurely written and detailed matter, that share of the work must necessarily be handed over to those who have a gift for writing, and who have the necessary literary machinery, in the shape of books of reference, to assist them. But the only value of a periodical of this sort will not consist in its containing elaborate essays. A large proportion of it should be devoted to "scraps" and to brief "Notes and Queries." Every Forest Officer who is worthy the name keeps a note-book, and as some new fact or some new experience comes to his notice, or some "happy thought," tending to the facilitation of some portion of his work, flashes across his mind, he will make a rough note of it. There is actually no one who can go about from day to day on plantation work, up and down a river on timber transport business, demarcating a forest, making valuation surveys, or engage in any other branch of his ordinary business, but must see something and learn something, which is in itself valuable, and a distinct addition to the stock of facts which are the basis of all rational and practical progress in forest adminstration.

And here is *the* line for the forest officer who loves not desk and blotting paper. Send us in, then, rough and unartificial, from your note-book jottings. A diamond, even uncut, is a diamond still; and even if we cannot always have a diamond we can have a crystal, and that is a very good thing in its way.

We beg everyone to send what he has, and not to subject it to preliminary criticism, and put it on one side. "I did not think you would care about it; I thought it hardly worth sending," are sentences that consign to inutility many really valuable facts, many good suggestions, that may contain the germs, perhaps as yet only partially developed, of future progress, or of some important economy. Literary merit and excellence of style is not looked for in such communications.

Another way of helping may be indicated to those whose taste or the sterner call of duty, forbids literary work. Ask questions. The interchange of opinions and expressions on all sorts of forest matters will be most useful, and it will create a good discussion, which will be of vital importance to our paper.

We shall endeavour ourselves to keep a good look out for information gleaned from home literature, as well as that of other countries, but we would invite everyone to call our attention to articles and other sources of information of this kind, and to correspond with friends at home, with a view to keeping us informed of the progress of forest literature, furnishing us with notices of

recently published books, stating the price and class. Communications regarding the supply of forest material to public works, improvements to be made in transport, information regarding seasoning timber and impregnation, regarding buildings, hill roads, cheap bridges, and numerous other connected subjects, will doubtless enable the latter class to benefit the public with their experience.

So much is applicable to forest officers; but we hope that forest officers will not be our only contributors: the scope of subjects open to comment will no doubt enable district, settlement, railway and engineer officers to give occasional assistance. Procedure in settling forest rights, notices of forest tribes and their requirements, questions of organization, principles of settlement, etc., will furnish opportunities for the latter to help us.

We may add that we shall be happy to illustrate papers by diagrams and drawings of a simple character, capable of being reproduced in octavo size, by lithography or by simple wood cuttings.

As regards the authorship of papers, every contributor is expected to communicate his name, or with his initials, or under a *nom de plume*, or without any name at all. Either plan can be adopted, provided the real name and address of the writer be entrusted to the Editor.

Whenever possible, rejected MS. contributions will be returned to the author at his request.

The Magazine will be arranged under headings in the following manner.

I. Articles, translations, official papers communicated, etc.
II. Reviews.
III. Notes and Queries.
IV. Shikar and Travels.
V. Extracts from Official Gazettes, appointments, promotions, transfers, etc.

Circumstances may, of course, render a modification of this programme advisable or necessary.

It has been suggested that we should indicate the sort of subject on which papers, notes and queries, may be communicated. With a view, therefore, of giving information to meet such enquiries, and not by any means to fetter the discretion of intending contributors, we offer the following sketch.

In the first instance we mention the subject of organization of service and forest law. Then sylviculture, as artificial reproduction, methods of working the soil, of sowing and planting, the rearing and treatment of seedlings, description of tools, natural reproduction, methods of treatment, cultivation of minor forest produce, etc. Next come working-plans in all their bearings, as forest surveys, methods of ascertaining the contents of growing material,

and of the rate of growth, methods of working forests or plans of operations. Utilization of forests forms another great section, as the properties of the different kinds of wood, the harvesting of forest produce, marking, girdling and falling of timber and wood, tools, extraction of India rubber, production of lac, fruits, as of *Bassia latifolia*, grass, leaves, peat, etc. Then again charcoal burning, preservation of forest produce, especially of wood and seeds, impregnation of the former, transport of forest produce by land and water, dragging, carrying, carting, snow-sledges, timber-slides, floating and boating, and of all things road making. The different methods of the disposal of forest produce, sale of standing forest produce, working by Government agency, permits, private sale and public auction. Next we mention the protection of the forests and their produce against men and beasts, treatment and settlement of forest rights and privileges, area of forests, its maximum and minimum, forest boundaries and their demarcation, protection of *humus* and other beneficial substances. Protection of forests against fires, storms, avalanches, frost, and of forest trees against diseases. Forest statistics and forest finance are two more great chapters. Then the physical and chemical properties of the soil, their influence upon forest vegetation, the atmosphere and its importance, heat, frost, moisture, light, winds and storms. Effect of forests upon climate, inundations, landslips, etc.

The above subjects are those most intimately connected with forestry. But besides these there are many others to which our pages are open, as forest botany, geology, zoology, physical science and chemistry in their bearings upon forestry, national economy, agriculture, etc.

We shall further accept with thanks communications on camp life, travelling, sport, notes on forest tribes, their habits and customs.

These lists are far from exhaustive, but they are at least full enough to show that there will be very little difficulty in finding matter of interest to communicate.

The field is a wide one; let us try and occupy it successfully.

(Sd.) W. SCHLICH.

(Sd.) B. H. BADEN-POWELL.

Extension of the trade in Padauk Wood.

Turning over the pages of the Continental Supplement to the 'Timber Trades Journal' our attention was caught by the advertisement "*Padauk* des Indes orientales. Bois fin des Iles

' d'Andaman et de la Birmanie, ressemblant au meilleur *acajou* ' propre pour meubles de tous genres, plaques, construction de ' batiments et de navires, voitures de chemin-de-fer etc. etc." on sale by Messrs. Ogilvy, Gillanders & Co. at 67 Cornhill, London, and Messrs C. Leary & Co. 108 Bishopsgate St. Within.

That padauk wood has succeeded in establishing itself in the home market as a valuable wood is now an accomplished fact, and our enquiries have led us to ascertain that the uses of padauk are really much more varied and its value much more widely appreciated than is generally known in India to be the case.

In India, ' padauk ' has long been used as a gun-carriage wood and we used to see, some fifteen or more years ago at the Kidderpore Dockyard and Hastings Arsenal in Calcutta, great blocks of the wood stored for seasoning for Ordnance purposes—while an exhibit of a ' padauk ' gun-carriage at the Indian an l Colonial Exhibition of 1886 might have shewn the home military and naval authorities what a valuable wood we had in India for the purpose. In 1877, when the Government of India started workshops in Calcutta and after obtaining wood specimens of authentic determination from nearly all provinces, prepared a magnificent collection for the Paris Exhibition of 1878 with smaller sets for various Indian, European and American Institutions, a huge log of padauk was one of the receipts from the Andamans. Out of its centre was cut a plank nearly 4 feet in diameter which went to Paris and is now, we presume, either at Nancy or at Kew. The rest of the log, after smaller specimens had been made out of it, was sent to England for sale with other woods and fetched a price of £17-10s. per ton, or nearly Rs. 4 per cubic foot, nearly double what is now received. But then we suppose that the exceptional beauty of the figure of the pieces of 1878 led to a fancy price being given for them. At the Paris Exhibition in that year (see ' Manual of Indian Timbers') some furniture made of padauk was exhibited by Messrs. Jackson and Graham and this was probably the first appearance of padouk wood in a commercial light before the European public. The wood was much admired and was most favourably reported on for appearance, durability and capability of standing climatic changes, and since that time its use, and, of course, the trade in it, have largely developed.

In India it is almost less known than it is at home ; the price which padauk wood has lately fetched in Calcutta being very little over Rs. 1 per cubic foot. That obtained in Madras is much better and reaches Rs. 1-8 showing the greater appreciation of its merits in the Southern Presidency. As a practical example of the value of ' padauk ' as a wood for interior decoration we may instance the ball room of one of the chief houses at Simla which was laid down by a recent owner a few years ago in padauk wood, with results which have left nothing to be desired in point either of beauty of appearance or of suitability for dancing. The floor

has stood as well, if not better, than teak wood would have done. In the same way, the use of padauk wood is extending on the Continent of Europe for the construction and laying down of 'parquet' floors, a purpose for which we can scarcely imagine any wood to be better adapted.

In the Handbooks issued under the name of the 'Imperial Institute' series, an account was given in 1892 by Mr. E. Thurston, then Reporter on Economic Products to the Government of India, of the gradual introduction of padouk wood into use and of its gradually increased exploitation in the Andamans. It was pointed out that the permanent introduction of the wood into the London market might be said to date from the time of the Indo-Colonial Exhibition. The Handbook gives an account of the use of the wood by Messrs, Coles & Co., of Coleman St., in building a hand-rail and a dado to the side of a stone staircase at 45, Fenchurch Street, and it is stated that for both purposes the wood came out of very fine figure and of excellent tone and colour. Padauk is also said to have been used by Mr. Joseph Roberts of Bigg Market, Newcastle, in fitting up a new Pharmacy in that city. The effect produced by the use of polished padauk for windows, doors and casings is said to have been unique and to recall the finest examples of Spanish Mahogany. Another London firm has lately employed it for the fittings of a telephone room.

Lately, it was suggested by the Government of India that some of the panelling and furniture of the Imperial Institute might with advantage be made of padauk and this has now been done, with, we are given to understand, excellent results. It has been tried and is, we hear, now extensively used by makers of pianofortes; and cases made of it ought to look remarkably well.

Lastly, among instances of the spread of the use of padauk timber, we may refer to its employment in America in the building of Pullman cars for which it has been most successful. We hope that this may induce the very conservative builders of railway carriages in this country to employ it to some extent, instead of teak, for their purposes, and, if we are correctly informed, there is one reason which ought forcibly to appeal to the travelling public and that is that in case of accidents, padauk breaks clean and does not, like so may other woods, go into splinters likely to inflict dangerous wounds.

We think we have now said enough to draw attention to the padauk trade and to encourage Forest Officers and others to recommend its more wide employment. There are many other woods in India which deserve better commercial popularity, but they cannot all hope at once to command the market; we ought to be well satisfied if one by one they can be introduced and utilized for furniture, sleepers, flooring, pavement blocks or what not, to the advantage of the revenue of the Indian forests.

II. CORRESPONDENCE.

Wood for Beer Barrels.

SIR,

With reference to wood for beer barrels, noted on in a recent number of the *Forester* it may be of interest to point out that the wood of the "Sándan" *Ougeinia dalbergioides* has been tried and found excellent for this purpose. The manager of the Naini Tal Brewery Company writes"—As to Sándan wood, casks (large, about 1,000 gals. and small, 54 gals. capacity) are the only things we have made of it to speak of, and we can give it the very highest character for that purpose, barring that it is rather heavy. We have had casks of it in constant use for nearly three years, and they are as good as the day they were made.

Unfortunately Sándan trees of sufficient age to yield the staves required are not abundant in the forests of the North-Western Provinces. But in many out-of-the-way places, more particularly on warm Southern slopes with a stiffish soil, and limestone the underlying rock, the tree reaches fine dimensions (6 ft. in girth) and is well grown and abundant. It occurs also thoughout most of the Hill Sál Forests, and should a demand arise for it, no doubt arrangements could be made to meet it.

The cost of carriage from the forests to the brewery would be considerable in these parts and this is the most serious obstacle to its being more generally used.

F. B. B.

Palmyras.

About a year ago I asked through your columns whether any of your correspondents could give me *any information regarding* the age of maturity of certain trees. I have received no replies to that query. In the meantime I have been trying to find out locally about that point and have managed to collect some information with regard to palmyras, which may, perhaps, be of interest.

In Repalli Taluk a palmyra tope was planted by Mr. Orr, Collector, in 1829. The trees are now from 30 to 36 feet high; but there is hardly a trace of black wood in their interior, which is supposed to be a *sine quâ non* for building purposes. These

trees are now estimated to be between half and two-thirds grown ; and therefore, judging from this, the age of maturity should be from 100 to 130 years. The soil in this plantation is sandy, with sub-soil water at about 3 feet below the surface in the hot weather.

I am told that it takes far longer for palmyra trees to become black in the heart in sandy soils than in hard soils ; and I have been informed that in the hard limestone tufa soils of Narsaraopet and other upland Taluks, the black wood sometimes comes after a growth of 30 years.

At the same time, even in the same locality trees appear to grow differently ; for in a tope near Narsaraopet, 10 trees, all believed to have been planted at the same time—were cut, and two of these possessed black wood and were fit for building, whilst the other eight were white and soft internally, and unsuitable for structures.

At Achammapeta in Sattenapalle Taluk and Zuzzur in Bandar Taluk of this district there exist palmyras branched some height from the base.

A. W. LUSHINGTON.

III.—OFFICIAL PAPERS & INTELLIGENCE.

The Forest of the Barwani State, Central India.

We have received a copy of a report on these forest by Mr. R. Fagan, Deputy Conservator in Bombay, written in 1891, and we believe that the following extracts will prove interesting to our readers.

The Barwani State I understand to be the entire property of the Rana Sahib, but under the management of the Central India Agency, and therefore forest conservancy, if introduced, can be maintained in perpetuity and according to the general lines laid down for British India.

The State covers an area of 1,755 square miles and has a population of 79,897 according to the figures of the census made this year. The State is bounded on the north by the Nerbadda river, on the east by Holkar's territory, and on the south and west by the Khandesh Districts of the Bombay Presidency. It is of a fairly compact quadrilateral shape comprising a slice of the Satpura range, which runs diagonally across it from south-west, there being two plains left, one in the north-east and another in the south-western corner of the State. The Satpura Hills are, however, again divided into two main ranges by the Goi river which practically runs in the same diagonal direction

as the hills themselves. The "Thalweg" of this river forms a long but irregular plain between the two main ranges. The highest point of the northern range, 2,111 feet above sea-level, is only 5 miles from the Nerbadda river, the bed of which is itself about 350 feet above sea-level. The highest point of the southern range is 3,322 feet above sea-level, its southern slopes rising abruptly from the Tapti valley, which at their base has an altitude of 800 to 900 feet, whilst on the northern side, though the general gradient is less, the country is one extended mass of forest-clad hills with peaks of great height, especially on the western side.

Viewed from any of the more important peaks, a most picturesque country of mountains is seen, apparently uninhabited and covered with dense forests, extending for miles downwards until the main tributaries of the Nerbadda and Tapti are reached, where the alternating black and white patches denote the presence of man. These hills covering more than $\frac{2}{3}$rds of the entire area of the State, must therefore play a most important rôle in connection with the water systems that flow into the Nerbadda and Tapti rivers. It results from this that the location of forest generally must be confined to the two ranges, whilst agriculture must be allowed full scope in the three main valleys.

The State for administrative purposes is divided into six parganas; the following table shows the area of each, its population and cultivated acreage :—

	Area, acres.	People.	Lands occupied, acres.	Lands unoccupied, acres.
Barwani	91,689	12,853	57,306	34,383
Rajpur	106,781	17,699	19,872	86,909
Anjar	108,800	16,971	32,759	176,041
Jalgone or Pansemal ...	424,914	13,772	62,500	362,414
Pati	328,791	7,161	17,675	310,016
Silawad	48,654	11,441	36,250	12,404
TOTAL ...	1,109,629	79,897	226,362	983,267

These figures must, as far as computed area of occupied and unoccupied lands are concerned, be very far from correct, especially in the Rajpur, Anjar, and Jalgone parganas, and it will be really found that nothing approaching this amount or proportion even (should both occupied and unoccupied areas be incorrect) of unoccupied land exists, and at any rate I know that the forest area cannot be raised above 50 per cent. of this waste area. The revenue proceeding from 226,362 acres is stated to be Rs. 85,932-4-3 or an average assessment of 6 annas only. The forest lands as at present existing are the unocupied areas, and they produced last year, 1889-90, Rs. 11,800-4. The whole revenue of the State being Rs. 1,98,870-14-1.

I take it that the oldest standing cultivation is that immediately south of the Nerbadda, then that in the Goi valley, and lastly that of the Tapti. In the first valley agriculture has reached the extreme limit of its extension as far as clearing the land of trees is concerned; there is much land, however, waste in the plains which it is not necessary to include in forests. The cultivation is generally of a high order throughout. In the Goi valley, I consider, in spite of the figures given above, that cultivation has not only reached the extreme limit that sound sense and good government should permit, but has passed it, for shifting cultivation of the most disastrous and profitless description is now being daily carried higher and higher up steep slopes overhanging narrow and fertile fields which lie along every main tributary, and in which the only good cultivation is possible for this country. The results are shewing themselves, and in a few years barren slopes and infertile fields in the valleys will be the residuum. In the Tapti valley there are still vast tracts of virgin soil suitable for the highest order of agriculture, and it is very clear that every acre of the flat land south of the Satpura slopes should be retained for cultivation, but that on the other hand the slopes should be conserved if only to protect the land of the valleys. For cultivation on them will only lead to the destruction of valuable timber forests and the reaping of a miserable crop of inferior cereals for a few years, after which the land will be thrown up. It is clear from the topographical maps, that in 1877-78 nearly the whole plain of Jalgone or Pansemal was one immense forest. At present it is nearly all cultivated, on the average, up to within a mile of the lowest slopes, and within this narrow land I have myself seen that hundreds of acres of forest are now yearly going down before the axe of the Powras of the Akrani.

The forest administration of the State has evidently been for some time past a very serious point of consideration to the State, and though I cannot congratulate the State on the results of its endeavours so far, still there is no doubt that the fact is

well known to the people that the forests are State property in which, owing to the peculiar circumstances of the case, they are exercising a freedom to which they have not the shadow of a right. The forests at no very late date extended over the whole of the Silawad, Pati and Jalgone parganas, and the higher parts of the Rajpore, Barwani and Anjar parganas. They are now, owing to the sense of security inculcated into the cultivator, almost entirely confined to the hilly tracts of these parganas, and they are most heavily cut into, not for the local wants of the agriculturists but for the purpose of enriching the wilder tribes who inhabit them, and who have not in the past had cause or reason to live by the means now absolutely forced upon them by the demands of advancing civilisation. This is the point on which the whole forest administration of the future must hinge.

We have had in the past, forest conservancy of the first order in which nature gave the most perfect forests; then within the memory of its present inhabitants, the wild tribes of the hills were shown they could no longer live by dakaiti and theft; cultivators they were not, but by degrees they have become so. Many tribes, notably the Powra and Bhilala, shew great aptitude as cultivators, whilst others, such as the Bhil Naiks, are more backward or prefer not to leave their hills. In the race of agriculturists the latter are left behind, and now demand wood of these forests to eke out the miserable sustenance their indolent and unpractical labour in the field affords. Time will and must alter all this or the forests must go.

The State on seeing its forests cut down, naturally insisted on its claims of royalty, with what result is clear from the revenues obtained. From 1870 to 1875 Rs. 13,000, including grazing and grass, was about the average revenue: it fell in the next five years to Rs. 18,000 about. A small expenditure was then incurred on forest establishments and a road made through the best forests of the State, which must previously have been inaccessible; the revenues then for the next five years rose to Rs. 18,000 but the forests getting played out, the last five years shew they have dropped, with increased expenditure, to about Rs. 12,900. A decreasing revenue shows that something is evidently going wrong with the forests themselves, which should of course be a regular, if not an increasing, source of income, especially when a Forest Department has been introduced. At the present day the Department consists of one Daroga, one Naib Daroga, six Duffadars, eighteen Forest Guards and one Clerk, costing Rs. 2,516 per annum. The Daroga at the head gets Rs. 30 per month and the lowest paid Forest Guard Rs. 5. The whole expenditure of the Forest Department is now Rs. 2,690 only.

The Daroga issues orders to the subordinates as received from the Diwan of the State. The orders, as far as I have been

able to get information on the point, are of a general and decidedly indefinite nature on all points relating to conservancy, but are sufficiently clear as to what money may be levied on forest products taken out of the forests, as may be seen from the list of fees now charged on various products. Nearly all these fees are levied at the custom houses of the State. The Forest Department have apparently no control whatever over the removal of any of these products, the permit being given in the first instance for the more valuable timbers by the Kamasdar of the Pargana. It is said that it is the duty of the forest officials to point out to the Bhils and others (who want the materials) the places in open forests from which to remove them. Nothing could be better than this system, but I am afraid the forests tell a very different tale than of the accurate working of this system, which moreover is quite impracticable with so few forest guards. A most ingenious, and, if enforced, a most certain, method of minimising the harm done by the permit system is that of allowing timber only to be cut for one month annually by the Bhils for sale from the open forests. But again here the limits of open and closed forests are matters left entirely to the appreciation of the cutter, and of what avail are all the orders if at any time any man may for his own use cut any tree or remove any product he likes; there is no system regulating the correspondence of, and reports on, forests by the forest officials; there is no system of accounts to check fraud and to ensure the greatest possible revenue being received by the State. These matters are left to the energy and honesty of an extremely weak and underpaid establishment.

The points then that strike me the most forcibly as needing immediate attention are—

1st.—The demarcating of the forests from other State lands by pillars and other boundray marks.

2nd.—The separation by well-defined boundaries of the closed and open forests.

3rd.—The separation in the matters of privileges to remove forest produce of the inhabitants of forest villages from inhabitants not residing in forests.

4th.—The separation in the matter of extended privileges of the aboriginal from the other inhabitants of forest villages.

5th.—The curtailment of the permit system to products of secondary value.

6th.—The exploitation of the more valuable products under direct State or departmental supervision controlled by an annual working plan.

7th.—An increase to the forest establishment and improvement in the status of the chief forest officer.

8th.—A separate system of accounts to be kept by all officials collecting and disbursing money on account of forests, the said accounts to be under the control of the chief forest officer.

9th.—A proper system of reports, general, monthly, quarterly and annual, to be submitted to ensure the working of each individual officer at his post and the carrying out of all the works laid down to be done during the year.

Demarcation of the Forests. From my personal observations whilst on tour I have been able to make a prospective boundary line (see map accompanying) for the forest; it is merely the basis upon which the actual boundary must hereafter be made. Within its limits I included roughly in the northern range 100 square miles. in the southern range 450 square miles or 550 square miles; in all these I have left a good deal of waste outside of forests. This was inevitable, as land fit for cultivation is not yet taken up everywhere, much is fallow and any infertile tracts are so isolated, small or otherwise unsuitably constituted for forests, that they could not be included in my scheme.

I shall treat along with the *Northern range* the half-dozen detached hills lying between it and the Nerbadda. The main range as stated above runs diagonally from Rajgarh on the Goi river south-east to Raita pass in the Rajpore Pargana, a distance of 28 miles length, extending from Bawangaz towards Pati and one or two minor spurs in Rajpore and Anjar Parganas. With these exceptions the block is extremely compact and evades all present cultivation except some small plots of a miserably poor description in impossible places on the hills which should in time be taken up; of course no interference is proposed with the lands connected with the Jain temples of Bawangaz.

The range is, like the rest of the Barwani State, composed of basalt, and consequently the forests are typical of that formation; it is, however, especially the home of that extremely valuable, delicate and rare timber tree the Anjan (*Hardwickia binata*). On both the northern and southern slopes this tree is, owing to its numbers and size of growth, the chief among the valuable species. Then come in orders of quantity among the better kinds (see appendix for technical names, etc.) Dhanda, Sadada, Khair, Tinas, Teak and Blackwood, all more or less destroyed as far as sound trees of any size go, but they are by the nature of things the main species and could become both numerous and sound. Associated with them in small quantities, chiefly in the ravines, will be found amongst the better species, Bor Kalam, Behda, Mango, Moho. Jambul, Tamarind, etc. The forests are at present, I regret to say, comprised, for more than ¾ths of their vegetation, of the inferior species, Salai, Mohni, Kad, Ganur, etc.; there are also a few bamboos in the more westerly portions of the range. Babul,

strange to say, I saw nowhere except near Barwani town ; sandal-wood is quite unknown. The forests within my boundary are on the whole on the southern slopes than on the northern, but all are perfectly capable of restitution if taken in time. These forests are moreover better in the west than east.

The *southern range* needs for description of its demarcation and constitution to be divided into two parts: a first comprising the northern side, which slopes to the Nerbadda, and a second comprising the southern which drains into the Tapti valley. The demarcating line between forest and cultivation fixed by me on the northern slopes, leaves out of forest a very great deal of the hilly lands and excludes the ravines of the bed of the Goi, Jarkal and other rivers, almost up to the sources of their various tributaries on the main ridges and hills. There is now no help for this. These lower hills are all more or less cleared of trees, or so enveloped in cultivation that to bring them under conservancy would entail much friction with the cultivators. I admit that wholesale destruction has taken place below my line, is taking place in parts above it, and will extend rapidly unless a boundary line is quickly put down. The cause is shifting cultivation which should be discouraged as much as is possible, for after the destruction of a valuable lot of timber, poor crops are taken from the land for two years, may be three, and then the land deserted and a fresh hill attacked further in. To this there must be a limit placed if only to protect the cultivation in the ravines which is practically the only permanent and rational cultivation on this side of the Goi river. It will be seen from the map that on this side there is practically no plain or level country, and that the hills really extend down to the banks of the Goi itself. In places such as Roesar, Zarar, Marwani, etc., what are known in Khandesh as Bhil or forest settlements, that is habitations and fields entirely surrounded by forest, will have to be demarcated. There is no disadvantage in a few such plots of lands being inside an extended tract of forest ; on the contrary they facilitate protection by enabling posts or head-quarters of forests officials to be located in them. If the people were not there the forest officials would not live there alone, and no help would be within miles for purposes of fire conservancy, arresting offenders, etc. In fact without these habitations, there would be no means of either protecting or working the forests. It is of course different where the forests are in a narrow strip, two or three miles broad.

The forests of this tract in the greater part are of the very best kind, but have been most shamefully treated as far as the better species are concerned even up to the highest points ; in fact it is the one characteristic of the Barwani forests that the best species have been always the most maltreated, whilst inferior species except in the vicinity of cultivated lands have been allowed to flourish.

The timber species contained in these forests are Anjan, Teak, Sadada, Tinas, Sissam, Khair, Kalam, Dhawda, Temru, Bherda, Shivan, Chinchola, Daman, Jambu, Moka, etc. The first half-dozen are the only ones cut for the market at present, and from them apparently no one troubles to take anything but the best part of the tree or the biggest beam. In consequence it would be difficult to point out one tree in ten that is sound, whilst the stumps and branches of the hacked and felled trees strew the forests throughout in various stages of decomposition owing to the action of fire, air and water. The Anjan is essentially the tree of the lower ranges, teak that of the higher. I have seen the finest specimens of Anjan, Teak, Blackwood and Tinas as well as of other species here that I have ever seen anywhere. The size to which teak grows is enormous, 10 and 12 feet in circumference, but under present treatment it is made unsound at an early age. A blackwood on "Deoghar" measured 9 feet in circumference. If trees grow sound they grow larger and to a geater age than unsound. The minor species of this range are numerous but I would specially note among valuable fruit trees the Moho, Charoli and Mango which abound here. The bamboo is found in great quantities and of very good quality in the middle and upper ranges. The value of this species, seeing the easy means of transport through this wild country, ought to be very great to the State. I am told that the "Gol Pahar" forests, south of Sustikhera in the Silawad Pargana and north of Sidili, are the best in this tract, and contain the finest Teak, Blackwood and Tinas; they must be very good to beat anything near Ramgarh, Deogarh, Ubadagar and other places, I am confident that they have been just as shamefully cut about as the other so-called closed parts. "Gol Pahar" is the only tract I failed to examine, owing to the orders regarding my extension coming after I had left the Barwani.

The forests from end to end inside the proposed demarcation line are one and all capable of producing the best trees that can be grown on this side of India. The land is essentially unfit for agriculture owing to the rapid slopes on which only a shallow soil held together by the roots of trees is possible, as the substratum is a deeply fissured rock which permits of roots of trees alone being able to obtain moisture from the great depths at which it is found. This fact will also account for the paucity of water springs in this area which of course in turn precludes any great increase to the number of inhabitants or cattle. The State may therefore without any apprehension for the agricultural classes put under forest 300 square miles (192,000 acres) about, as proposed by me for the north side of the range.

I now come to the south side. The demarcation proposed here is very simple; it follows the bare contour line of the hills extending from east to west of the Jalgone or Pausemal Pargana; it will, I think, be found to contain roughly 150 square miles (96,000

acres), and has practically no cultivation inside. In fact the cultivator is as yet occupied in clearing the rich plains below the hills where he has many square miles of forest yet to cut down, but he must be prevented from mounting the slopes which are covered with teak forest of the very first order. Anjan is not found here (I only saw three trees), but other species mentioned above grow to large and valuable sizes. There ought to be an enormous revenue made from these forests, seeing that they are all within easy carting distance of the Khandesh timber markets and its ginning factories.

The care and management of Farm-manure in South India.

The manure obtained from his cattle is almost everywhere the chief standby of the farmer for manuring his land.

It is only by manuring his land well and tilling it properly that the farmer can hope to secure good crops from it; and how greatly his success in this respect depends upon manure is a matter of common experience. With sufficient manure and abundance of water, there is scarcely any limit to the productiveness of the land in India. Manure and water are in this respect inter-dependent; the supply of water being that obtained in the falling rain or from irrigation works or wells. The matter at present so to be considered is, however, the manure supply.

Unfortunately the amount of manure which the ryot finds at his disposal is usually but small. It is often also of but poor quality. Owing to want of proper care of the supplies available and to bad management, the stores of manure are generally small. Similar reasons explain the low quality of the manure.

In some places where wood fuel is scarce and near large towns a very large proportion of the cattle dung is made into cakes and used for fuel; only a little ashes remaining for use as manure and even these, in cases where the cakes are sold into towns, are lost to the ryot. When his cattle-dung is burnt by the ryot himself, the ashes are generally thrown into a heap in the open, where they become leached of much of their valuable matters. That the practice of burning cattle dung is a cause of great loss, is known to every one. By using the dung of his cattle for fuel, the ryot makes only a very petty saving in expenditure, whilst he could, by growing fences round his fields, as is done in parts of Coimbatore and Salem, or by setting apart a small portion of his fields on which to grow trees for fuel, easily provide himself with fuel sufficient for his wants. By such means the very wasteful practice of burning cattle dung may be avoided. Near large towns, the price of fuel is so high as to render the growth of fuel trees generally a profitable undertaking.

The more general practice of the ryot is, however, to accumulate the dung of his cattle in a loose heap in the open air. The dung there dries into hard lumps, and is thoroughly washed by any rain that falls. It suffers loss in every possible way; and the ultimate result is a small heap of very poor, almost valueless, stuff left to be carted to the fields. With the dung is to be seen a certain amount of straw and leaves. Each material is left to itself, the dung to lose its value, the stalks to become hard and desiccated. Because in India no litter is supplied to the cattle, not once in a thousand times is any attempt made to save the urine of the cattle when they are kept in the houses or sheds of their owners. Wasteful this process is, because the solid manure is exposed as described. Still more wasteful and injurious is it, because the liquid manure is not only not preserved, but is allowed to sink into the ground, and especially into the hollows made by the feet of the cattle, The soil on which the cattle stand is saturated below by the urine. and the air of the house or shed becomes foul and contaminated. Every one has noticed the strong and peculiar odour found in these sheds in the morning. This is due mainly to the evaporation of valuable matters contained in the urine which drops on the floor and is lost.

The value of the urine of his cattle as manure is not, it is to be feared, appreciated fully by the ryot, even if the value thereof is not totally unknown. The urine, as a matter of fact, is richer in fertilising matters than the solid excreta of cattle, and the loss involved in letting the urine go to waste is very large. This loss may be avoided by the use of litter to absorb the urine, or even by sprinkling the floors of the cattle-sheds with dry earth, if litter be unprocurable. By the latter process, much of the urine could be saved; the earth being allowed to accumulate in the sheds till required for use as manure, or being removed as soon as it becomes saturated and carefully preserved in a manure pit as is described below. In cases where cattle are tethered or penned in the fields, the urine soaking into the land is not lost.

If the ryot be asked why he does not use litter for his stock, he usually says that he has not enough fodder to feed them properly, still less has he straw for use as litter. The appearance of so much waste straw, &c. in the manure heaps is, however, often evidence that this is not the reason, for these matters, as well as coarse grass, weeds, leaves, and rubbish of all sorts might be used as litter, and the quantity required, especially if dry earth be also sprinkled over the floors, is not large.

As has already been said, the most valuable portion of farm manure consists of the urine of the cattle. The manure comprises also, when properly made, the whole of the solid dung as well as litter used for bedding the cattle. As it consists of litter and the voiding of animals fed on the produce of the soil, it forms in itself a complete fertiliser. In the making of good manure, it is of importance that all these matters should be thoroughly and

intimately mixed and that they should be preserved carefully after they have been collected ; so that the whole mass may ferment and decompose slowly and thoroughly. The value of farm-manure lies probably as much in the mechanical effect it has on the soil to which it is applied, as on the fertilising matters it contains. The mechanical effect depends greatly, if not chiefly, on the state of decomposition in which the manure is when applied to the land.

An excellent method of managing farm-manure suited to the conditions of the ryot is described below. In this method the dung and the urine are not removed from the shed except at intervals of several months, when the manure is required. The litter used absorbs the urine.

The floor of the cattle-shed should be made 2 or 3 feet lower than the surrounding ground, and the sides and the bottom of the pit plastered with clay. On the floor a layer of ashes should then be spread once for all, and every day a layer of vegetable rubbish should be spread over the surface as litter, that is, for bedding. For this purpose, leaves, coarse grass and other vegetable rubbish may be collected and stored during those parts of the year when they can be easily procured and when the ryot and his cattle have plenty of leisure. Waste fodder and various refuse portions of crops, such as the ear-heads from which corn has been thrashed &c., may be used as bedding. The shed may be 10 feet long and 6 feet broad for a pair of cattle. It is best the cattle should be left loose in the shed, so that they may tread on every part of the manure and press it down. If the manure is not pressed, it will rot too fast and become much heated and give off bad smells and the health of the cattle will be injured. Every morning the dung dropped by the cattle in the previous night should be evenly distributed and a thin layer of litter spread over it. In this manner the manure may be collected until the pit is filled, which may take about three months.

Too much bedding should not be supplied ; otherwise the manure will be too dry and not decompose with sufficient slowness and thus lose in value. The manure in the pit should always be thoroughly moist throughout its bulk. If the manure has an ash-colored appearance anywhere when it is being removed that is because it has not decayed properly ; the appearance being due to the great heat caused by the manure being too dry. If the straw, &c., supplied as bedding be long and hard, the manure will not rot properly ; such litter should be cut up into short pieces. Unless the manure is well rotted, it will not be of much use to crops, as it will not act quickly. It will also make the soil too open, so that the crops thereon may suffer much from draught. The manure, if properly managed, will be of a black colour and of mellow substance, thoroughly rotted throughout so that it may almost be cut with a knife. In removing manure from the pit the unrotted portion near the surface should be placed on one side, and after the well-rotted

portion has been taken out, should be put back again at the bottom of the pit, and manure may be collected again as before.

By this method of managing manure, about 5 to 7 tons of good manure may be obtained yearly for each head of cattle kept, whereas if the dung be thrown out in loose heaps in the open air, only about half a ton of very inferior manure will be obtained in the year. The only objections raised the system are :—

(1) That it is supposed to cause unhealthiness amongst the cattle housed.

(2) That it requires a large amount of litter to be supplied.

In reference to the last, it may he noted that in some parts of South Canara the ryots take great pains to collect leaves and grass, and supply bedding to their cattle ; but they remove the manure at intervals of a few days, and throw it out in a hollow place where it can be compressed by the carts travelling to and fro over it. In reference to the first objection, experience has shown that it is groundless.

If for any reason, it is inconvenient to a ryot to collect manure in the above-mentioned manner, the following method may be adopted :—

The floor of the cattle-shed should be made smooth and compact with a gentle slope towards the back, where a small channel should be placed so that all the urine falling on the floor may be carried by the channel to a pot placed outside the shed at one end. The dung can be removed every day and thrown into a pit, the sides and bottom of which should be plastered with clay, and over which a low thatched roof should be erected. Whatever vegetable refuse is available on the farm may be thrown into the pit, and the urine collected poured over the heap daily. The whole mass of dung, urine and vegetable rubbish should be kept uniformly mixed and well trodden and pressed down so as to make the mass decay uniformly and slowly.

If the manure pit last described cannot be protected by a simple shed, the heap should be covered with earth. It has in all cases been found very useful to cover manure heaps with earth, as this prevents the loss of valuable fertilising matters into the air. This practice is fully adopted in some places. *e.g.*, in Tinnevelly, with the best results. If the upper portions of a manure heap become dry, the heap should be turned over so as to mix the moister and the drier portions together, and if there be any tendency for the heap to dry up generally, it may be watered slightly with advantage. The covering of the heaps with earth to a great extent prevents undue drying. The great aim should be to maintain the heap in a moist state, so that the whole mass may decay slowly and completely, and thus the fertilising matters of the manure may be preserved and rendered more immediately useful than as they are found naturally.—(C. BENSON, *in Madras Agricultural Bulletin*, No. 31, 1894).

IV.—REVIEWS.

Review of Forest Administration in British India for 1892-93.

The area of 'Reserved' Forests added in the year referred to, was 8,126 square miles, making, less a few small exclusions, 66,865 square miles on the whole. There were also 33,083 square miles of 'protected' and 25,412 square miles of 'unclassed' forest.

The Inspector-General's remarks on the aims of forest conservancy and the advisability for excluding from state forests not only all areas capable of being placed under permanent and self-supporting cultivation or of being made so by irrigation, seem to differ somewhat from the opinions recorded last year. We consider that culturable forest land should be abandoned if the population on the soil and other circumstances render it necessary; but we think that it would be a mistake to exclude and practically abandon such lands in the hope of attracting settlers and before any real pressure has taken place. The following remarks on the subject of grazing-grounds and protective forests are interesting and worthy of reproduction.

"Considerable tracts exist in India which should doubtless be 'primarily used as grazing grounds, and which no amount of 'protection will ever transform into a tree-forest. These areas 'should be used for the purpose for which nature has intended 'them; but the certainty of such intention should be based on 'local enquiry, as large areas exist which under the direct 'influence of man, have deteriorated into barren wastes, and which 'would yield more and better produce, be it grass or be it wood, 'under a conservative treatment.

'The protection of forests occupying hill slopes is in every 'way of great climatic, protective and economic importance in the 'agricultural advancement of the country; and even in the plains 'the creation or maintenance of forests may be of permanent 'economic value. Considerable progress has been made in this direc-'tion wherever land was at the disposal of Government; but this 'has not everywhere been the case, and the existing forest laws are 'impractical in regard to the creation of village forests, their settle-'ment or the settlement of private forests, and the protection of all 'classes of forest not included in the reserved or protected cate-'gories."

In Chapter I sec. V, the aims of Forest Working-plans are discussed in long paragraphs covering three pages. The discussion is too long to quote, so we must refer our readers to the original.

Sec. VI treats of 'Communications and Buildings' and we are glad to reproduce Mr. Ribbentrop's excellent remarks on the subject.

"I have repeatedly, and again in the present review in the 'preceding section, urged that the greater part of the price paid 'by the consumer of forest-produce in India is frequently that 'portion which covers the cost of transport, and that it is therefore 'the duty of the administration to facilitate as far as possible ex- 'traction of produce by close attention to the improvement of 'export lines. The question is, however, of importance not only 'to the consumer but also to the State, as owning large forest- 'properties which yield, as yet, on account of the want of good 'forest roads, an income small disproportionately to their value 'and possibility. The absence of suitable export lines is not, how- 'ever, merely felt within the forest boundaries, where fair-weather 'roads and leads or slides will often sufficiently meet requirements. 'but is even more apparent in regard to feeder roads which should 'connect the forests with the permanent system of district roads. 'It is more often the case than not that these feeder lines are mere 'fair-weather tracks, very frequently interrupted by fields during 'part of the year, and they are consequently useless during the 'season when draught cattle could be spared for bringing in forest- 'produce. Personally, I am inclined to think that a portion of 'the forest revenue might be suitably diverted in helping to con- 'struct permanent, if possible, metalled, roads, so as to connect the 'State forests with the larger arteries of traffic, where such exist, 'or are under contemplation; for it cannot be gainsaid that in 'many localities even the main arteries are still in a backward 'state. Under any circumstances, I urgently recommend that the 'construction of permanent roads, and when the possibility of the 'forests and the demand for forest-produce warrant it, of tram- 'ways, as well as the improvement of waterways, should receive 'the constant and serious consideration of every officer connected 'with the forest administration of the Empire. Many of the 'administration reports fail to elucidate with sufficient clearness 'this important question, and the progress made has, to a certain 'extent, to be gauged by the amount spent on means of com- 'munication. This is not always sufficient to judge correctly of 'the progress made; and it would be well if the purpose to be 'served by any particular road were shortly noted. According to 'the standard applied, however, it is evident, from the provincial 'notices, that of late years a considerably greater activity 'exists in the improvement of export lines than was formerly 'the case."

Chapter II deals of Protection and Improvement. After reviewing the results of general protection and the results of prosecutions and the compounding of offences and very properly pointing out how advisable it is that small concessions like the free removal of branch pieces and twigs in coupes should be freely granted, the Review goes on to the question of Fire-Protection and says :—

"The gross area successfully protected from fire by the adop-'tion of special measures was again increased, and amounted to '27,438 square miles against 23,461 in the preceding year, 23,114 'in 1890-91 and 15,570 square miles ten years ago in 1883-84."

"The fire season is the most trying and anxious time for the 'majority of forest officers in India, and the greatest credit is due 'to them for the constant extension of fire-protected areas, which 'can only be secured at an increase of harassing work and great 'exposure during the hottest season of the year. It is, under 'these circumstances, a matter which cannot be too highly appre-'ciated that, of recent years, the interest taken by revenue officers 'in this important branch of forest administration has been visibly 'growing, and that in many parts of the country the people are 'becoming more careful in the burning of grazing grounds adjacent 'to protected forests, and, moreover, often actively assist in fire-'protection and in the suppression of fires. This assistance, with-'out lessening the credit due to forest officers of all grades, has 'helped considerably towards securing favourable results, and 'cannot be too gratefully acknowledged."

The remarks on the Grazing question next claim our attention. We find that Mr. Ribbentrop clearly considers that the usual and common System of Rules is only a makeshift and that the real necessity is a good series of Working-plans in which the grazing shall be provided for equally into the arrangements for the cutting and supply of timber. He says :—

"Next to protection from fire, the regulation of grazing is the 'most important question in the successful management of our 'forest areas, and in many parts of the Empire the most difficult 'of all. The grazing question is, as a general rule, most acute in 'places where, for climatical reasons, the forests require the great-'est amount of protection ; for it is precisely in these localities that 'the population is most dependent on the forests for its fodder-'supply. It cannot be denied that a gradual progress is being 'made in systematizing the utilization of the fodder-supply in the 'forests, and rules and regulations with this purpose in view have 'been promulgated in several Provinces. Such rules are doubt-'less of considerable importance, but they will not, in my opinion, 'lead to a final solution of the difficulties, as the conditions with 'which we have to deal vary in every locality. I am convinced

'that the only practical way of successfully dealing with the 'matter is by means of Working-Plans, setting forth the purpose 'for which each forest area is to be treated, and consequently pro- 'viding the degree of restriction necessary for the aim in view.

"Generalization is not, in my opinion, applicable at present, 'and moreover gives no clear idea of the real progress made. I 'have consequently abstained from even summarizing the provin- 'cial notes on the subject."

We now quote from this Chapter the remarks on the 'Improvement of the forests by the axe,' contenting ourselves by saying that we do not fully understand the views expressed. The recommendations for the *second class* of Improvement fellings seem to us rather dangerous. The great removal of inferior species might lead, especially in gregarious forests like those of Sál, to too great a clearance of everything but the principal species and to the destruction of that 'mixed crop' which we believe to be much better and more advantageous than a 'pure' one. And again, surely the cutting of old trees (not necessarily always 'useless') over advance growth is not so much an 'Improvement felling as a simple ordinary felling for the purpose of regeneration. In the case of the *first class*, we are rather puzzled about the exact meaning of the operation described. It seems to be something of the character of the Dún works with the improvement cuttings and cutting back operations combined.

"The necessity of improvement fellings, which, owing either 'to former misuse of the forests or to the particular demand on 'them for one or a few species only out of mixed forest growth, 'exists in the majority of our Indian forests, is now universally 'recognized; and steady progress is taking place in this respect. 'The introduction of working, plans, the compilation which neces- 'itates a sudy of the conditions of a forest area before proposals for 'its utilization can be propounded, has done away with the practice 'previously existing in many localities under the misnomer of '"selection fellings," *viz.*, of merely removing the best mature 'timber to the market. In most of the working-plans and of the 'preliminary proposals for systematic working which come before 'me for scrutiny, the final improvement of the forest area dealt 'with is fully provided for, and the plans are, so far, generally acted 'up to. No sacrifices of the capital value of the reserves in order 'to swell the present income are any longer permitted. It is of 'course self-evident that the course of forest improvement by means 'of improvement fellings is a long one, and is further impeded in 'many localities by a short demand for produce.

'The improvement fellings executed under working-plans 'may be divided into two main categories. The first deals with 'deteriorated forests, where it is desirable to cut misshapen and 'diseased trees—sometimes gnarled and bushlike—down to the

'stock, in order to encourage a healthy coppice growth to come 'up with the seedlings of the selected parent trees left standing on 'the ground. These cuttings vary in intensity, in accordance 'with local conditions, from gentle thinnings to fellings of a severe 'character, which may be described as cuttings for coppice with 'standards. The second main class deals with the removal of 'inferior species of trees round parent stems and over young 'growth of a better kind, or the cutting old useless trees, even of a 'better class, when shading their own offspring.

"As regards the removal of inferior species we are not so 'much tied down by the existence of a market; for in cases where 'the removal does not pay, the stems are simply girdled and killed. 'Still even this costs money and above all necessitates supervision 'which cannot always be given. The progress is, therefore, not so 'rapid as might otherwise be the case. The reasons prevent a 'more extensive thinning of young growth than is taking place. 'The question is, however, not lost sight of, nor is the removal of 'creepers and climbers which in some forests are pests of consider-'able importance. Attention to their removal has had, however, 'the most beneficial effect in many valuable forests; but it is 'beyond doubt that the attention must be constant, so it seems 'impossible to permanently eradicate the evil. Experience of late 'years has shown that greater attention to the weeding of young 'growth, especially in *taungyas* and other cultural operations, is 'more necessary than was at first supposed. More care has accord-'ingly been taken, and the results have more than repaid the 'outlay.

Chapter III treats of the Working and Outturn of the forests and from it we gather that the total results were as follows:—

	Rs.
Timber (cubic feet)	54,370,817
Fuel (do.)	106,764,800
Bamboos (No.)	152,297,266
Minor produce (Rs.)	35,00,487

Chapter IV summarizes the 'Financial results' of the year which gave a *gross* revenue of Rs. 163,44,340, divided as follows :—

	Rs.
Wood	123,78,880
Minor Produce	13,65,910
Grazing	18,02.970
Forests not managed by Government ...	3,85,690
Miscellaneous	4,10,890

The *net* revenue was Rs. 74,38,010 giving 46 per cent. of the *gross* revenue and Rs. 59 per square mile of area under management. The following table shews the figures for the Provinces.

Province.	Revenue. 1892-93.	Surplus. 1892-93.	Deficit. 1892-23.	Proportion of Surplus to Gross Revenue (1892-93).	Net Revenue per square mile of land under control Forest Department (1892-93.)
	Rs.	Rs.	Rs.	Per cent.	Rs.
Imperial	5,240	...	1,02,030	...	...
Bengal	7,44,880	3,63,270	...	49	28
North-Western Provinces and Oudh... ...	16,52,540	7,24,000	...	44	187
Punjab	8,12,630	1,56,360	...	19	26
Central Provinces ...	12,30,850	3,79,450	...	31	19
Burma (Lower) ..	35,83,370	22,20,020	...	62	383
Burma (Upper) ...	20,76,630	16,34,880	...	79	61
Assam	3,82,830	1,18,760	...	31	10
Coorg	1,80,680	1,07,590	...	60	120
Ajmere	14,890	...	110	...	...
Baluchistan... ...	19,030	...	36,590	...	...
Andamans	3,60,490	1,29,280	...	36	66
Forest School ...	1,980	...	48,420	...	...
Forest Surveys (Imperial)	520	...	21,640	...	...
Total ...	1,10,66,560	56,24,820	...	51	63
Berar	4,31,020	2,01,790	...	47	48
Forest Surveys (Berar)...	...	...	...	...	...
Total Bengal Presidency	1,14,97,580	58,26,610	...	50	62
Madras	15,77,210	2,46,820	...	16	14
Bombay	32,69,550	13,64,580	...	42	94
GRAND TOTAL ...	1,63,44,340	74,38,010	..	46	59

Chapter IV deals of Establishments, Education and other 'matters. In regard to the reoganization of the subordinate 'service, the Inspector-General says :—

"The subordinate service, however, especially the ranger class, 'is greatly under-manned in all provinces.

"It is evident that this condition of affairs hampers progess ; 'for it is the ranger class which forms and must form the mainstay 'of any sound forest administration. Every Local Government 'takes this view and has done so for years past, and the demands 'for an increase of the subordinate staff are both frequent and 'urgent. The Government of India have fully recognised that a 'thorough reorgnization of the staff, of Rangers, Foresters, and 'Forest Guards, is necessary for administrative as well as for financial 'reasons, and have recommended a considerable, though under the 'circumstances moderate, increase of subordinates of the subordinate

'staff in all its branches ; but, owing to the financial conditions of 'the country, the proposals have, for the time being, been negativ-'ed by the Home authorities. The steady growth of the forest 'administration in general importance and the constantly increas-'ing revenue, render, in my opinion, the increase advisable, and 'even imperative in consideration of the enormous capital repre-'sented by India's State forests which must suffer if the administra-'tive agency is not strengthened. The clerical staff also requires 'a considerable increase, but this is not of the same vital im-'portance."

"The necessity of the reorgnization, still under consideration, 'was first recognised in 1886."

Let us hope that these remarks may attract the attention of the India office authorities and induce them to withdraw their opposition to a measure which has so long been urgently wanted and which is an absolute necessity if a really efficient staff is to be secured for the lower appointments of the Department.

There is nothing of very great importance to be found in the section on experiments ; the chief point being the expectation that some of our chief timbers will soon be required for street-paving and other purposes in Europe. We are always urging the importance of developing the trade in 'Pynkado' and similar hardwood, for paving blocks, and hope that the Government of India will see its way to some really practical strong action toward this end.

On the subject of *Education* there are some remarkable paragraphs regarding the Coopers Hill College and the Dehra Dun Forest School which we reproduce in full as they are of such interest. We have several times discussed in our pages the mistake which is now made in discouraging a preliminary scientific training for the entrance to Coopers Hill and we are pleased to find our opinions endorsed by such high authority.

"The number of officers of the Indian Forest Service was 182, of which 110, or 60.4 per cent., had undergone special train-'ing in European forest schools. Owing to a change in the curric-'ulum of studies at the Coopers Hill College, under which the 'period of instruction was extended from two to three years, no 'recruits for the Forest Service arrived in India during the period 'under review. The prolongation of the technical course was ac-'companied by modifications in the system of instruction involved 'by the decision that the inclusion in the competitive tests for 'admission to the College of certain special subjects, not usually 'taught at the schools, injuriously affected both the number and the 'quality of candidates presenting themselves at the entrance 'examination. The preliminary tests have accordingly been re-'duced from 17 compulsory to 3 compulsory and 4 optional, the

'main object being "to secure a youth who has had a thoroughly 'well-grounded liberal education as an English gentleman." To 'this general standard there can be no objection, provided at the 'same time the youths selected are fitted by inclination, habits and 'physique for the very special service they are called upon to carry 'out in this country. The examination, however, admits young 'men who know nothing of the special subjects upon which the 'science of forestry is based and who, for a considerable portion of 'their time at Coopers Hill, have to be taught elementary botany, 'geology, chemistry and physics—subjects which they have not 'previously studied, and for which they may possess no special 'natural aptitude. While it is as yet too early to express a con-'fident opinion, there is some reason to think that the change in 'the entrance exmination is not conducive to the selection of the 'candidates best qualified, from the educational standpoint, for the 'Forest Service of this country. Moreover, careful selection of 'candidates will in future be all the more desirable in consequence 'of the impending reduction of the cadre of the Imperial Service 'following upon the creation of provincial forest services recruited 'in India. For some years to come the home recruitment is to be 'restricted to about 6, instead of about 10, officers annually. If 'the Imperial Service is to be maintained as a scientific *corps* '*d'élite*, it seems probable that candidates for entry must be required 'to prove their eligibility otherwise than by indicating their pro-'ficiency in the dead languages and by passing easy tests in the 'only obligatory subjects, English composition, lower mathematics 'and German.

"While, however, the acquisition at Coopers Hill College of a 'good groundwork of forest knowledge, based on scientific prin-'ciples applied in the highly organized forests of Germany and 'France, is essential, the knowledge so gained must be adapted to 'the varying requirements of India in a wider and more liberal 'spirit than is necessary or desirable in the long-established forest 'administrations of the West. Forest officers, after some years of 'practical work in India, are in a position to assimilate, as it were, 'such branches of continental practice as are more immediately ap-'plicable in the provinces where they are employed. It is therefore 'very satisfactory that Government has recently sanctioned the 'grant of facilities by which selected officers, who have done good 'work in this couutry, can renew, while on furlough in Europe 'their forest studies. The concession has already been freely made 'use of with, as I a am in a position to say, fruitful results.

"The Imperial Forest School at Dehra Dun was attended 'during the year by 102 students, of whom 70 were already in 'Government service, or were afforded assistance by Government, 'while 10 were deputed by Native States and 22 were private 'students. At the final examinations, held in March 1893, 34

'students were awarded certificates by the higher standard, while 'four passed the forester's examination. The total expenditure, 'during the fifteen months ending 30th June, 1893, amounted to 'Rs. 64,227 as against Rs. 44,337 in the preceding financial year.

"The School was successfully administered during the year 'and the staff of officers deserve commendation for their continued 'efforts to secure the acquisition by the students of practical 'knowledge and the failure of "cramming" propensities. The 'final examinations were conducted under the supervision of the 'School Board of Visitors, which drew up rules for the Institution 'and for the admission of students. An important feature of these 'rules, which have since been approved by Government, is that 'candidates should ordinarily be admitted as private students, and 'that the best men would *cæteris paribus* secure appointments 'under Government only on their successfully passing out of the 'School. The School is now utilized by Ceylon and by every local 'administration in India except the Government of Bombay, from 'which province, however, students come to the School in their 'private capacity and without any official support.

"If the reorganisation of the Ranger's class is further delay-'ed, it will become necessary to consider whether a reduction in 'the number of students at Dehra is not advisable. as the present 'sanctioned scale of appointments does not provide employment 'for the numbers now educated."

We will wind up our extracts with the following table showing the Sea-borne exports of forest produce from India to foreign countries during 1892-93.

Articles.	Quantity in tons of 20 cwt; in the case of Teak, cubic tons.	Valuation at port of shipment in 1892-93.	
		Total.	Per ton.
		Rs.	Rs.
Caoutchouc	499	13,07,819	2,621
Shell-lac	5,103	64,38,513	1,261
Lac-dye	12	..	841
Sandalwood, ebony and other ornamental woods.	Information not available.	10,090	...
		6,92,585	...
		...	...
Cutch and Gambier...	11,466	38,24,840	334
Myrabolams	33,377	33,67,093	100
Teak	58,350	57,01,024	98
Cardamoms	136	2,96,969	2,184
Total in 1892-93	...	2,16,38,933	...

Annual Forest Administration Report on the Andamans for 1892-93.

This Report shews that Government did well to start Forest work in the Andamans, for the financial results of the year shew

		Rs.
Receipts	...	... 3,60,486
Expenditure	...	... 2,31,206
Surplus	...	... 1,29,280

the average surplus of the last six years having been Rs. 77,164 which is an excellent result for so few years of work. The Government of India confidently expect a considerable increase in the future and better prices for 'padauk' in the London market.

The gradual extension of the use of 'padauk' wood in Europe and America is a noteworthy matter, and to this we have referred in another part of this number; still, the Government of India say—"there appears to be grounds for thinking that the exceptional 'qualities of padauk timber have not been sufficiently made known 'in the timber-trade, as has been done in the case of the Australian 'hardwoods, jarrah and karri; and that large and better sales may 'be secured by advertising the timber more extensively in Europe 'and America."

The prices obtained in London for the padauk squares shipped in the 'Safar' and 'Undine,' were £9-7-6 per ton for the former and £7-14-2 for the latter consignment. The 'Undine' wood was admittedly inferior. In Calcutta padouk squares fetched Rs. 60 and in Madras Rs. 75 per ton. Some 'lakúch' wood (*Artocarpus Lakoocha*) sold in Madras, fetched Rs. 59 per ton. 'Thitmin' wood (*Podocarpus bracteata*) sent for sale to London only realized 6d. per cubic foot, which is a pity as thitmin is a fine timber not unlike the New Zealand 'Kauri.'

The following extract describes the valuation surveys made during the year:—

"These surveys ware carried out during the year on the north 'side of the harbour, as being more convenient. It if had not 'been for the late cyclone, more work would have been done, and 'things generally would have proceeded more rapidly.

'There is one thing noticeable, that so far as the valuation 'surveys have gone, padauk (*Pterocarpus indicus*) has been found 'in the valleys' and rarely or ever is to be found growing at an 'elevation of over 300 feet. In former years the valuation surveys,

'owing to the cyclone, were made along dragging paths; but it 'was thought wise to try and avoid this system this year, as 'dragging paths are purposely kept as much as possible on the 'low and level lands, to save the elephants, and this is where 'padauk (*Pterocarpus indicus*) is generally found. The result 'therefore of the average of these valuation surveys would be far 'too high to be taken as representative of the forest as a whole.

'It was therefore decided to run all the valuation surveys due 'east and west as by so doing a fair proportion of hill and valley, re-'presentative of the country as a whole, would be taken in. For 'this purpose points were marked off on the Goplakabung road, 'and on the one side the lines were run due east to the sea, and on 'the other side due west for two or three miles; and besides these 'lines three short lines were run north and south."

The result of these surveys are summarized as follows, per Square mile.

Trees 30 in. and over in diameter ...	... 289
„ 24 „ „ „ ...	... 57
„ 18 „ „ „ ...	... 30
„ 12 „ „ „ ...	... 17
Poles	... 6

or per acre 0·54 trees over 2 ft. in diameter, as against 0·84 trees found in the previous year when the survey was more confined to lower and richer localities.

The artificial reproduction of padauk is being proceeded with, as is the planting of teak and mahogany. The planting is in lines, 100 feet apart, 6 feet in the lines, alternately teak and padauk, and the results have been very satisfactory, especially with teak. Teak plants 1 year old reach from 8 to 12 feet high and padauk of similar age from 5 to 8 feet.

Some of our readers may be interested in the following list of the chief timbertrees which it is usual to fell.

Padouk	Pterocarpus indicus
Pyimma	Lagerströmia hypoleuca
Gangow	Mesua ferrea
Koko	Albizzia Lebbek
Thitmin	Podocarpus bracteata
Chunnu	Croton argyratus
Toungpeing-ngè	Artocarpus Chaplasha
Thingan	Hopea odorata

The Andamans forests during 1892-93 were under the charge, *first* of Mr. E. G. Chester, *afterwards* of Mr. Dingwall Fordyce, both assisted by Mr. E. M. Buchanan. All these officers are duly commended by Government.

V.—SHIKAR AND TRAVEL.

Elephant-capturing Operations on the Anaimalai Hills.

Elephant-capturing operations by the pit-fall systems were set in working order in the locality of the forest station at Mount Stuart on the Anaimalai Hills by Mr. H. J. Porter, Deputy Conservator of Forests in the season of 1890. For the past five years, therefore, during each of the working seasons which commence in June and end in December elephant captures have been attempted and it may interest some readers of the *Indian Forester* to know the results of the operations and the experience gained. Places were selected in the known runs of the elephants and the pits were dug in groups of three 

To commence with, about 21 pits were dug in different parts, all, however, being within a two-mile radius of the Mount Stuart Forest station. Since 1890, some 20 pits more have been dug out. The dimensions of the original pits were 12 ft. × 9 ft. with a depth of 10 ft. These are too large and a pit 10 ft. × 10 ft. × 10 ft. is amply big enough. The sides of the pits were made vertical and not sloping downwards as are the pits in Malabar, under Mr. Hadfield; and some two or three feet of brushwood were placed in the bottom of each to act as bedding to break the fall of the animal. The pits were then covered by means of bamboos placed across them and on these were spread grass, leaves, etc. The pits are visited every morning by a Forest guard or watcher deputed for the purpose, and these report to their superior officers whenever a fall takes place. The Range officer in charge or the D.F.O. himself should, however, inspect the pits as often as possible and at least once in a week, to see that the guard and watcher are not humbugging. During the first year, one animal, to which the name of Juno was given, was captured. This subsequently died. In the second year, 1891, four animals were captured, two of which subsequently died and two of which are now living. In the third year, 1892, two extraordinary falls took place by which *seven* animals were captured in *five* pits. I reported this to the *Indian Forester* at the time of capture, 1st September 1892. Out of these seven animals, four are

still living. During 1893 two animals were captured and during the present year, 1894, four animals have been caught, all of which are living. I append the following statement giving the names, sex, and height of the animals captured and whether living or not :—

List of Elephants captured up to September 30th, 1894.

Serial number.	Name of Elephant.	Date of capture.	Male or female.	Height.	Remarks.
1	Juno	1890-91	Cow	...	Died (exact date of capture and death not known).
2	Maude	23rd July 1891.	Cow	4½′	Sold on 20th July 1892 for Rs. 300.
3	Ada	24th July 1891.	Cow	5′	Died on 14th February, 1892.
4	Abdul	4th Oct. 1891.	Tusker	6½′	Still living.
5	Elsie	23rd Spt. 1892.	Cow	5½′	Died in June, 1893.
6	Alice	do.	do.	4½	Transferred to S. Malabar in December, 1893.
7	Ranger	do.	Male	4½	Died in June, 1893.
8	Cerise	do.	Cow	7½′	Died on 1st October, 1892 from an injury sustained in the face.
9	Phyllis II.	25th Sept. 1892.	Cow	7′	Still living } these two were captured in the same pit at the same time as were Ranger and Cerise.
10	Jumbo II.	do.	Tusker	6′	do. }
11	Pragasam	do.	Cow	4½′	Transferred to S. Malabar, December 1893.
12	Ranger	23rd July 1893.	Tusker	7½′	Still living.
13	Cerise	20th Oct. 1893.	Cow	5′	do.
14	Forester	10th Aug. 1894.	Tusker	7½′	do.
15	Elsie	18th Aug. 1894.	Cow	8′	do.
15	Penelope	18th Aug. 1894.	Cow	8′	do.
17	Ganesh	4th Sept. 1894.	Male	4½′	do.

It will be seen from the above statement that out of a total of 17 captures, 12 are now living. It may be remarked moreover that the casualties took place amongst the first three years' captures when the attendants, who are local hillmen, called Mulcers,

were entirely inexperienced concerning elephants. During the last two years, I have increased the bed of brushwood considerably and made it a rule to have the bed reach to within 4 feet of the top of the pit. The results speak for themselves: not a single animal has since been injured in the face, although two of the latest captures are the largest animals caught since operations were commenced.

The removal of a capture to the kraals, which are within two or three miles from the pits, is a very simple matter, provided everything is in readiness beforehand. The size of the animal's neck is estimated and a peg is put in the rope so as to prevent the noose going smaller than the neck-size as estimated. This noose is then thrown over the elephant's neck and pulled tight to the peg, the end of the rope being bound round a neighbouring tree; next, one of the elephant's hind legs is noosed and the end of this rope, too, is for the time being, bound round a neighbouring tree. The neck rope at the peg then has to be tied with twine or fibre to prevent the noose being loosened by the elephant. This operation is, taking it all round, the most risky one connected with the capture. But if proper care is taken there is nothing to fear.

The pit is then filled up by means of billets of wood being thrown in, and as the animal rises nearer the surface of the ground, the two ropes fastening him are pulled tighter around the trees. Eventually he gets out of the pit somewhat fatigued; the ropes which secure him are then fastened to two tame elephants and the animals are marched in single file (the captured one being of course in the middle) to the kraal and all the ropes are removed. He is watered three times a day and soon made tame by kindness, given sugarcane, etc. Somewhat large animals are generally in the kraal 3 months before they can be taken out; the little ones of 4 ft. or 5½ feet high, however, I have removed within 3 weeks of capture.

The work of capturing elephants is an exceedingly interesting one, and only needs care and constant supervision to render it successful; and certainly the more one has to do with these animals the one more is bound to recognise what intelligent, useful beasts they are. Having left the south Coimbatore District, I regret much that for some time, at least, I shall have no connection with this kind of work entrusted to Forest officers.

PALAMCOTTAH,
Tinnevelly Division.

H. B. BRYANT.

Tiger shooting in the Saharanpur Siwaliks.

The following extract is from the 'Pioneer' of January 8th. Enquiries from the officer who shot the tigers shew that the place where they were shot was Gular Sot, about 2½ miles north of Dholkhand. He says that he took the cub to be a small leopard and did not find out the truth until it was dead; and that a Forest Guard who was with him behaved very well. Five tigers have lately been accounted for in the Dún and Saharanpur, including these, the one shot by the Lieutenant-Governor near Kansrau and another near Khara by the Ex-Amir of Cabul. They seem to have been on the increase in numbers lately.

"A Forest Officer had rather an exciting adventure in the 'Siwaliks a few days ago while stalking for deer. He had seen a 'sambhur stag on the opposite slope of the "khud," and leaving 'one of his men to direct him he crossed over and had hardly begun 'stalking in the direction pointed out when he came suddenly on a 'tiger cub about fifteen yards above him. He tried to get round 'and above the beast, but it kept following along, growling and 'snarling, until the suspense becoming too great, the sportsman 'fired and killed it with two shots. He had hardly time to reload 'before the tigress was seen prowling along a little way down the 'slope, and it fell dead to the first shot. The animal, which was a 'very fine one, was evidently looking for its cub, and it is fortu-'nate that she was spotted in time and killed outright, or the affair 'might have ended otherwise."

VI.—EXTRACTS, NOTES AND QUERIES.

Deforestation in Russia.

The following article appeared in a recent number of the *Literary Digest*. It was translated from the *Preussiche Jahrbucher* for July."

'When treating of the Russian famine of 1891-92 in the April 'Number of the Magazine, we remarked that this was not to be re-'garded as a passing incident, but rather as the inauguration of a 'chronic condition of affairs, traceable to unsystematic farming, to 'the general withdrawal of capital from the land for investment in 'manufacturing enterprise, under the ægis of a protective tariff, 'and to the general deforestation of the country, in great part to

'provide fuel for railroads and protected enterprises. The fatal 'consequences of this general deforestation are now generally ap- 'preciated, the shrunken state of the once noble rivers of the coun- 'try, and growing aridity of the climate, affording evidence that 'can neither be overlooked or gainsaid."—

'The regions of the mighty rivers, the Don, the Volga, and the 'Dnieper, the great arteries of Russia, were formerly fringed with 'wide-speading forests along their whole upper and middle cour- 'ses, which sheltered their sources and tributaries from evapora- 'tion throughout the year. These forests have now for the most 'part disappeared.—Mile after mile the traveller sees nothing but 'low scrub and melancholy stumps in unbroken succession; the 'Mother "Volga" grows yearly shallower; the steamers find scarce- 'ly seven or eight feet of water in mid stream, and the ferries 'pursue their snake-like course from bank to bank in search of the 'ever-shifting channel. The Don, with its tributaries, is choked; 'the sources of the Dnieper creep downward and its chief tributary, 'the once noble Worskla, with a flow of some 220 English miles, 'is now dry from source to mouth.

'The city of Poltawa lies on its banks, and it was at its mouth 'that the Swedish Army surrendered to Peter the Great.—This 'stream, which fertilized a broad region, supporting a numerous 'population, exits no more—not temporarily run dry but with all 'its springs exhausted, so that in future it may be stricken from the 'map. Of the Bitjug, another river in the Don region the upper 'course has wholly disappeared—valley and bed are filed to the 'bank with sand and earth. As if by magic, wide fertie lands are 'buried under the sands, and whole villages desolated. "There 'has been," says Wiestnik Jewropy, "an unparalelled revolution 'of natural conditions, which threatens a great part of the country 'with the heat and aridity of the Central Asian steppes. The pre- 'sent condition of our black earth region is so sereious and its 'future so dangerous, that it cannot possibly escape the serious 'attention of the Government, the scientist and the husbndman, 'to whom the further development of the situation is perhaps a 'question of life and death."

'There is perfect unanimity in attributing the threatening cat- 'astrophe to the denudation of the forests. Innumerable factories 'sprang into existence, and, in the absence of any systematic pro- 'vision for coal supply, they were erected in the heart of the forest, 'and after having consumed all the available fuel within easy 'distance, their plant was actually sometimes transferred to fresh 'fields. Thus originated the system of wholesale destruction, 'which was liberally furthered by the network of railways built to 'maintain their communication with the great marts of commerce 'and provide generally for the transport of produce.—For the past 'forty years thousands of locomotives and factories have been 'almost wholly run with wood without a thought being given to

'any provision for reproduction. The extension of the railways 'afforded an opportunity for extracting colossal fortunes 'from the 'worthless' forests. These were the manufacturers' views also; so 'the fate of the Russian forests was sealed. The machines have 'devoured the wood.'—

'The recently passed law for the protection of the forests has 'come fifteen, twenty or twenty-five years too late to avert the 'destruction of the agricultural region.'

'And the Government and people of Russia had already been 'warned.—Forty two years ago—that is, shortly after the famine of '1847-49—we find the following in a letter from the Charkowski 'Government to the Imperial Society of Economics. There are 'now living people who rememeber when the present limitless 'expanse of sand-waste along the banks of the Donez was covered 'with almost impenetrable forest, interspersed with lakes, which 'have since dried up, or are fast drying up. Our region is flat, 'deforested and exposed to all winds. The fatal east wind finds 'no impediment, and brings ruin in its train.—This wind will 'perhaps at no distant date prove fatal.—The Grecian colonies 'went under probably from the same cause. Protect the forest; 'so plant forests, protect them with rigorous laws. The Volga and Don and all the rivers of southern Russia will be silted up 'and disappear unless the forest be protected.'

'More fatal even than the drying up of the streams is the 'cessation of the spring and summer rains. This is the immediate 'cause of last year's harvest failure, and on it even depends the 'current year's harvest. There have been local rains, but not 'nearly enough.'—

'This reversal of old conditions has been coming on gradually 'with the denudation of the forests; and emphatic warnings, as we 'have seen, have been uttered. The only result has been the 'appointment of commissions which have done nothing. Remedial 'measures on a large scale are now contemplated. Are they too 'late? (*Papers and Reports upon Forestry*).

African Bamboo.

One of the most useful vegetable products in the British Central Africa country is the bamboo, of which there are at least two species, one only found on the very high mountains, and of quite a dwarf variety, of no account in commerce; the other also growing on the mountains, but at a lower level, being almost, if not quite, identical with the common Indian species, though it is found in the two forms known as the "male" and "female" bamboo. That these two terms indicate any real difference of sex Mr. Johnston scarcely thinks. In his report on the administration he adds:—I

am not aware, at the time of writing, whether the bamboo is monœcious or dicœcious. As is well known, it very rarely, if ever, flowers and seeds, but propagates itself by offshoots. The stems of the male bamboo are of smaller girth, and are practically solid throughout. The female bamboo, which is much sought after, is of very large girth, perhaps 3 in. to 4 in., and is hollow, so that it is very useful for making rough water pipes. Strange to say, the natives of Africa make absolutely no use of the bamboo in the hundred ways in which it is employed by the natives of Eastern Asia. They only use it for building purposes, either employing the whole bamboo as a rafter, or splitting it to make into laths. The bamboo is scarcely ever met with below 3,000 ft. in altitude, and the large species does not grow much above 5,000 ft.; but, inasmuch as such a large proportion of the land in British Central Africa lies between those two altitudes, it may be said that the bamboo is distributed with fair abundance throughout this territory—a very fortunate thing, as it is extraordinarily useful.—(*Timber Trades Journal.*)

Forest Preservation in Sweden.

The Scandinavians, and more especially the Swedes, are waking up to the fact that their forests are exhaustible, and now recognise the importance of forthwith taking precautionary measures to check the demolition that for some years has been going on almost unheeded. The theory was thrust upon them in a practical manner when, following upon a period of nearly thirty years of cheap purchase of raw material, the time came when available forests became almost unobtainable from the farmers, and sawmill owners had either to purchase forests and farms at high prices or rely upon the State supplies that were fast growing too costly. Gradually the cry became more pronounced, and now within the last year the shippers themselves, recognizing the serious state of affairs, have discussed the best means of setting things right. It is obvious that farming in a district so hard to cultivate as Norrland is not congenial to the Swedish shippers, but they have, as we have lately seen in the instance of the Wifstawarf purchases, acquired large tracts of land which will have to be cultivated, and this is done by leasing the land to peasant farmers. It is, however, recognised that this is by no means an ideal mode of agriculture, and hence the endeavours on the part of national economists to bring about a change. There is a strong feeling that the ownership of land and forest should be separate, and differently taxed; but

again the difficulty arises that certain timber is required for every-day use on the farm, and it is difficult to draw the distinct line between the two.

It has been suggested that a strict dimension law should be enacted, limiting tree-felling to timber that has attained certain dimensions. The logs have much reduced in size within the last few years. The time was when 9 in. timber was a very moderate log, now it is considered quite a decent size, and if a limit is instituted at all it will be on a much lower basis. In neighbouring countries, 5 and even 4½ in. logs are cut, and the quantity of the favourite 2×4 scantlings are usually sawn out of 6 in. logs. In Norrland, however, such small logs as these are not used. It has been proposed to place the limit at 21 centimetres at a height of 1·5 metres from the root, which would mean about 8 in. top. It is, however, probable that the meeting which was specially arranged at Stockholm will hardly have seen its way to agree to this, and that a somewhat smaller minimum size will have been established.

Since writing the above we have received the following telegram from our Stockholm correspondent:—"The meeting held here to-day (Nov. 20) resolved by a majority of eleven votes to six to endeavour to carry a measure through the Riksdagen, prohibiting cutting of all trees below 8¼ in. diameter at a height of 5 ft. from root, under bark, this having reference to forests in Westernorrland and Jemtland." It will be seen that the limit is below what was proposed, and will practically mean logs of 7 in. top at the usual height up. There is every probability of the law passing, being backed up by the shippers. It will be a severe restriction, and likely to go a long way towards checking the heedless demolition of forest.

VII.—TIMBER & PRODUCE TRADE.

Churchill and Sim's Circular.

December 5th, 1894.

EAST INDIA TEAK—The deliveries from the Docks for the first eleven months of the year are 10,071 loads as compared with 11,736 loads in the same months of 1893; while November, taken above, strikes a welcome note of improvement with 759 loads delivered this year against 460 loads in November 1893. Apart from this there has been little movement, prices remaining about stationary, both here and for floating cargoes, only a limited number of the latter being immediately available for possible demand.

ROSEWOOD.—Is not often asked for.

SATINWOOD.—Is quiet, only finely-figured logs being asked for.

EBONY.—Really good logs, in small parcels, would sell well.

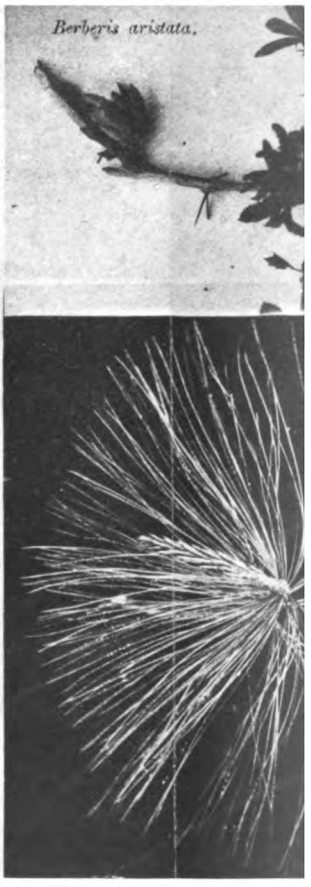
PRICE CURRENT.

Indian Teak	per load	£10s.	to £16
Satinwood	per foot superficial	6d.	to 12d.
Rosewood	„ ton	£5.	to £8.
Ebony	„	£6.	to £8

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, February, 1894.

Cardamoms	per lb.	2s.	to 2s. 6d.
Croton seeds	per cwt.	20s.	to 27s. 6d.
Cutch	„	20s.	to 32s.
Gum Arabic, Madras	„	15s.	to 30s.
Gum Kino	„	£15	to £18
India Rubber, Assam,	per lb.	1s. 7d.	to 2s.
„ Burma	„	1s. 7d.	to 2s.
Myrabolams, Bombay,	per cwt.	7s. 3d.	to 9s. 3d.
„ Jubbulpore	„	6s. 3d.	to 7s.
„ Godavari	„	6s.	to 6s. 9d,
Nux Vomica, good	„	6s.	to 10s.
Oil, Lemon Grass,	per lb,	1¾d.	
Orchella, Ceylon	per ton	15s.	to 22s.
Redwood	„	£3. 10s	to £4
„	„	£3	to £4
Sandalwood, logs	„	£35	to £55
„ chips	„	£9	to £30
Seed lac	„	30s.	to 90s.
Tamarinds	„	6s.	to 12s. 6d.



The Calcutta Phototype Co.

FROM PHOTOGRAPHS TAKEN BY C. G. ROGERS, ESQ., DEPUTY CONSERVATOR OF FORESTS, IN JAU

I mentioned in the "Traitement des Bois" in 1881 and recommended high forests of oak to be worked by removing one tree in

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INDIAN FORESTER.

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The Reproduction of High Forest.

(By M. Ch. Broillard in the Revue des Eaux et Forêts.)

In reply to numerous questions which have been put to me regarding regeneration fellings by area in High Forest, I think I cannot do better than give the history of the method. It was in seeking the best method of obtaining the reproduction of forests by seed that I became convinced of the necessity of fixing high-forest fellings by area and not by volume. It is therefore from a cultural point of view that I have been led to advocate fellings by area and I venture to presume that there are few foresters who are satisfied with the cultural results of fellings by volume.

The idea of the regular return over the same area of the regeneration felling first struck me in the Forêt de Haye. This forest had to be worked by the uniform system in eight working circles containing 10,500 acres. Having to organize these fellings from the year 1863 under MM. Parade and Nanquette, work with whom was always a pleasure, I sought first for the best disposition to give to the seed fellings which were regulated by area; it was the first working plan in which this was the case. The species in this forest are oak and beech with hornbeam (abundant) maple and others. At first we were extremely cautious, feeling our way gradually by successive trial. Work was carried out annually at several different places and as the years with their changes succeeded each other, we were able to compare the different results. Finally, the seedlings of the different species, more or less favourably mixed, established themselves everywhere. At the end of ten years, after a suitable felling repeated after five years, the regeneration was an accomplished fact. I was even able to formulate the idea that in returning every five years, it was possible to dispense with an examination of the soil to ascertain the condition of the young crop, this being in Haye everywhere complete ten years after the seed felling.

From this to regularly ordered fellings was but a step. These I mentioned in the "Traitement des Bois" in 1881 and recommended high forests of oak to be worked by removing one tree in

four every five years. The idea was not sufficiently developed and escaped notice and fellings by area were not clearly defined. From 1881 to 1892 in the Saone-et-Loire, the Ain and on the Jura even, I had again ample opportunity for observation in the fellings which were carried out or were in course of execution in high forests of oak, hornbeam, beech and silver fir. For one thing, I found that in fir forests no felling can extend to one third of the volume without endangering the forest. This was one important step.

In the Côte-d'Or we succeeded in putting into most perfect order the operations to be carried out in the forest of Citeaux, thanks to the fellings by area in the first period—localities divided into 30 equal portions. In following closely the marking of the trees, I was able to note that the removal of one oak in four, one beech in three, and one hornbeam in two, always gave a good result in any one of the successive regeneration fellings.

Finally, having found in this region several coppices being worked with a view to their conversion into high forest, I was able to formulate clearly the order of the successive regeneration fellings all of them by area (See *Revue des Eaux et Forêts*, 10th June, 1890). I was supported in this system by two friends who sought, as I did, order and good cultural results. Previous to this, several endeavours had been made to simplify high forest working plans but without result. This time, if I am not mistaken, the solution of the difficulty is attained. Based on the area, in high forest as well as in coppice, the fellings allow a regular order and a return at fixed intervals, which, if the volume be taken as the basis of the possibility, it is impossible to arrange.

I have been told that I am wrong about one oak in four and one beech in three, and that it is rather one beech in four and one oak in three which ought to be cut.

The beech has much denser foliage than the oak and the young seedlings are very sensitive to drought and frost. Nevertheless if from a crop where the canopy is complete only one beech in four is removed, sufficient light is not given to the soil for vegetation to establish itself, the soil remains covered with the dry beech leaves, and any young seedlings which may appear, die off at once. In fact by the growth and spreading of the crown, the beech fills up in two or three years any gaps made by such a light felling. It is at least one in three, and that generally the biggest of the three, which should be removed to give the light necessary to begin with and for the young seedlings afterwards in any subsequent regeneration felling.

From the objection referred to above, I am led to conclude that seed fellings are often carried out too timidly in beech forests and still more so when oak happens to be mixed with the beech. For the benefit of the beech and still more for the benefit of the oak, it is at least one beech in three, and generally the biggest of the three, which should be cut in any of the regeneration fellings.

The next question is, whether the removal of one oak in four, choosing the feeblest and least promising, is equally well justified. Does this give enough light for a young seedling of such a robust and light-demanding species to establish itself and develop ? There is no doubt that it does. Examination will show that in high forests of oak the most reliable seedling and the one which will force its way through the undergrowth which appears after a felling, is the one which had already established itself before the cover was opened. And it does not require many of these to constitute later on a favourable crop of saplings, it is even preferable that they should be scattered through such a crop but pushing their way through it and predominating over the others around them. In removing one oak in four, and generally the least favourable in each of the successive regeneration fellings, one secures gradually the establishment, maintenance and development of those excellent oak saplings among the undergrowth which increases but slowly before the invasion of such species as the birch, poplar and hornbeam and without even the beech being able to smother them, owing to the cover which hinders its rapid growth. In short, the removal of one oak in four will be sufficient to secure the reproduction of the oak, while at the same time, it keeps down the undergrowth and inferior species.

Finally, in the case of a forest in which oak and beech are mixed, whether the one or the other species be more abundant, it will always answer well as regards the reproduction of the two species, to cut out every five or six years one beech in three and one oak in four, whereas removing one oak in three and one beech in four would inevitably finally result in a pure forest of beech. The seed of the oak is much heavier than that of the beech and it is only natural that in order to obtain the reproduction of the former, it should not be thinned so heavily.

The above arguments, which I do not pretend are either complete or perfect, might be repeated for every species without affecting the main fact. Experiments can easily be made to test the truth of these statements. In any high forest or coppice undergoing conversion, a certain area can be set aside in which the different fellings can be ordered so as to remove the required proportion of the different species, whereas in the neighbouring forest, the old defective method may be adhered to. It will take ten years to fully obtain the required results from the time the fellings are made, but conclusions may be drawn by comparing the two methods. Coupes regulated by volume do not prevent these experiments being made, they only hinder the periodical return of the fellings over the same area.

(To be continued.)

A. F. G.

The Rain Tree for Avenues.

In the Tindivanam Taluk of South Arcot District, the rain-tree (*Pithecolobium Saman*) has been planted over short distances along some of the public roads, for instance, on the Tindivanam-Salavadi branch road, Tindivanam-Merkanam main road, &c. This tree is said to have been first introduced into the Taluk some 10 years ago by Mr. Weld, then Sub-Collector of South Arcot, who has left permanent marks of his love for arboriculture, in the various topes planted during his time in the neighbourhood of Tindivanam. The rain-trees on the Tindivanam-Salavadi road appear to have been planted 10 years ago, and some of them have already attained a girth of 5 feet and a height of about 35 feet, thus shewing the remarkable rapidity with which this species grows. The crowns of the trees on both sides of the road have already formed a complete leaf-canopy by the meeting and interlacing of their lateral branches. The road is formed by an embankment, on the slopes of which the trees are planted. On both sides of the road, water collects during the rainy season and remains for about 4 months in the year. During the remaining 8 months of the year the trees do not suffer for want of water which is within easy reach of their roots, being hardly 5 feet below the ground-level. Elsewhere, too, I have observed the rain-tree growing vigorously on the bunds of tanks, ponds, wells, &c, and it may therefore be concluded that it is a lover of moist but well drained localities.

In order to ascertain the area shaded by the crown of a well-grown rain-tree I took some measurements in the belt of rain trees (believed to be 10 years old) planted between the tenth and eleventh mile on the Merkanam-Tindivanam road at about 1. P.M. The average result of 3 separate measurements of different rain-trees showed that the vertical shade of a tree extended to a radius of about 20 feet all round its base. At the same place where the leaf-canopy was more or less complete, I found that the distance across the road from the foot of one tree to that of another was 12 yards, and on the same side of the road the trees stood the same distance apart. Their girths varied from 4 to 5 feet.

Judging from the short lengths over which the rain-tree has been planted along the roads in this Taluk, I am led to think it was originally undertaken as an experiment to test its suitability and adaptability for avenues. If my surmise is correct, then I may say that the result of the experiment is a great success and claims for the rain-tree much more attention than it has hitherto received as an avenue tree.

From what I have seen in a small nursery of young plants of this tree, I believe that it is very easy to raise them from seed. I have seen large seedlings of 4 to 6 feet in height transplanted from the nursery with perfect success. Apart from these advantages, its peculiar system of more or less verticillate branching,

generally at a height of 8 or 10 feet, the branches radiating in all directions and forming a broad angle with the trunk of the tree coupled with its remarkable rapidity of growth is its greatest recommendation where shade is the desired object of tree planting.

Moreover, it is a well known fact that its pods are most eagerly devoured by cattle on account of their sweet pulp, and I am not sure that cattle do not make a welcome feast of its leaves, too, in times of scarcity of fodder. As manure for wet paddy fields, I think its leaves are as valuable as those of any other kind of tree resorted to by the ryots for the purpose.

I am glad to note that the Local Fund Department is endeavouring to extend the planting of the rain-tree for avenues on some of its roads. On the Tindivanam-Tiruvannamalai road a large number of its seedlings were planted last year between Tivanur and Vallam. The plants are looking vigorous and healthy and some of them have shot up to considerable heights. I hope its planting will be extended to all 'other unsheltered roads in the District.

M. R.

Flowering of Strobilanthes in Burma.

From time to time I have seen short paragraphs stating that Forest Officers have noticed in places the periodical flowering of different species of Strobilanthes. It may interest readers of the *Forester* to hear of the protective effect from fire, exerted by an extensive flowering of a species of Strobilanthes in the Upper Chindwin.

Any one who has once seen the huge jungle fires which rage unchecked through vast tracts of forest, may imagine the damage which is done by one when it passes through a teak forest, especially if it occurs late in the dry weather, after the first showers which always fall in this Division in April, when most of the teak seed has fallen and germination has commenced.

On the hill range running parallel to the western bank of the Chindwin are some of the finest teak forests in Burma, consisting of teak mixed with other species and 'tinwa' bamboos (*Cephalostachyum pergracile*). The forests are open ones, for Burma, and favour the growth of coarse grasses, these together with fallen leaves when dry give an ideal fuel for fires, and yearly about 60 per cent of the whole tract is burnt over, the fires always starting from the carelessness of travellers in throwing lighted cheroots into the grass, or leaving their camp-fires alight. During the months of March, April, and part of May, my work took me to these forests and I at once noticed the huge masses of a blue-flowering herb varying in height from 3 feet in dry and open ground, to 6 feet in shady and moister localities. From a spectacular point of view the sight was magnificent; it seemed as if a green carpet with masses of blue as a pattern had been spread

over the forest and I was delighted to get a change from the dull drab colouring of the dry weather, but as I had to walk all day long through this jungle, my spirit soon revolted and I was no longer an aesthetic. The physical difficulty of forcing one's way through this dense mass of jungle with the sun pouring on me was considerable, add to this immense numbers of honey-bees attracted by the flowers, who strongly resented in a painful way being disturbed ; also the strong smell of the flower and the pungent essence of the plant, which penetrated everywhere, into ones mouth and eyes, making the latter smart and giving the former a bitter thirsty feeling, which was difficult to get rid of, made me soon wish the plant had taken to flowering in some other division. The Shans told me that this plant was called "Moyan" and flowered once in 6 years, which coincided with their festival to the bee nats (spirits) ; they seemed to think that the festival was the cause of the flowering and told me a long and interesting folk-story of the doings of the spirits which this festival commemorates.

On examining the plant, I found it was a species of Strobilanthes but could not find it in "Kurz;" however, through the kindness of Mr. Gamble it has since been identified as *Strobilanthes rufescens*.

Early in April the plant seeded and all that remained was an immense mass of dry stems standing close together wherever one chose to go. As last year the seeding of the teak in these forests had been very good I was very much put out, as I thought at once that not one of the seedlings would survive the particularly fierce fires which were sure to sweep this year through the forests, but as April wore into May and what fires that did occur were uncommonly feeble and spread over small areas, this was noticed by me and also that the fires this year, instead of as usual raging several feet high over large tracts, were confined to small flames licking along the surface of the ground and soon dying out. I was puzzled and set about trying to account for this. I then noticed that the dry stems of the "Moyan" did not burn readily, as in places where these low fires had gone through the jungle the dead stems of the "Moyan" were still standing, only slightly charred and the fire had not spread, whereas on the hill tops crowned with Engdaing in which "Moyan" did not grow, the fires had raged with their usual fierceness. I can only account for the fact in this way, that the dense growth of the "Moyan" checked the growth of grasses and that the dry stems standing with slight intervals between them were nothing like such good fuel as dense masses of dry grass and weeds. I also throught, however, with what truth I cannot say, that the essential oil of the "Moyan" which gives it its peculiar and disagreeable odour, was not inflammable. It is also to be noted that birds did not seem to be attracted by the extensive seeding, only bees were, so that this flowering has had a very marked effect on the wax revenue of this division.

C. W. A. B.

II.—CORRESPONDENCE.

Commutation of Rights.

DEAR MR. EDITOR,

I have read with much interest Mr. G. A. Hight's Report on Forest Administration in Germany, which was circulated with your November number. The author does not seem to have seen my "Lectures on Forest Law," in which (for the benefit of readers who do not know German) many of the salient points of Dr. Danckelmann's "Ablösung and Regelung" are extracted or embodied. I here also give an account, in an Appendix to one of the lectures, of the process of regulating, and also of valuing rights, for compensation, in Germany. The process of regulating rights is not so simple as Mr. Hight seems to think. In principle, of course, not only in wood-rights but in all others, the object (for the purpose of compensation) is to ascertain an annual value, and capitalize that.

But not only is this sometimes a matter of difficulty owing to the uncertainty of local values, actual and prospective, but it is a matter (discussed by Dr. Danckelmann at length) of difficulty to determine what is the proper rate of interest to be used as the factor in valuing rights. Then again, as regards the compensation, not only is the form of it to be considered, whether money in the lump, or an annual payment, or an area of land (usually culturable land), but it is also a question, in the latter case, what area of land represents the true equivalent of the capitalized value of the right.

It is not my object, however, to criticize or to offer remarks on the subject of the valuable and well written paper in general, but to call attention to one single phrase, which is likely to give rise to much misapprehension on a subject of increasing importance, and which I venture to think is also much misunderstood in a recent Resolution of the Government of India. This Resolution is no doubt animated by good and statesmanlike intentions, but it is very likely to be misapplied and may lead to the active discontinuance of Forest Conservancy in some of the very forests where that is most wanted. The more rights or demands for material (major or minor) there are, the more important it is (*a*) that the nature and amount of the demand should be known, and (*b*) that measures

should be taken to see that the demand does not overtax the resources of the (capital) forest. This implies the regulation of free use and the progressive restoration and regeneration of the yielding area, involving rest and closing—which are the chief, if not the only things to which an ignorant peasantry always object whether in Europe or in India. An outcry on the subject cannot be dealt with—though it is easily and irresponsibly made—*en masse*. It can only be dealt with by specific enquiry and remedy in specific localities.

The point in Mr. Hight's paper is on page 1, where he says "What we in India call *privileges*, the author (Dr. Danckelmann, *i. e.*) calls by their proper name *rights*." I submit that this implies a radical misconception of the whole position. I need not do more than offer a passing remark objecting to the term 'privilege.' In English, the word *itself* means a right of a peculiarly strict and exacting kind (*e. g.* 'privilege' of Parliament). But in everyday practice, it has come into use among Forest Officers in India, to mean what the Forest Law calls "tolerance," a favor allowed to meet a 'hard case' where there is, however, *no legal right*. 'License' would be a much better term to use; but let that pass. The Indian Forest law does *not* confuse privileges and rights: and privileges allowed in Indian Forests would *not* be called by their 'proper name' if they were called 'rights.'

You will have observed that there is no mention of 'licenses' or 'privileges' in the Act because these being in the nature of gifts or concessions by the State (or Public) of its Forest property (*i. e.*, the yield of it) no legislative sanction was needed. Sec. 22 prohibits the growth of *new rights*, except by grant, &c. of the Government, and as such positive and irrevocable grant is in nearly all cases as unnecessary as it is undesirable, hard cases are usually met by giving a license or concession instead; and here the matter *might* have been, perhaps usefully, mentioned in the section.

But it is important to understand the real position of the many practices which in all 'settled' forests, *now* really and truly are 'rights.' And they are quite distinct from 'privileges.'

It is necessary briefly to go back to the first general principle which *must* lie at the basis of any legal determination of the position, however broadly equitable and simple the law is intended to be. The "Things" in the world (and Forests and their produce are 'Things') are connected with "Persons" in two chief ways. In one case, the Person (may be an individual or a 'corporation' or the State) is what we call *owner*: he has, directly or indirectly, actually or constructively, 'legal possession', and that with *a good title* of whatever kind. But the ownership is not always (or indeed often) quite full or unfettered, so that *all* uses and enjoyments of the 'Thing' (we may now say 'Estate') are in the hands of the owner; there may be, (and here we have the second important kind of connection between 'things' and 'persons') a limited right of one

person over the property which is owned by *another* person 'to enjoy some use of it or take some produce from it,' and that is the essential element in the nature of what is variously called a 'servitude,' an 'easement,' 'a right of common,' &c., &c. which is a permanent right not arising out of a mere terminable contract. The right must, under such circumstances, be of a 'limited' character, because otherwise it might be or become, co-extensive with the ownership itself, it might swallow up or cover the entire use and enjoyment, and prevent *any* use of any kind to the owner. Even where there is the uncommon and extensive right called "usufruct" involving the enjoyment by the right-holder (not 'owner') of the *whole* of the Forest products and yield of the estate, still there is a limit; the *substance* of the estate cannot be attacked. How then does the second kind of *right* (or easement) over property arise? It comes about either by direct grant or charter of the Kings and Barons or by some other ancient documentary origin or judgment of Court; and as the grant is permanent and destructive in its nature* no one (practically) confuses it with the sort of temporary right conveyed by a lease, a mortgage, or a contract to remove certain produce. Often the right has arisen out of ancient forms of agrarian association, the 'mark' and other such institutions since dissolved. Still oftener, it arises—how, no one can exactly tell; but it has been going on for time 'whereto the memory of man runneth not to the contrary' as the lawyers say. And after such a time, the sense of the community (as embodied in its laws of 'Prescription' or 'Limitation') does not allow the owner of the (servient) estate or any one else, to ignore or interfere with what it now calls a 'right' acquired by 'Prescription.' But it is obvious that in order for such a law to be fixed, there must be in every civilized system of law, however equitable and untechnical, some *condition* as to the circumstances under which this longstanding exercise will be regarded as 'Prescription' in its effect (legally). One obvious condition is that the time should be considerable; and for convenience a fixed period—may be to 20 or 30 years (as the legislature decides)—is substituted for the vague 'immemorial' time. Another condition is hardly less obvious; if the practice has being going on very doubtfully, or maintained by fits and starts, at distant and broken intervals, if it has been done in secret and by some fraud or by violence (against the protest of the owner) or obviously by his leave and on sufferance, and on the *well understood* condition that the owner might stop it whenever he chose or wanted the land for some purpose; then the law would not hold

*In Europe, these rights are very commonly, if not always, 'appendant' or attached to some (dominant) estate as the right-holder :—they are (in a technical sense) 'real' rights. In India the facts do not enable us to make such a general definition.

the practice to be such as to have given rise to a *legal prescriptive right*.† There might be a claim for indulgence and consideration, &c. that is another matter, there would be no *prescriptive right*, under any definite legal system. The legal definition adopted in the Indian Easements Act of 1882 (where that is in force) and in Act XV of 1877 (Limitation Act)extends the term 'Easement' to include all kinds of rights of one person over the property of another to use the latter property or take some of its natural produce, when they are of a certain character; and disregards the old English law distinction between 'easements' and 'profits à prendre' or 'rights of common.' It requires that the 'easement' must be as of *right* (*i. e.* not by mere leave or sufference) and as a permanent right and without interruption, and peaceably and openly exercised (not by fraud, or violence or in secret unknown to the owner). It has been held by the High Courts, that Sec. 26 of the Limitation Act is not *exhaustive*; a true 'absolute and indefeasible' *right* may be decreed by the Courts on other grounds, but the decisions do not in any way imply that a *right* may be recognized otherwise than in accord with general legal principles —which are obviously based on common sense and sound logic. Now it is obvious as regards customs of using the Forests in India, that it is only rarely that they exist by charter or by mere judgment or public order or record. It is obvious also that they rarely, if ever, arise out of the dissolution of some recognized 'mark' or other ancient institution, for in all cases where a village had something like a real claim to the land in the vicinity of or forming part of the circle of the village, the Land Revenue Settlements had already given up the land to the village and included it, and it is not now available to come under the Forest Law. In the vast majority of cases, Forest claims, if *rights* at all (in a strict sense) must be based or *prescription*. I need not refer to the question of actual ownership of Forest-clad lands. All land that any holder of a cultivated estate could reasonably claim, has long since been given up and included in the registered estate. The 'Waste lands' that formed the substance or raw material out of which Forests under the Act were created, were the residuary Waste lands unquestionably the property of the State; but in some cases they were burdened by the claims of adjacent villages, and sometimes of nomadic graziers and others to exercise what, in form, were rights of user or rights of common; and as I just now stated, are claimable

† This matter also involves determination of the question what effect on the continuity of the practice is produced, by the practicer (would-be right-holder) himself '*intermitting*' the practice for a time, or by the owner (or a third party) '*interrupting*' the exercise, and the right-holder submitting to such "interruption." The Indian law has settled both questions:—if the holder intermits for *two years* or submits to interruption for *one year* (under certain conditions) his right is or may be lost. In English law, the question of 'interruption' is settled by Statute; that of 'intermission' is not: it is left to be a question of facts which may or may not show an intention to give up the rights.

on the basis of *prescription*, if claimable at all. The obvious question then arises ; applying the general legal principles regarding *rights* (easements), are these practices entitled to take rank as strict rights? In many cases the practices have arisen only in late years when the increase of population and spread of cultivation caused the villages to increase in places formerly uninhabited. This fact is often forgotten : but let it pass. I have also mentioned the fact, that where the grazing, &c., &c., has been exercised in land which was really regarded in practice as attached to, adjoining, or in some sense belonging to, the villages, such cases have been long since provided for, because such areas have been granted or at any rate allotted to the use of the villages. Where the grazing, &c., was carried on in waste not reasonably claimable as belonging to the geographical area of a village—and that is the usual state of the case—it is very doubtful, at least in a large number of cases, whether the practice could be said to be exercised 'as of right' and not precariously. In fact, it was merely on sufference, or because the local ruler, &c., did not care to interfere ; for every one knew perfectly well that directly the local authority wanted the 'waste' land in order to make a grant or to keep it as a hunting ground for himself or for any other purpose, he could take it, and grazing and other such practices would be turned out, and have to go elsewhere. This would certainly be held to deprive the practice of the character of a strictly legal right, even if it had been carried on for as a long as 20 years or about that period. Nor will I say anything about the total absence of any law or principle of formally recognizing rights of this kind under any native government whatever in past times. When, therefore, the Forest Law was enacted, it became a question of policy, how these requirements of grazing and other produce, should be dealt with. It *might* have been quite correct from a legal point of view, to say that (any *special* cases where proof to the contrary was available excepted) in general there are *no* strict 'rights' in the residuary waste lands, made into forest, after (be it remembered) the Land Revenue Settlements had made their arrangements for handing over large areas of useful waste to the villages and estates. It might have been said further that while no *rights* are now recognized, Government would make provision for 'concessions' or 'licences' wherever any equitable cause appeared. But a more liberal course was adopted. The word 'easement' as defined by the Indian Legislature is not used in the Forest Act, probably to avoid all misconception. It is left to the Forest Settlement Officer to entertain all *claims* to "rights" and then it was in his pleasure or equitable discretion (subject to appeal) to admit or reject the claim wholly or it part. When he *does* admit a claim, he is directed to *define* the rights (because an *unlimited*, *indefinite* 'right' is inconsistent with legal principle) and then to provide for it in certain ways stated. Once admitted, the customary use or practice *becomes* (in every sense of the word) a full *legal right*.

Thus all further question is set at rest. The Act does not allow nor does the Forest administration desire to 'curtail' (as is so often erroneously asserted) any claim equitably admitted as a 'right.' The law requires the right to be *defined*, and if allowed in a Reserved forest, to be 'regulated' as to its mode of exercise solely with a view to the safety of the forest and with reference to its yield-power and its regeneration. This is, in no sense, curtailment. To define a right, to regulate its exercise so that the servient forest be kept safe and productive, to require that it be for the use of the person or estate to which it is attached and not for extra profit, &c., is not to 'curtail' the right, but merely to attach the necessary features inherent on broad legal and equitable principles to all rights of user or produce. But even when the Settlement Officer has allowed all that he considers may equitably (and waiving all strict technical objections) be allowed as *rights*, there are still some cases where the welfare of neighbours suggests or requires that concessions or 'privileges' as we call them should be allowed, and he accordingly allows them, of grace, over and above 'rights' or where he cannot find rights to be existent. It is, therefore, highly incorrect to say that what are called 'privileges' in Indian Forests are really or properly to be called 'rights.'

If *apart* from any question of 'right,' the Government, as owner of the Forest, choses to say that certain estates are always to be managed so that the bulk of the produce is to be *given* to the neighbouring population irrespective of their having either recorded rights or regularly conferred 'privileges'—well and good; but it should see that from a practical point of view, it is known what value of produce (fairly estimated) is thus given away; and should not complain, at the same time, that the forests as a whole, pay so little, that necessary expenditure must be disallowed. Above all do not let the mischievous notion gain ground, (for it *is* abroad, and I believe can be traced obscurely in the recent Resolution) that only high class, or valuable timber forests need restriction, regeneration and care, and the humbler class of forests need none, but if thrown open without any restriction (as now virtually ordered—everyone will understand the orders to mean that) they will go on for ever supplying the wants of the population. It is true of *all* classes of Forest—the lowest as well as the highest, that we have a Capital Stock to deal with and that so surely as we knowingly (or unknowingly) allow that capital—be it the growing wood or the grazing soil—to be over taxed more than the probable annual increment to regularly taken from it (I do not, of course, speak of special advance cuttings) so surely will the forests in time fail and the 'rights' it is so plausibly desired to cherish, will themselves be the chief sufferers, owing to the failure of the source of supplying them.

B. H. B.-P.

OXFORD,
December 18th, 1894.

Pyingado for Wood Pavement.

Sir,

In continution of my letter of 16th ulto. published at page 452 of the *Indian Forester* for December 1894, I forward you the note with which Mr Bagley has kindly furnished me in reference to Pyingado. It is unfortunate that none of the approaches to Offices which are laid with wood pavement are under the Railway branch in Rangoon, as Mr. Bagley's opinion would then have had a more direct and practical value than can be attached to it regarding the particular point under consideration, *viz.*, the utility of Pyingado *for wood pavement*. He writes as follows :—

"We tried the pyingado blocks for paving the *flooring* of platforms and workshops only but not for road work. As a flooring, the blocks have stood 10 years, wear *perfectly*, not $\frac{1}{2}$ per cent requiring removal during that time."

"I have no experience of pyingado blocks in street paving, but do not know of any Indian timber in ordinary use that can compare with it for hardness and durability, and cannot imagine a better material for any work where these qualities are necessary. Any statements made to the contrary are probably founded on experiments made with green unseasoned timber, and that not properly selected."

The whole matter is one that has many other aspects besides the mere question of durability ; but this is neither the time nor the place—nor have I access to the requisite *data* in the way of official correspondence,—for attempting to discuss the subject in all its bearings. Even such a trifling matter as the name of the wood may *possibly* count for something in London. Hence it might perhaps be more advisable to bring it to notice and push its introduction simply as *Ironwood*, rather than by calling it by any of its Indian names, Pyingado, Irul, or Jamba; *Xylia dolabriformis* would of course damn the chance of the best wood that ever existed, so that that depressing scientific name should invariably be suppressed.

J. NISBET.

DEHRA,
20th January, 1895.

NOTE.—We certainly think 'Indian Ironwood' would be the best name for trade purposes.

HON ED.

Rate of Growth of Teak.

DEAR SIR,

In the "Forester" for June, 1893, whilst reviewing the Forest Administration Reports, 1891-92, you have asked if in Nilambur Plantations we can beat the dimensions you quote for the growth of teak at Makum, *viz.*, height 82 feet., girth 3 ft. 6 inches, girth 3 ft. 2 inches, in a plantation 16 years old. There are no plantations here of that age for comparison. In a sample acre taken from 1st class soil (alluvial) in a plantation 19 years old, the two biggest trees measure :—

(1) Girth at 4in. 6 feet = 3ft. 8in.
(2) do. = 3ft. 0¼in.

The bole of the former is 60ft. in length, but, there being no use for the branch wood, the full height is not measured.

It is, however, unfair to make the comparison only for two trees, as, if picked out specially, a few trees much bigger could be found growing on the outside of the plantation.

As I have measured 23 sample plots, you will understand that I cannot at present give you all the measurements, which doubtless will find their way to you in time, but the measurements in the "Jubilee plantation" (1844) are as follows:—

No of trees per acre,	68.	
No of trees measured	60.	
Average girth at 4feet 6in.	53·64	inches
„ „ at centre	40·68	„
„ height of bole	68ft.	
„ cubic contents	48·99	c. feet.
„ Annual Increment (current). girth at 4feet 6in.	·675	in.

There are a number of trees in the plantation over 6 ft. in girth of which 31 have been measured in order to obtain the rates of *circumference at centre : circumference at breast height.*

The biggest girth is 8ft. 8in. with centre girth 5·4ft. but with a short bole, *viz.* 52ft. (The greatest length of bole measured was 78ft.) The bole at breast height is very much fluted, though the flutings do not go far up the trunk.

NILAMBUR, P. M. LUSHINGTON.
24th January, 1895.

Palmyras

SIR,

Surely Mr. A. W. Lushington in his letter to you about Palmyras is very wrong in writing about "black wood" in the heart of this tree. I have never known any Palmyra, whatever its age or height, which was black in the centre, except possibly from rot.

The "black wood" is always the outer rind or cortex, I should say, of the tree. This greater density and blackness of the outer part of the tree is due the to direction the fibrous bundles from the leaf take, *viz.* first direct from the leaf-stalk inwards, when being full of sap and imbedded in parenchyma they cause the white appearance of the centre of the tree which is particularly liable to rot. The bundles then tend outwardly, anastomoze, and join other and older leaf-fibres in the outer part of the tree. I shall be glad to be corrected if I am wrong.

J. G. F. M.

Note.—Mr. Lushington used the words 'black wood in their interior' and 'black in the heart' but it never occurred to us that he misunderstood the structure of a monocoty ledonous stem. Even if not an anatomical botanist, no intelligent person who has ever cut open a palmyra could make a mistake on the subject. That some trees have a hard dark wood and others a soft wood, we have ourselves noticed, though we doubt if the soft wood variety becomes harder by age. Perhaps the difference is one of sex and this could easily be determined.

Hon. Ed.

III.—OFFICIAL PAPERS & INTELLIGENCE.

Annual Forest Administration Report for Mysore for 1891-92.

It is rather late in the day for us to review a Report of 1891-92 when it is considered that we have already discussed nearly all the reports of British Provinces for 1892-93 and may hope shortly to begin those for 1893-94. But there are several matters of interest to be noted, so we think our readers will excuse us. On June 30th 1892 the area of Reserved Forest in the Mysore State was 1547 square miles, and of this area 1328 square miles are under protection from fire. During the year, 1252 square miles were successfully protected, which amounts to 93 per cent. of the area attempted, which is very good indeed, especially as the cost per acre is 5 pies, a result which some Indian Provinces would find it hard to beat. Some of the Mysore forests are probably easy to protect, like those on the Cuddapah—North Arcot side, but others must be very difficult, and especially so will probably be those on

the Wynaad and Nilgiri border where it is so difficult to control the wild Kurumbers who live in the depths of the forest and who are indeed most difficult even to communicate with. The following extract shews that the Inspector General in Mysore fully appreciates the necessity for fire-protection and understands that the common excuse, which we ourselves regret to have occasionally heard even from experienced officers that 'no serious damage was done' is one which should not for a moment be entertained.

"It is stated that no serious damage was occasioned by these 'fires; but to accept such statements would be striking a serious 'blow at the efficacy of fire-protection. Such efficacy was doubted 'by a former District Forest Officer of Mysore, whilst his succes- 'sor almost went to the length of saying that such fires could not 'be prevented. The majority of the Mysore District Forests run 'contiguous with Her Majesty's Forests in Coorg and Malabar, 'which of itself is a reason for extra care in fire-protection. The 'co-operation of the Forest Officers in charge of British Forests on 'the frontiers of Mysore has been secured, and a large number of 'fire-guards employed for frontier, District and State Forest lines, 'as also for roads running through Forests, yet the results are still 'far from satisfactory. Roads and cart-tracks running through 'these Forests, Kurumbers living within Forest precincts, and sur- 'reptitious burning of grass under gall-nut trees to facilitate collec- 'tion of the fruit, are doubtless some of the causes which militate 'against successful fire-protection; but admitting this, there yet 'remains much for local enquiry in the matter and which will be 'taken up by the Inspector General in person as soon as possible."

It is worthy of note that an attempt was made in the Shimoga District to test the results of fire-protection by the number of seedlings found on an acre after different periods, the results being that whereas 63 seedlings only were observable after 5 years, 133 were found after 18 years of protection. Such experiments must, of course be made most carefully, but the idea is good, and experienced Indian officers may perhaps be able from it to evolve some test which cannot be objected to.

On the much-vexed grazing question, the opinions and views of the head of a Department in a Native State, which perhaps more than any State in India, under the enlightened Ruler who has, to the great regret of all who had ever met him, just passed away, are sure to be of interest, and so we reprint the following extract which precedes a quotation from the opinion of our own Inspector General Mr. Ribbentrop.

"As compared with the previous year, the receipts were 'greater by Rs. 3,450 in spite of the subsequent concessions that 'had to be made owing to unfavorable character of the season. As 'regards their fodder requirements generally, the raiyats have 'always been treated with consideration, both at the Survey Settle- 'ment and when new Forest areas are to be brought under reserva- 'tion. As a rule it may be stated that cattle grazing in Forests is

'very prejudicial and should not be allowed. To abide by this 'rule would be comparatively easy if the raiyats could be induced 'to cut and remove the grass; but this at present they will not do. 'A compromise in the interests of cattle owners has therefore to be 'effected by permitting cattle to graze in poor Forests or in select-'ed parts of good Forests where cultural operations are not going 'on. Of course only limited numbers of cattle can be thus admit-'ted and in consideration of this fact which gives them more and 'better grazing, the license fee should not generally be less than 4 'annas per head except where special concessions have to be made 'in cases of neighbouring villages, in return for services to be 'rendered; and where the Forest Department would thus charge '4 annas, private individuals and raiyats would charge one rupee 'most probably.

'A steady increase of Revenue from grazing may be expected 'which will in a measure compensate for the damage done; but, 'on the whole, the cattle owner has the best of the bargain."

On the question of Natural Reproduction, the following remarks will be read with interest, for the problem enunciated is not one which arisis in Mysore only, but may be discussed in all Provinces and can only be really solved in those localities where all the produce has its market, so that inferior species can be utilized and have not to be left to propagate when the better ones of value are removed.

"With successful protection from fire and gazing, natural re-'production may be counted upon for a fair stock of seedlings; but 'their subsequent growth is very slow and the great difficulty is to 'secure the right kind of reproduction, *viz.*, of the few valuable 'species. To remove the undergrowth, owing to luxuriant vegeta-'tion, would be a frequent and expensive process. The thinning 'out of inferior species seems easier; but a break of canopy results 'in a rank undergrowth which to remove effectually would be very 'costly. Therefore, how to properly regulate and promote natural 'reproduction of valuable species in the forests of Mysore is the 'problem that has to be solved. It is easy to fell, cart and sell 'valuable timber like teak and honné; but unfortunately their 'removal does not make room for "relays of their species, but for 'those of other and valueless species." Thus there is the danger of 'overtaxing, if not exterminating, natural reproduction of the valu-'able species, which are but sparsely distributed in the forests and 'finding their places filled by comparatively valueless species, 'especially bamboos."

For that very difficult question, the reproduction of sandal, the digging around seed-bearing trees and the protection of seedlings by thorns is recommended.

Much attention is being paid in Mysore as usual to Artificial Reproduction, as much as Rs. 1,15,200 having been spent during the year. Planting work is traditional in Mysore and there ought

now to be some valuable forests among the 18,600 acres of regular plantations, many of which date, we presume, from the time when the Mysore forests were managed by the Government of India with a staff of officials from the Imperial Forest Department.

The Revenue of Mysore, amounting, in the year we refer to, to nearly 17 lakhs, is largely dependant on sandalwood, which gives nearly 10 lakhs, only 3½ being obtained from other timber departmentally extracted. The amount of sandalwood collected was 3,829 tons, the average amount realized per ton being Rs. 402. Among minor produce, the chief articles are lac, tangadi bark (*Cassia auriculata*), myrabolams and 'popli chekke' (*Ventilago maderaspatana*). The Inspector General has some interesting remarks on the advantages obtained by departmental collection of such produce, instead of the usual contract system and these we venture to reproduce.

"'The collection of minor produce seems to be the natural 'duty of Forest Officers and their subordinates and if carefully 'attended to, will not only increase their knowledge of the resources 'of their Forests, but also add to the revenue.

'Without entering into lengthened particulars, two instances 'may be given showing how departmental agency is infinitely 'preferable to a contract system. A lac contractor cannot be ex-'pected to be so disinterested as to attend to the increased propa-'gation of lac when the result of his labours and expenditure may 'be for the benefit of a new contractor.

'The right of collecting 'Popli chekke' or root of the "*Ventilago madraspatana*," from which a valuable red dye is ex-'tracted, when sold to a contractor, results in wholesale removal of 'the root and thereby seriously retarding, if not destroying future 'reproduction. Departmental collection of 'popli chekke' en-'sures that only the mature lateral roots are extracted and thus 'reproduction is hardly interfered with.

'Departmental collection of lac and at the same time careful 'attention to future propagation, have been attended with the best 'results in the Hassan District. Similar experiments are now 'being carried out in other Districts; and the financial results, espe-'cially if there be a steady demand for the dye, promise to be 'most favorable. Departmental collection of gall-nuts 'Myroba-'lams' is an idea borrowed in part from the practice prevailing 'in North Canara where the revenue realized thereby is very 'large. There is no reason why Forest Officers should not be 'intimately acquainted with all the localities where gall nut 'trees (*Terminalia Chebula*) are to be found, and even to form an 'approximate estimate of the crop and thus realize a better revenue 'than at present."

It is also reported that the demand for the barks of 'Some' (*Soymida febrifuga*) and 'Kakke' (*Cassia Fistula*) is increasing, but it is very rightly pointed out that both of them are trees with valuable timber and not mere waste-land shrubs like tangadi; so that

it is not desirable to encourage the trade in the bark too much. *Soymida* gives one of the most beautiful of Indian woods and ought to be much too valuable to be exploited chiefly for its bark.

In Mysore, the Khedda operations are part of the forest work, and during the year 75 elephants were caught of which 50 remained after the death of some and destruction of others. The Khedda receipts amounted to Rs. 78,840, the expenditure to Rs. 1,11,272, but we suppose that many of the most valuable animals are not sold but used for State purposes.

So too, are the 'avenues' and 'groves' managed by the Department and both seem to be very successful. The planting of both is a work of much value which ought always, in our opinion, to be supervised by the professional agency, if it is to be really successful.

We are glad to see that the Mysore staff, almost entirely a native one, is doing well on the whole, and that some of its members who, we may hope, are products of the Dehra Dún education, have shewed themselves really good workers.

The financial results of the year were :—

Receipts	...	...	Rs. 16,06,430
Expenditure	...	...	„ 6,12,278
Surplus ...		...	„ 9,94,152

We will end by congratulating Mr. Ricketts and his staff on the good work which the Report evidences and on the many interesting points which we have endeavoured to record.

Forest Administration in Jodhpur, 1893-94.

The Jodhpur Report for 1892-93 was reviewed in our No. for April 1894. It shewed a deficit of Rs. 1,532. The present Report shows a *gross* revenue of Rs. 16,372, and a *net* revenue of Rs. 4,034, and this the Musahib Ala, Maharaj Dhiraj Colonel Sir Pratap Singh considers very satisfactory.

The Report itself seems to shew evidences of better work than last year. A Forest Act was brought into force on January 1st 1894, and there were 5 new cases with 12 old ones pending from the previous year. The cases resulted in convictions and 7 were pending at the end of the year ; 130 cases were compounded as against 275 in 1892-93.

Fire protection was fairly satisfactory, for 1,124 acres were burnt out of 174,720 attempted ; the fires being attributed chiefly to the carelessness of Bhil honey-gatherers.

Regarding natural-reproduction, we extract the following remarks.

"During the rainy season all forests are closed to grazing, so, 'as usual, there was no lack of seedlings of *Anogeissus pendula*, 'Gol, Dhaman, Salar and Dhau trees but the unlimited grazing

'during the winter and hot weather killed most of them except in 'places which are too steep for the cattle to approach. Anyhow 'there is much improvement in this direction. Fine patches of 'naturally grown seedlings of various ages of Dhau were seen by 'the Superintendent in Behra, Bijapur, Sadhri, Vagol, Kot, Jujawar and Kantalia forests."

We will conclude by reproducing the following extracts from the Review by Sir Pratap Sing which is prefixed to the Report:—

"*Enunciation of Forest Policy.*—It was complained that a tendency appeared to make popular and customary rights subservient to the improvement of forest conservancy. The Durbar takes this opportunity of recording its views that the only satisfactory forest settlement scheme is one which after fully considering all the interests concerned, adequately provides for the wants of agriculture as well as for beneficial forest conservancy. In carrying out this policy I am glad to remark that the present Forest Superintendent has given me cordial and able assistance.

'*Two classes of population concerned and their rights how settled.*—Two classes of population were affected by the demarcation of the forest area; *viz.*, (1) those living *within* (2) those living *without* the forest.'

'To the first class belongs the semi-aboriginal tribe of the Grasias. The use they make of the forest is threefold. (1) They collect natural products of the forest such as honey, wax and medicinal herbs and earn money by their sale. The Forest Department has been advised to see if they can usefully employ Grasias in subordinate positions as collectors and sellers of forest articles which they best know how to find. (2) They also raise grain crops by a peculiarly destructive process of nomadic cultivation with ash as manure. They clean a piece of forest land by setting fire to it. The Durbar wishes to be considerate to these forest denizens. Having been deemed advisable to put a stop to the wasteful process of raising crops it has been ruled to allow the Grasias to cultivate fields which they already held but not to let them clear new fields. (3) They use it as pasture ground for herds of goats and cattle. Indiscriminate grazing has been disallowed, and to goats, sheep and camels the forest has been closed.'

'To the second class belong the villagers who are advanced cultivators. Their rights have been (1) to get timber for their houses and agricultural purposes (2) to graze their cattle. These rights were thoroughly gone into and the villages were reclassified and approved by the Durbar. It has given satisfaction to all those concerned.

"*Standard of grazing area.*—As to grazing area, there was no fixed standard to work with. It is pleasing to record that with the concurrence of the villagers a fairly correct standard has been obtained. It is to allow one acre per head of cattle as a pasture ground."

V.—SHIKAR AND TRAVEL.

A Narrow Shave.

Some years ago in the Seoni district, C. P. I camped at a village where a Gond had had his thumb clean bit off by a tiger a few days previous to my arrival. While loading a cart in the forest he heard something rushing at him, turning round and seeing the tiger he shouted and stretched out his arm, curious to say, the tiger did not make his charge good but snatching at his hand turned tail. The thumb was taken off almost as neat as if an operation had been performed. By the application of Neem leaf poultices, inflamation was kept down and the man's hand healed up all right but he thought one such escape was enough for a life time and shortly after the Gond settled in a village in the open country.

This tiger after chawing up some half dozen persons fell to my gun handled by my native Shikarrie. After several failures at "beats", I tried the plan of feeding him in a quiet nook inside the reserve. I then had a pit dug and from this vantage ground stripes got his quietus while making a rush on the bait; he was shot before he could kill the buffalo that was tethered in front of the pit.

E. D.

A Lady's Shikar in Oudh.

We hear that during the Inspector-General's recent tour in Oudh, his daughter, Miss Ribbentrop, had some excellent sport, getting a tiger, a panther and a fine stag. She shoots with a ·500 Express with 5 drams of powder. We offer her our congratulations on her success and our best wishes to her father and herself for their approaching tour round the world.

VI.—EXTRACTS, NOTES AND QUERIES.

The Cedar of Central Africa.

In Commissioner Johnston's report of the first three years' administration of the eastern portion of British Central Africa there is a sketch-map showing the agricultural condition of this country and the extent of such forests as yet remain. Mr. Johnston says:—The dense forests are now mainly confined to certain hilly regions, where local circumstances protect them to some extent from destruction by bush-fires. They are always associated also with either an unusual rain-supply or the presence of underground springs. Slightly stagnant or surface water appears to contain too many salts in solution to be favourable to the growth of forest, and such forests as are usually found growing near swampy districts are palm thickets. Thereis onemagnificent forest of raphia palms—one of the grandest sights I have ever seen in the vegetable world—near Jumbe's town, Kota-Kota, in the valley of a sluggish stream flowing into the Bua. As a remarkable feature peculiar to British Central Africa should be noted the splendid cedar forests on the upper plateau of Mlanje. Under the explorations of Mr. Alexander Whyte, the naturalist attached to my administration, it was not known that any conifer existed in Central Africa, south of Abyssinia, and north of the Drakensberg, with the exception of a few small juniper bushes discovered by Mr. Thompson growing on Mount Kenia and one or two other heights in Equatorial Africa. The existence of conifers on the top of Mlanje was first reported by the Rev. Robert Clelland, a missionary belonging to the Church of Scotland Mission. Not much heed was given, however, to this news, because no specimens were sent home for identification. But, undoubtedly, Mr. Clelland's information put us on the scent, and one of the first things I attempted on arriving here in 1891 was to have the upper plateau of Mlanje explored. As a consequence, Mr. Whyte discovered the grand conifer, of the genus Widdringtonia, to which his name was given. An account of this tree and the circumstances of finding it were given in an earlier report of mine printed by the Foreign Office. This Widdringtonia would appear to be nearest allied to the cypresses, as it unquestionably is by the shape of its seed vessels, and the nature of its foliage; at the same time, it is widely different to the cypresses in shape and size, and far more resembles the cedar, both in appearance and in the fragrant smell of its timber.

It would seem now as though there were two different species of Widdringtonia growing on Mlanje, one a very lofty tree, reaching fully to 130 ft. in height, and the other scarcely exceeding 30

or 40 ft., and growing in a very straggling habit. There is a slight difference in the foliage of the two species. We have not yet been able to get the dwarf species identified, but hope to do so before long. In regard to this Widdringtonia, I might mention that Mr. Whyte has spared no efforts to introduce, or let us say, re-introduce its growth into all parts of the Shire highlands above 3,000 ft. in altitude. The tree would appear to flourish at a relatively low altitude, inasmuch as those planted in the grounds at Zomba, below the Residency, at an altitude not exceeding 2,900 ft. above the sea, leave nothing to be desired as regards their vigour of growth, some of the young seedlings having attained a height of 5 ft. in two years. Mr. Sharpe believes that he has seen a Widdringtonia growing on one or two of the more inaccessible peaks of Zomba, and, judging from what I could see through a field-glass, I think he is right in his opinion. Nowhere else, however, throughout British Central Africa, or in the adjoining regions, has any one reported the existence of this conifer. Baron von Eltz has made an active search over the lofty Livingstonia Mountains, at the north end of the lake, but has failed to find anything of the kind.

As an example of the rapid application to practical usefulness to which we have put this discovery of Mr. Whyte's, I may mention that, whereas the definite existence of the tree was only first made known in October 1891, in June 1893, Captain Johnson, commanding the Indian troops at Mlanje, was having the dead trees sawn up into logs, which were being sold to advantage in Blantyre, and later on, in the autumn of 1893, enough cedarwood was supplied from Mlanje to re-roof the whole of the Residency and its attendant buildings at Zomba, besides which a great many useful articles of furniture have been made of the wood.—(*Timber Trades Journal.*)

Bragantia Wallichii.

By David Hooper, Government Quinologist Madras.

"Alpam" is the name of a shrub belonging to the natural order Aristolochiaceæ, growing on the western coast of India, Rheede van Drakenstein, the Dutch Governor of Malabar during the latter part of the seventeenth century, seems to be the first botanist who mentions this plant, as "alpam" is figured in 'Hortus Malabaricus, vol. vi., t. 28, published in 1686-1703. Lamarck, in the botanical portion of 'Encyclopédie Méthodique' (1783), names the plant *Apama siliquosa*, but as Lamarck's knowledge of it was wholly derived from the 'Hortus Malabaricus,' it is most probable that 'apama' is a misprint for 'alpama,' and that the generic name was intended to be taken from 'alpam,' which is Rheede's name.

Bartolomeo, * in his 'Voyage to the East Indies,' says, "The only Malabar plant which I can with certainty call an antidote to poison is a shrub about three or four feet in height, named alpam. The root is pounded, and administered in warm water to those who have been poisoned. A Malabar proverb says, 'Alpam agatta Veszam poratta.' (As soon as the alpam root enters the body, poison leaves it.) The poison referred to by this traveller is that of venomous snakes, especially cobras, which are very plentiful in the jungles of the western coast. Dr. Ainslie alludes to the plant (in 'Materia Indica,' 1826, vol. ii., p. 13) on the authority of Bartolomeo, and recommends it for further investigation, although he had not met with a specimen of the drug, and did not know its botanical origin.

Bengal and Bombay writers on Indian drugs make little or no allusion to 'alpam,' on account of its habitat being confined to the Malabar coast and Travancore. Dr. Dymock found the plant growing in Goa, and merely recorded what others had said about it in 'Materia Medica of Western India,' and because no authentic specimen could be obtained for description and examination, it was omitted altogether from 'Pharmacographia Indica.' Mr. M. A. Lawson, during a recent botanical tour in Travancore, met with *Bragantia* in the hill ranges, and has placed some of the roots at my disposal.

Like other plants of this order, alpam has been supposed to have virtues in the cure of snake-bite, the juice of the leaves and the root being the parts used. Drury states that the whole plant, mixed with oil and reduced to an ointment, is said to be very efficacious in the treatment of 'psora' or inveterate ulcers. The juice of the leaves mixed with Vassumbu root (*Acorus calamus*) the root itself rubbed up with lime-juice and made into a poultice and externally applied, are the chief modes of administering it among the natives.

Bragantia Wallichii, R. Br., is a diœcious shrub; leaves oblong lanceolate, three-nerved at the base, 5-8 inches by 1½-2 inches; flowers in small, irregular, few flowered cymes; tube of perianth smooth, lobes acutish; anthers nine, triadelphous; pistil short; stigmas nine, radiating; fruit a capsule (like a siliqua), slender, three to four inches long, terete; seeds one-tenth inch long, 3-gonous, deeply pitted.

There are three species of *Bragantia* natives of India and Malaya. *B. tomentosa*, Blume, possesses intense bitterness, and according to Horsfield is employed by the Javanese as an emmenagogue.

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* Fra Paolino de San Bartolomeo was born in Austria in 1748. He joined the Carmelites, and came out to Malabar in 1774, where he was successively appointed vicar-general and apostolic visitor. He remained in India for fourteen years, studying the languages, literature, and religions of the people. His 'Viaggio alle Indie Orientali' was published in Rome in 1796. He died in 1806.

The roots of alpam are light brown in colour, knotted and twisted, about one inch in diameter at the thickest part, and tapering. The thin cortical portion is soft and corky, and may easily be removed by scraping with the finger nail. The substance of the root is tough in consistence. The odour of the bruised root is terebinthinate, and the taste nauseously bitter. A transverse section of the root shows a rather remarkable appearance. although the peculiar structure of the wood of the Aristolochias has been pointed out by Lindley, Decaisne, Von Mohl, Duchartre, and others There are not very evident concentric zones in the wood, but it is broken up in a radiating manner into thin wedge-shaped masses extending in some instances from the cambium to the centre of the root. There is no proper pith, and the parenchymatous system is distributed in alternating layers with the wedge-shaped bundles of wood, like exaggerated medullary rays. The wood is yellowish-brown, and consists of long wood-cells, with some porous vessels running down the centre of each bundle. The parenchyma contains a large quantity of starch, and is almost white in colour.

A description of the structure of the wood of *Bragantia Wallichii* with a figure of a transverse section was recorded by Dr. Maxwell Masters in a paper* read before the Linnean Society about twenty years ago. The sketch of the section of the stem shows a very eccentric arrangment of the wood, with irregular zones extending laterally. This indicates a plant with a scandent habit ; but Mr. Lawson's specimens were not of that character, and some sections of young stems attached to the roots of these samples showed a regular arrangement of the wood as from a round stem of an erect plant.

The powdered Bragantia root yielded some yellow, tenacious, resinous substances to ether, which did not crystallize on standing The mass was heated on a water-bath to dissipate essential oil, and the residue was treated with ammonia water, which only partially dissolved some resin with a yellowish-brown colour. The alkaline mixture was shaken with ether, and the ethereal layer separated and evaporated, left a soft neutral resin of a golden brown colour, giving a reddish-brown solution with sulphuric acid. The clear alkaline solution was acidified and again shaken with ether. The ethereal liquid was fluorescent, and left on evaporation a brittle, golden-brown resin acid. These resinous bodies were not analogous to aristin, found by Dr. Hesse in *Aristolochia argentea*, by Dr. Warden in *A. indica*, and by myself, only lately, in *A. bracteata*.

After removal of resins from the powdered drug, rectified spirit extracted an alkaloid which formed a combination in the plant soluble in water. The aqueous solution of this extract,

* "Remarks on the Structure, Affinities and Distribution of the genus *Aristolochia*, with descriptions of some hitherto unpublished Species." Read February 1873. *Journ. Linn.* Soc., xiv., p. 487.

shaken with chloroform, afforded a residue containing some resinous matter with an alkaloid. The solution was then treated with ammonia, which caused a precipitate, and again shaken with chloroform. The chloroformic extract left a pinkish coloured residue consisting of impure alkaloid. This was dissolved in acetic acid, rendered alkaline with ammonia, shaken with ether, and the ethereal layer left a whitish residue of almost pure alkaloid. This base had an alkaline reaction, it gave a greenish-red solution in sulphuric acid, a yellowish one with nitric acid, destroyed the red colour of permanganate of potash, and afforded a crystal lime acetate. Acidified solutions of the alkaloid gave precipitates with alkalies, insoluble in excess also with tannin, iodine in iodide of potassium, potassiomercuric iodide, potassium ferrocyanide, and phosphomolybdate of ammonium. The alkaloid and its salts were intensely bitter ; it is probably allied to aristolochine, the source of bitterness in certain plants of this order.

Most of the alkaloid was removed by the spirit extraction, only a small quantity remaining in the extract subsequently made with water. The watery extract also contained a substance which reduced Fehling's test, and on allowing the evaporated extract to stand for some weeks, some hard, white, transparent crystals separated out, which were related to dulcite.

The following table gives the results of the examination of the powered root of *Bragantia Wallichii* or "alpam."

Neutral and acid resins, and ext. by ether ...	1·48
Alkaloid, etc., ext. by spirit	3·43
Water extract	6·71
Starch and fibre	77·02
Ash	3·35
Moisture, etc., ...	8·01
	100·00

(*Pharmaceutical Journal.*)

A Forest Flora for Bombay.

We hear that a proposal is on foot for the preparation of a Forest Flora for the Bombay Presidency and that the work is to be entrusted to Mr. W. A. Talbot, Deputy Conservator, whose botanical knowledge is so well known and to whose recent 'List' we recently drew attention in our pages. We hope the report is true—it is a chance which may be missed, if advantage is not taken of Mr. Talbot's special knowledge and qualifications. We hope that the work will be not merely botanical, like the Burma flora of Mr. Kurz, but prepared on the lines of Brandis' N. W. and C. India Flora with full notes on geographical and economic points.

Fruit Culture on the Himalaya.

The experience obtained in regard to fruit cultivation on the hills has now reached a stage at which it deserves to be brought under attention for the benefit of those who may be tempted to take up the pursuit as a means of livelihood. The industry is still in its infancy, but it undoubtedly possesses great capabilities for future development, and if carried out under proper management should prove to be a source of much profit. The demand for English fruit in India is far in excess of what can now be supplied, and it would take many years for fruit growers in this country to experience the disadvantages which growers in England have to contend with in the low prices offered during seasons of plenty. The most important considerations in all attempts to grow fruit successfully on the Himalaya are—firstly, a suitable climate, and secondly an accessible market. Unfortunately it is not easy to find localities where both of these conditions are combined ; for as a rule, the best fruit-growing districts are situated too far away from any market of sufficient importance, and fruit growers in these parts are at present much handicapped by the difficulties and expense of transport. This obstacle may in time become lessened as communications are improved. In order to expedite the despatch of portable fruit it might be possible in some cases to adopt wire carriage in the same manner as railway sleepers are brought down from the leased forests of Tehri-Garhwal. The principal markets for Himalayan fruit are, of course, the various hill stations, which are situated for the most part on the outermost ranges. At some of those hill stations there are Government fruit nurseries ; and a considerable quantity of fruit is raised by private enterprise. But the climate of the outer ranges is too uncertain ; favourable seasons may occur occasionally, but in the long run fruit growing there is found to be too precarious an occupation to be depended upon as a means of livelihood. Thanks to Mr. Coldstream, lately Deputy Commissioner of Simla, we are now in possession of some extremely valuable facts regarding fruit culture in Kulu and in the neighbourhood of Simla. Mr. Coldstream has for several years taken much practical interest in the subject, and he has now put together in printed form some very useful information consisting of notes contributed by a few of the most experienced growers in Kulu and elsewhere in the Punjab. The results, as far as they go, are decidedly encouraging.

A great variety of fruit can be grown in Kulu owing to differences in elevation. Apples, pears, plums and cherries succeed best at the higher altitudes, *i.e.*, at or above 6,500ft. ; at about one thousand feet lower is the proper elevation for apricots and peaches, whilst oranges, grapes and figs can be grown to best advantage between 3,000 and 4,500ft. above the sea. Apples and

pears are grown to great perfection in Kulu. Consignments of these fruits are occasionally received in Simla during the autumn months, and many persons there can testify to their excellent quality. Captain Lee says that most of the varieties of English and American apples that he has tried have succeeded at Bundrole (5,000ft.) Captain Banon, writing from Manauli, the elevation of which is 6,400ft. says:—"All the English varieties I have yet experimented with have answered admirably They seem to improve as regards flavour, size, and colour, and usually ripen a mouth earlier than in England....Some English apples, as for instance, Cox's Orange Pippin, which is considered the most delicious apple in England, the soil and climate of this place seem to suit perfectly; and if one grew apples simply for profit one should grow nothing but this sort for the Simla market." Mr. Donald of Dobi reports very favourably of the apple trees in his garden, the elevation of which is about 4,000 ft. only above the sea. Buds from English varieties were put on to indigenous trees, and the stocks being large, the trees fruited after four years, and have ever since borne heavy crops every alternate year Pears do well at Manauli, but not as well as apples. Captain Banon says that the indigenous medlar pear called *shegal* (*Pyrus Pashia*), and which is abundant in Kulu, "answers admirably as stock for English pears, medlars, and quinces. If anything, this place is a little too cold for pears in some years....Louise Bonne of Jersey is the most profitable pear to grow here for market, through Marie Louise and William's Bon Chrétien also grow well and with a superior flavour to the fruit grown in England." Mr. Donald of Dobi says that pears budded on the quince stock are the most prolific and can stand more moisture.

That the apricot grows abundantly all over the hills everyone knows: it might, in fact, be called the potato of the Himalayas, but the ordinary kind would not attract the palate of a gourmand. Mr. Carleton's experiments with Kashmir apricots at Ani, a village in Kulu at 3,500ft., have proved a remarkable success. He says—"The native apricot in this warm valley was not prolific, and from analogy, we concluded that the place was too warm for the Kashmir or English variety. We, however, introduced 10 trees from the Government Garden at Lahore. They grew very vigorously and began to bear fruit the fourth year. They are even more prolific than the native variety in Kulu valley. The fruit ripens about the 15th or 20th of June. I should advise the extensive cultivation of the Kashmir and English apricot in all the lower hills. The successful introduction of the famous Kashmir-American fruit drying machines into Simla would enable enterprising persons to establish a very profitable industry in preparing dried apricots for the Indian markets." Captain Banon notices this important difficulty in regard to the cultivation of the apricot. "For several years past," he writes, "I have noticed that the first

ripe apricot and the monsoon rains arrive together on the same day. The effect of the rain is to wash all the flavour out of the apricot, cause the fruit to split open, and prevent its ripening properly. Sometimes, after the first burst of the monsoon, we get ten days or a fortnight's fine weather, when the apricot ripens perfectly and is not wanting in flavour. I agree with the Revd. Mr. Carleton in thinking that good varieties of the Kashmir, and perhaps English, apricots might be introduced into the villages."

Mr. Coldstream, in an editorial note of his report says :—"Peaches of excellent quality have been grown by Mr. Carleton at Ani in Kulu, from peach stones imported from America without grafting. American peach stones have been imported in considerable quantity and distributed in the Simla District and elsewhere. Inquiry was made of Mr. Carleton in August 1893, regarding some remarkably fine peaches sent by him to Simla." Mr. Carleton replied :—"Nine years ago we received from Philadelphia some peach stones taken from a variety of very choice peaches. We planted them here and nearly all germinated ; with one exception they were all transplanted to a rocky and rather poor soil ; one was left in a rich soil where it germinated, and has never had any cultivation whatever and is now double the size of the others that were transplanted to a poor soil. All these have been mulched and highly cultivated, but still remain somewhat stunted ; all bear the finest fruit. Some of the peaches have measured more than 10 inches in circumference ; most of them are superior to the fruit of the grafted trees sent from America. They began to fruit when four years old." The common plum of the hills, usually known as "Aru Bokhara," is abundant in Kulu, and does very well, Capt. Banon says, as stock for English plums, which thrive well and bear early and heavy crops. He also states that cooking-plums improve so much in flavour and sweetness that they become in reality dessert plums. Captain Lee also reports favourably on plum cultivation at Bundrole. As to cherries, Captain Banon says :—"All kinds of English cherries, red, black, and white hearts, ripen well here ; but, if anything, the climate is a little too warm for them. They ripen, as a general rule, early in June, and are the first fruit to come into the market. They would not be very profitable to grow as they do not bear carriage well. If the Post Office were to halve their rates for the parcel post a good trade might be done with the more perishable fruit ; but at present few people can afford to pay 8 annas a seer on consignments of fruit, though they would be willing enough to pay 4 annas." The wild cherry is naturalised in Kulu and can be used as stock for English kinds. Grapes, especially the hardly American sorts, have been found to do well with some time and trouble. They would certainly be a remunerative crop. An important point with regard to vine-culture in this country is to secure early varieties which will come

into bearing before the advent of the heavy monsoon rain, or late-bearing varieties which will give fruit after the rains are over.

In connection with fruit growing, we must not omit to take account of the walnut, a tree the growing of which ought to be encouraged by every possible means, not only in Kulu, where it grows to perfection, but throughout the Himalayan Districts. Mr. Carleton observes that in former times in Kashmir, Chumba and Kulu, the only use of the fruit was the production of oil to adulterate ghee. But now the demand for walnuts in the plains is greater than the supply. Captain Lee says he has never seen finer walnuts than those grown in Kulu. In Jaunsar, beyond Chakrata, they are also very fine, especially the thin-shelled variety. Considering how easily the fruit can be distributed to distant markets, walnut cultivation ought to prove a very profitable undertaking. The chesnut is another tree of which it is very desirable to extend the cultivation in the Himalayas, but the difficulty is to find a soil and climate where they do well. Sir Edward Buck has devoted much trouble to encouraging the growth of this tree in the neighbourhood of Simla.

Mr. Carleton's experiments with oranges in Kulu have shown that the Malta Orange can be grown successfully on the lower hills up to an elevation of 4,500 ft. "In California," he says, "orange cultivation is extending up to the rich valleys of the Pacific slopes, and I see no reason why in these lower hills, orange cultivation should not be a success. I learn that oranges sold from the Government garden in Gujranwala, and other gardens, usually fetch from 5 to 8 rupees per hundred, and it is quite certain that Maltese oranges sent to the Simla market in April, when there is little fruit for sale, would fetch Rs. 8 and perhaps Rs. 10 rupees per hundred. An orange tree 8 years old that gives an annual crop of over 200 oranges could give the owner a profit of 16 rupees, and that only on 10 feet square of ground."

Many other kinds of fruit can be grown successfully in Kulu, such as strawberries, gooseberries, currants, raspberries, figs, &c., but they are all of too perishable a nature for safe carriage to the nearest market. There is no reason, however, why they should not be preserved either as jam or bottled fruit, and the same suggestion would apply equally to peaches, apricots and pears. The art of preserving fruit is one quite apart from that of its cultivation, and requires a very different kind of experience. These two industries might, however, be undertaken by a company employing experts in each department, and such a business, if properly managed, could not fail to be a very profitable one. Instead of importing year by year enormous quantities of jams and bottled fruits, India ought in reality to become an exporter of such things, Even now, some of the jams made by natives at Simla and other hill stations, are very far superior to much of what is imported from England. Excellent liqueurs can be prepared also from peaches, apricots and cherries grown on the Himalaya.

There are many other localities on the Himalaya besides Kulu where fruit culture and fruit preserves might be undertaken with profit. The most important existing fruit orchards are those at Mahasu near Simla, which were started about eleven years ago. To Mr. A. O. Hume and Sir Edward Buck their existence and continuous development are due, and they are now in a flourishing condition under the control of the Simla Municipality. These and the Government Gardens at Mussoorie and a few nurseries under the charge of the Forest Department, are the only establishments where any results are periodically made known, and very few of these reports come under the eye of the general public. Excellent fruit is grown in many private gardens in British Garhwal and Kumaon. There are Government nurseries near Ranikhet, and the fruit gardens at Julna near Almora, have long been famous for the excellent quality of the fruit produced there by Messrs. Wheeler Brothers. We have not mentioned Kashmir, which country alone might in time be made capable of supplying the whole of India with fruit. But in order to render fruit culture on the hills more attractive as an industry for private enterprise, co-operation is required, and this would undoubtedly be brought about by the existence of a journal which might be started so as to include the whole subject of fruit culture and fruit preserving, in the plains as well as on the hills. Such a periodical would serve as a continuous record of results, as well as a medium for profitable discussion. By way of summary it may be stated: firstly, that the present condition of fruit culture on the Himalaya gives promise of great future development. Secondly, that persons, either individually or as a company, desiring to take it up as an industry, would not fail to find it a profitable undertaking by combining with that business the manufacture of jams and other preparations of preserved fruit. Thirdly, that in order to excite interest in the subject, and to induce competent persons to take up the industry as a means of livelihood, the starting of a periodical journal is a desideratum.—(*Pioneer, December 12th, 1894.*)

Lopping Tree Branches.

The question whether the owner of an estate has the right to lop the branches of trees growing on his neighbour's property but extending over his own, has just been settled in the decision in the case of 'Lemmon *vs* Webb' which we quote.

"This was an appeal before the Lord Chancellor, Lord Mac-
'naughten, and Lord Davey from a decision of the Court of Appeal,
'reversing a judgment of Mr. Justice Kekewich, who decided in
'favour of the present appellant. In 1869 the appellant purchased
'a property called Malquoits, situated near Guildford, in the county
'of Surrey, and comprising about twenty-one acres, and in 1879 he

'purchased another estate, called Ewhurst Place, of about 106 'acres, the boundaries of which marched with those of Malquoits. In '1878 the appellant sold Malquoits to the respondent. At the time 'of the purchase by the respondent of the latter property, there were 'growing on the boundary of the two estates, but upon the land 'of Ewhurst Place, a number of large timber trees, the branches 'of which overhung the land and soil of Malquoits. The respon- 'dent, without giving any notice to the appellant, after he took 'possession of Malquoits, proceeded to lop off the branches of the 'trees that overhung his land, whereupon the appellant instituted 'the present proceedings with the object of obtaining a declaration 'that the respondent was not entitled to cut any branches of the 'appellant's trees which overhung the respondent's land when such 'overhanging had continued for many years, for an injunction to 'restrain the respondent from cutting the branches, and for dama- 'ges. The action was heard before Mr. Justice Kekewich who 'ordered the respondent to pay the appellant the sum of £5 'damages and costs. The respondent having appealed, the Court of 'Appeal reversed the decision of Mr. Justice Kekewich, and gave 'judgment for the respondent. The appellant now sought to have 'the decision of the Court of appeal reversed, contending that notice 'was necessary before the branches could be cut.

'At the conclusion of the arguments for the appellant, their 'Lordships dismissed the appeal, being of opinion that the respon- 'dent was not bound to give notice before abating the nuisance.

'Appeal dismissed with costs."

The Deterioration of Scotch Pine.

It cannot to doubted that the question, "Has Scotch pine deteriorated in quality during late years?" requires still further elucidation. It is asserted in the Scottish Arboricultural Society's *Transactions* that subsoil has a good deal to do with the degenerate appearance of some Scotch pine plantations, and two cases are cited in support of this theory. Before accepting this, however, it might be advisable to investigate still further into the nature of the tree itself, also somewhat into the history of its cultivation in Scotland. In my estimation, no tree at present in cultivation is so accommodating as to soil and situation as the native Scotch pine. Provided the ground is drained, it will produce timber of the very best quality and dimensions on stiff, clayey soil. I have seen it luxuriating equally well on a sandy soil and subsoil, and on a tenacious bottom. Take, for instance, the light, sandy soil of Morayshire, where you can see a large extent of Scotch fir growing well, and on the other hand the tenacious clay of East Lothian, comprised in that belt of land intersecting the county from east to west—say from the village of Garvald to that of Pencaitland,

where there are some fine Scotch fir growing. The timber, age considered, cannot be surpassed for weight and redness of quality, and growing too, on a soil which taxes the genius of the very best farmer to work in certain seasons. With regard to Scotch pine assuming a coarse, naked habit at certain stages of their growth, may this not arise from the presence of too much moisture in the subsoil and not from any fault in the soil itself? I have seen, particularly after a severe thinning on damp soil of this description, the Scotch fir assume a weakly, straggling habit, and never regain its wonted vigour. The Scotch fir has a decided tendency to run to branches when allowed space, and that, too, on the very lightest soils; one of the most notable examples falling under my own observation was a plantation near the river Spey. Part of it for some purpose or other had got a very severe thinning at one time; the remains of large half-decayed branches pointing out in all directions from the stems bore ample testimony that the growth at one time had taken a lateral direction, and it was only after nature had time to partially work a cure that the plantation was beginning to start away with a vigorous upward growth. The native pine adapts itself readily to any climatic influence; if planted at a great altitude and on an exposed situation, it lives to a great age, and remains perfectly healthy, though only arriving at a mere bush. In the same publication, it is said that "the native Scots pine when planted in the south does not succeed well, except occasionally in moorish localities." I could point out some very fine Scots fir in the south of Scotland, and when it gets leave to mature, arrives at first-rate dimensions, but this part of the country has been long opened up to trade, hence the timber as a rule is much earlier cut. I am led to believe, however, that *Pinus sylvestris horizontalis* had a much wider geographical range in Scotland at one time than it has at present. There can be no doubt but that large tracts of it existed at a much earlier period in the south of Scotland. Where did the supply of timber come from that built such towns as Edinburgh and Leith previous to the beginning of sixteenth century—for it must be borne in mind that prior to that date they were largely built of wod? There are houses still standing suppossed to have been built about that time, and wooded with Scotch fir; indeed, if I mistake not, Holyrood palace, which has been re-roofed, was formerly timbered with Scotch fir, which had been obtained somewhere in the neighbourhood, having stood for upwards of two hundred years. Now, since the north of Scotland has been opened up the same as the south, and where the process of clearing is being carried on to a large extent, the seed of the true variety will every year become more difficult to get, and Scotch fir may ultimately in many cases decline in quality in the north as it has done in the south. The selection of seed is everything in this question. In the south, where this has been carefully attended to, the reward has been

ample. The complete success of many fine Scotch fir woods in the south of Scotland can be traced in the first instance to the care bestowed upon selecting the true variety, which can only be secured in any quantity, from the natural forests in the north.

It might not be out of place here to mention that there is such a thing in forest nosology as the "larch disease"; the disease is clearly traceable to the effects of our climate upon this foreign plant. It is exactly the case with the Continental also Scotch fir; it is not suited to our climate and can never be compared with the native, the one which Nature has, with her own unerring hand, planted as the tree of the country. Some of the foreign Scotch fir, however, is not so unsuitable as others, but the best of it should be rejected unless for planting on dry, sheltered ground. Having had some experience of its early treatment in a small way (there being a home nursery of two acres under the writer's charge), I would reject it for no other reason than the percentage of deaths which occur in the nursery if the season is wet. A great amount of this seed is imported every year: it is a regular trade. I could buy it at Hamburg by the ton at a tremendous reduction compared with our own. I believe that the importation of seed is the chief cause of the languid, degenerate, appearance of many Scotch firs. In plantations of 20 and 30 years of age it could be distinguished this winter at a considerable distance, growing along with the native pine, with the seed of which it had been mixed, by its brownish tinge and straggling head. The Continental Scotch fir does not succeed either at a high altitude; indeed, I think in its native habit it does not reach to anything like the same high range as our own. The true native Scots pine is the safest tree to plant—it is the tree of the country—it is exempt from all climatic influences or diseases. It has been said that Scotch fir will succeed on any kind of soil, and in spite of all the cry about soil, subsoil, and climate, I have seen nothing yet to refute this statement.—(*W. W. R. in Timber Trades Journal.*)

Afforestation in England.

In the interesting letter which we published yesterday, Mr. W. R. Fisher, of the Royal Indian Engineering College at Cooper's-hill, called attention, not for the first time, to the importance of the subject of afforestation. Our readers may remember that this question was ventilated in our columns last winter, and on the strength of the information that reached us, we asked the Government to make inquiry as to the best means of developing a great and neglected source of national wealth and a highly important industry. Nothing, however, has been done so far as we are aware, either by the Commissioner of Woods and Forests or by the Board

of Agriculture, in the way of collecting data or conducting experiments. We may be excused, therefore, for returning to the subject, and for urging once more the vital importance of a national plan of forestry. What are the facts of the case? Dr. Schlich, the eminent forestry expert, estimates that half the waste lands in the United Kingdom could be profitably laid down as forest land. There are 26,000,000 acres of these waste lands, and if we were to plant only 6,000,000 acres we should obtain, according to Dr. Schlich, in the course of time, a sufficient supply to replace our annual import of timber. But not only do we refuse to plant fresh tracts of woodland: we are allowing our national forests to deteriorate year by year; private forest lands are treated on no scientific plan, but their fate is decided for the most part by the exigencies of the landlord's pocket.

As to the profitableness of planting our waste lands, the experts are agreed. Care would have to be exercised in selecting the species for the various soils and situations, and trained foresters would, of course, be required to look after the trees. In forty years' time, however, the return upon the outlay would be a handsome one. Mr. Fisher tells us that large plantations in Wales produce £90 per acre in the course of fifty-six years. In the interview which appeared in our columns last December, Dr. Schlich said, "I have calculated that a return may be obtained from all kinds of land, and it comes out, reckoning every possible outlay and including compound interest on the money invested, at the rate of about two and three-quarters per cent profit. As for the nature of the land which can be rendered profitable by afforestation, almost any kind is useful which can be obtained for £10 an acre, and that is always worth putting down in Scotch fir." Obviously, then, the State would stand to lose nothing by taking in hand the waste places and the unprofitable tracts of country, which might as well be at the bottom of the sea for all the good they do. Great Britain is, indeed, the only civilised country where it appears to be necessary to argue this point. In India, the Government have a fully-equipped forestry department. The French have a great school of forestry at Nancy, and Germany and most other European countries have their own forestry schools. Nay, our own Legislature is favourable to the principle while it remains indifferent to its application; for in 1887 a Select Committee of the House of Commons, presided over, if we remember aright, by Sir John Lubbock, recommended the establishment of a Forestry Board and national school in England. These schools might, perhaps, count for little in themselves but foreign Governments are by no means indifferent to the practice as well as the theory of forestry. The planting of the Landes, which was begun in 1789, has covered the vast desert of sand between the Adour and the Gironde with magnificent pine forests, and added £40,000,000 to the wealth of France. And this splended piece of reclamation, though the

greatest work of the kind, is only one of the many instances in which—to our shame be it said—other Governments have shown themselves superior to ours conserving and developing the national possessions. In spite of our taste for political economy and the gospel of thrift, we somehow manage to run through our national capital without much regard to the needs of the future. The time has come, we venture to think, to cry "stand" to this passion for turning everything realisable into ready money when the greed of commerce or the fancy for possession clash with the sound principles of public trusteeship. And in no respect is this more true than in this matter of afforestation.

We cannot imagine a better opportunity than the present for the inception of a scheme of afforestation worthy of this great and wealthy State. It is not necessary that all our enterprise and bravery should be spent abroad, or that capital should rust in the banks for want of enough Indian railways and African companies to absorb it. Here, at home, is a splendid opening for enterprise, administrative ability, and money that is going a begging. Landlords are searching eagerly for persons to buy their lands on almost any terms; agriculture, it is asserted, is in the sorest straits, dying for want of enterprise and backing, and unable to afford more than the barest living to the manual workers; the villages have just received their charter of Government, but the villagers want bread and houses, and some sort of prospect if they are to use it; and in the great towns every winter throws multitudes of people out of employment, whilst the exacting and unhealthy conditions of life press more and more heavily on the masses of the people. If the statesmanship of Great Britain is not equal to turning such a situation to worthy purposes, if it prefers to follow the old fatalism wherever it leads, there is nothing more to be said for the present, except that we must grow new statesmen as fast as possible who can interpret the needs of the country. But we refuse to believe anything of the kind. The workers are waiting and pleading to begin. The pioneer work of afforestment can be undertaken without any special training; a town labourer can do it as well as a countryman with the slightest practice; it can be done in winter, except when the ground is freezing, as well as in summer; and year by year as the underwood grows and the saplings shoot up, the new industry will call for more labour, while it sends its fresh currents of sap through the old country. No doubt there will be initial difficulties to get over, as there are in every untried scheme. But there are difficulties in the present situation too. The process of transforming rural England into a cover for game is not without its difficulties. The congestion of misery, sickness, and lack of employment in the great towns is a standing difficulty. The payment of poor rates and the administration of a Poor-law on the cul-de sac pattern is a difficulty. We ask the Government, therefore, with confidence, to take up this

question, and to deal with it in no mean or peddling way. Let them decide to cloth the bare places where thistles and weeds are growing, the grimy tracts of the black conntry and the wide moorlands, with the green trees which should be the heritage of every country, the trees which Mr. Auberon Herbert reminds us are as necessary to the beauty as they are to the proper utility of the country. Let them put spades into the hands of the workless labourers in town and country, and send them forth to plant the lands which have been stripped of their forests, and so help to bring back something of the old surroundings and the old spirit of the times when our land was known as Merrie England. *Daily Chronicle*, 27*th December*, 1894.

VII.—TIMBER & PRODUCE TRADE.

Statement of average selling rates of timber and bamboos in Meerut, Cawnpore, Bulandshahr, Bareilly, and Moradabad for the quarter ending 31st December, 1894.

Description.	Timber Scantlings per score.		Bamboos per 100 scores.		Remarks.
	From	To	From	To	
MEERUT.	R. A. P.	R. A. P.	R. A. P.	R. A. P.	
Sal 10′ Tors (Poles) ...	10 0 0	20 0 0	...	...	
Sal & Sain, &c., Kuries, 12′ × 5″ × 4″ ...	25 0 0	40 0 0	...	...	
Sal bed posts, 7′ × 2½″ × 2½″ ...	12 8 0	15 0 0	...	...	
Bamboos 9′ to 10′ per 100 scores ...	..	...	35 0 0	100 0 0	
CAWNPORE.					
Sal 10′ Tors (Poles) ...	4 8 0	5 4 0	...	...	
Sal, & Sain, &c., Kuries, 12′ × 5″ × 4″ ..	20 0 0	60 0 0	...	..	
Sal bed posts 7′ × 2½″ × 2½″ ...	10 0 0	12 8 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	30 0 0	60 0 0	
BULANDSHAHR.					
Sal 10′ Tors (Poles) ...	...	...	...	...	
Sal and Sain, &c., Kuries, 12′ × 5″ × 4″ ...	...	...	...	...	
Sal bed posts, 7′ × 2½″ × 2½″ ..	...	...	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	50 0 0	55 0 0	
BAREILLY.					
Sal 10′ Tors (Poles) ...		10 0 0	...	...	
Sal & Sain, &c., Kuries, 12′ × 5″ × 4″	5 0 0 25 0 0 40 0 0	35 0 0 50 0 0 60 0 0	.. ..	... ...	
Sal bed posts 7′ × 2½″ × 2½″ ...		15 0 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	10 0 0 ...	-	50 0 0	137 0 0	
MORADABAD.					
Sal 10′ Tors (Poles) ...	20 0 0	25 0 0	...	...	
Sal & Sain, &c., Kuries 12′ × 5″ × 4″ ...	30 0 0	50 0 0	..	...	
Sal bed posts 7′ × 2½ ″ × 2½″ ...	0 8 0	0 10 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	--	50 0 0	75 0 0	

Churchill and Sim's Circular.

December 5th, 1894.

MAHOGANY-MALABAR.—Several small parcels, which had been held as unsaleable for upwards of two years, were cleared by unreserved auction at the end of the year. The disastrous prices realized, averaging barely 1¾d. per foot, furnish very forcible evidence to shippers that this wood is not appreciated here.

CEDAR.— Only one small parcel came from Malabar, but the logs, being large, brought fair prices, and it is only sound, straight logs, of large sizes, which are likely to sell well.

PADOUK.—The consumption of this wood has not extended so much as was anticipated, the demand for the United States seriously declined, and the probability of increased use in the home trade was prevented by the low prices ruling for Mahogany. These circumstances resulted in an accumulation of stock, which is now heavy, and a decline in prices to from 2s.6d. to 3s. per foot cube for planks and logs.

ROSEWOOD.—East India. Old stocks are gradually cleared, but at low prices, which showed that no improvement all through the year. Only two small parcels arrived, and these having been placed, importers are now without stock ; but shipments should be small and consist solely of large, sound logs of good colour. Quotations are from £5 to £8 per ton.

SATINWOOD.—Figury logs brought good prices, but there was very little demand for plain wood, only three small parcels (together 31 logs) were imported, no planks or boards came forward, but they were not needed. Quotations for logs are from 6d. to 12d. per foot.

EBONY—East India. Only two small parcels came forward, and these being above average in colour and soundness, sold well ; there is now no stock on hand, so that moderate shipments of really good lots would find ready buyers. Quotations are from £6 to £8 per ton.

EAST INDIAN TEAK—The importation of timber and planks has been :—

	1888.	1889.	1890.	1891.
	12,270 loads.	19,407 loads.	16,000 loads.	16,588 loads.
and the deliveries	16,618 ,,	15,899 ,,	17,140 ,,	14,371 ,,
		1892.	1893.	1824.
		7,923 loads.	12,687 loads.	9,849 loads.
and the deliveries		10,455 ,,	12,646 ,,	10,620 ,,

There is nothing satisfactory to report of the London Market for Teak during 1894, this finest of woods having remained at low and very stagnant level of price from one end of the year to the other, and even this cheapness having failed to check a very decided falling off in the rate of consumption. The market stock has been kept low all the year by a judicious moderation in the shipments both from Burmah and Siam; the latter continue to grow in favour as the excellence of their quality and conversion becomes more practically known.

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, January 1st, 1894.

Cardamoms	per lb.	2s.	to	2s. 6d.
Croton seeds	per cwt.	20s.	to	27s. 6d.
Cutch	„	20s.	to	32s.
Gum Arabic, Madras	„	15s.	to	30s.
Gum Kino	„	£15	to	£18.
India Rubber, Assam,	per lb.	1s. 7d.	to	2s.
„ Burma	„	1s. 7d.	to	2s.
Myrabolams, Bombay,	per cwt.	7s. 6d.	to	9s. 3d.
„	„	3s. 6d.	to	4s. 3d.
„ Godavari	„	6s.	to	6s. 9d.
Nux Vomica, good	„	6s.	to	10s.
Oil, Lemon Grass	per lb.	1¾d.		
Orchella, Ceylon	per cwt.	15s.	to	22s.
Redwood	per ton	£3. 10s.	to	£4
Sandalwood, logs	„	£35	to	£55
„ chips	„	£9	to	£30
Seed lac	per cwt.	30s.	to	90s.
Tamarinds	„	8s.	to	8s.

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The Reproduction of High Forest.—(*Cont.*)

(*By M. Ch. Broillard in the Revue des Eaux et Forêts.*)

As to the arrangement of the coupes by area in a forest treated on the uniform system of successive regeneration fellings, it is obvious that in the case of a compartment in which each coupe passes over the whole area that the case is met by returning simply at intervals of five years. It is also clear that if we were dealing with five similar compartments, a coupe could be made each year, one in each of the five compartments successively, until the exploitation of the whole was compete, *viz.*, for 20 years.

As to whether the yield of these coupes would be more or less equal would depend on circumstances, but it is easy to see that in any case *a good coupe* would be made every year ; in the 19th just as in the 6th or the 15th, or any other year. The relation of the values of the different coupes depends not only on the number of trees but also on their value. The second coupe would, of course, give less trees than the first, and so with the others, each would give less than the preceding one. But if in each successive coupe the worst trees are chosen, it is possible that the values would equalize themselves, sometimes even the value increases. For the present I restrict myself to stating this fact.

At the end of 20 years then, the exploitation of the five compartments will be complete, just in the same way as one would complete the exploitation of a small coppice working circle. But if we have 20 high forest compartments, we can, after exploiting the first five in 20 years, set aside five others for the next 20 years, and so on, taking 80 years to finish the whole, and similarly 100 years in the case of 25 compartments, or 120 years for 30, making each year a good coupe, good in a sylvicultural sense, and attended with valuable results on the crop.

This then is a simple method of fixing by means of a small number of equal coupes the working by area of a forest treated on the uniform system of successive regeneration fellings, for it is always easy to divide it like a coppice into 20 or 30 compartments. This too fulfils the promise I made some two months ago to indicate the best method of removing each year approximately the 20th or 30th part of the material of a high forest crop.

There are several other methods of adapting the working to different forests. I mentioned one in the "Traitement des Bois," p. 258, which is as follows:—If it is desired to exploit two principal coupes each year instead of one, this can be done by making the number of compartments equal to one-half the number of years in the rotation.

In the forest of Darney, worked on a rotation of 160 years, each working circle is divided into 80 equal compartments. By locating the first felling successively in each compartment in the odd years 1895-97-99, &c., and the second felling in the same compartments in the even years 1900, 1902, &c., the working plan is complete. The third felling follows the first 10 years after in 1905, 1907, &c., and the fourth similarly follows the second in 1910, 1912, &c. From the tenth year two coupes are thus regularly exploited each year, 1st and 3rd, or 2nd and 4th. The coupes like the compartments thus go in pairs, which seems an excellent and simple arrangement. The order of the felling is easily seen from the following table showing the arrangement of the coupes in pairs:—

Year of the felling.	1st and 3rd fellings.		2nd and 4th fellings.	
	Compartment.		Compartment.	
1895	I	..	...	...
6	...	...	...	..
7	II	...	...	...
8	...	...	...	...
9	III	...	...	...
1900	...	...	I	...
1	IV	...	...	...
2	...	...	II	...
3	V	...	...	...
4	...	...	III	...
5	VI	I	...	...
6	...	...	IV	...
7	VII	II	...	...
8	...	...	V	...
9	VIII	III	...	...
10	...	...	VI	I
11	IX	IV	...	...
12	..	...	VII	II
13	X	V	...	...
14	..	...	VIII	III
15	XI	VI	...	...
16	...	...	IX	IV
17	XII	VII	...	...
18	...	...	X	V
19	XIII	VII	...	...
1920	...	...	XI	VI
21	XIV	IX	...	...
22	...	...	XII	VII
23	XV	X	...	...
24	...	...	XIII	VIII
25	XVI	XI	..	...

The blanks left where no fellings are provided for the first few years will often be filled by compartments which are in course of exploitation, and the table will thus be complete and the yield sufficient from the commencement. The typical arrangement of the coupes in a High Forest would be that in which the forest is divided into the same number of compartments as years are required to produce an exploitable crop, and which provides each year a 1st, a 2nd, a 3rd and a 4th felling, each passing from one compartment to the following one. The fellings following each other at 5 or 6 years' interval in the same compartment, it is as easy to regulate them as it is thinnings. One may almost say there is nothing to anticipate, once the exploitations are started one simply has to follow the order. This ideal is sufficiently easy to realize in the high forests of the plains of France. Leaving this ideal we are well aware that it may be necessary to return a fifth time in several compartments to remove some of the trees reserved in the fourth coupe which would otherwise deteriorate. Again, it may happen that occasionally one of the four principal coupes has to be reduced in a given compartment, or even postponed altogether, on account of the insufficiency of the reproduction, or for some other reason. The sequence of the fellings undergoes from then a delay of five years in that particular compartment, but the general order is not affected. The record of such facts, together with the number and volume of the trees exploited from each compartment at different times, will form the history of the compartment, each of which thus becomes an experimental plot. In the course of time it will be easy to follow the events of the past, and the phenomena peculiar to the forest and the different parts of the forest will manifest themselves as time goes on. The record thus kept up, as has been done since 1881 for the Forêt de Haye, will show by simple and numerous facts what has been the production of the soil, what system of culture is suitable, and what modificatious it may be necessary for the working plan to provide. These will probably be just as simple as the main provisions.

If working by area is easily applied to high forest of leafy species and pines, it is equally adaptable to silver fir forests, and particularly so when beech, spruce, Scots pine or other species are mixed in the crop. Sometimes one is at a loss to know how to set about obtaining a satisfactory reproduction in such forests without exposing the whole tract to the ravages of storms.

Generally, the system which offers the best chances of success will be that which provides for the removal every six years of one silver fir in five, one beech or spruce in three, and one pine or other species in two, in the same way as one would remove one oak in four if the oak were represented. Suppose, for example, that there were 300 trees per hectare, 100 silver fir, 100 beech and

100 Scots pine, the first coupe would remove—

Silver fir, 1 in 5, the least promising	... 20
Beech, 1 in 3, the most spreading	... 33
Pine, 1 in 2, those with the smallest crown	... 50

There would then remain 80 silver fir, the best; 67 beech, the straightest, least spreading; and 50 pines, those with the best crowns, all characters valuable in themselves as well as for the production of seed.

Six years later the next coupe would remove 16 silver fir, 22 beech and 25 pines, chosen as in the preceding operation. The third coupe would remove 13 silver fir, 15 beech, and 13 pines, and finally the fourth 10 silver fir, 10 beech and 6 pines.

There will thus remain finally some 40 young silver fir, 20 small beech, and some half dozen well grown pines, to enrich the new crop, with which all or most of these will be able to assimilate themselves. If not, a fifth coupe would dispose of such trees as were likely to deteriorate. This would be 24 years after the seed felling; it is not too late, as in mountainous regions it requires a fairly long time for the regeneration of a forest of mixed species to complete itself.

In a mixed crop of spruce and silver fir, the exploitation may be conducted without any particular modification. It will probably be desirable to remove one spruce in three, in order to fell proportionally more spruce than silver fir. In pure forests of spruce and forests of beech and spruce, I think that this would still be the figure to adopt, on account of the large number of stems and the robust nature of the young spruce seedling,—at any rate where the method of thinnings is applicable to this species. In all that has been said above, there is nothing which refers to the selection method, nor is any comparison intended of the two methods; indeed the result of such comparison is usually a discussion based on uncertain premises, and the more preferable of the two systems, selection or thinnings, seems to depend on which is better applied.

Whatever the facts may be on this point there is no doubt that the regeneration of a high forest as a whole may be obtained in the best condition by means of coupes fixed by area, and returning over the same ground at fixed intervals.

In proceeding as I have just indicated it is possible to satisfy all the conditions required by the different species and by given or desired mixtures of species; it is easy enough to satisfy oneself on this head, when the character and reproductive power of the different forest species is known, by calculating the number of trees of each species left standing after the 1st, 2nd, 3rd, and 4th coupe.

Whether the trees of a crop are large or small, or of various sizes mixed together, the definition of the regeneration felling by area remains the same; it is always the removal of one tree or one

pole in 2, 3, 4, or 5, according to species. From a group of five large silver firs only one would be taken, if there were fifteen small ones, either in a group or already more or less separated, then three would be felled; if there were large and small mixed together one in each five would still be removed, and that one the least promising, whether among the small or the large trees.

Take the most complex circumstances: for example, a high forest or a coppice with standards, or even an old simple coppice, in which the crop is complete in places, incomplete in others, open in others, having here and there only isolated trees, in short presenting all sorts of conditions not only in the above respect but also as regards the species. The most practised of Forest officers might be at a loss to know how to conduct a regeneration felling in such a case, as it would have to be of a quite different character from point to point. It is only recently I had occasion to prove this on the spot in a coppice undergoing conversion, where, above all, it is important to have some certain and definite method of procedure. In seed fellings or secondary fellings it is easy enough to test the fact that in following the method indicated above, a suitable coupe will in all cases be made, and one which will tend to bring about at all points the desired result, which is the re-stocking of the soil with the principal forest species. It is certainly better to choose the trees to be felled carefully, in removing by preference among the oaks the worst tree, among the beeches the most spreading, of the hornbeam the shortest, and so on, instead of simply taking the fourth oak, the third beech, without discrimination throughout the compartment. But if I am not mistaken, in undertaking the work even in such a mechanical manner as this, one would, nevertheless, succeed in time in obtaining a good reproduction of the forest. With intervals of five years between two successive coupes this time may be 15, 20, or 25, years according to the skill of the operator; and the question as to whether it is preferable to finish in 15 or in 25 years is not easily answered. One point about which there is no doubt is the necessity of the free use of the bill-book at the time of each exploitation, to clear the ground, cut back the beech, or thin out any inferior species which threatens to invade the crop, according to circumstances. For such an operation I do not see that there can be any other guide but experience.

The method indicated to be followed does not then render unnecessary the careful choice of the trees to be felled, a thorough knowledge of the forest, nor the precautions to be taken to prepare the soil or get rid of the undergrowth completely or partially, as the case may be, any more than it suffices to assure the production of seedlings of the better species where seed bearers of these are absent. There can be no doubt that to manage and work a forest it is desirable to have a Forest Officer, but before commencing operations, he, no matter how experienced he may be, should have a clear idea of the nature of the coupe he is going to make, which

is not by any means always the case. The mechanism described above limits and defines the idea of the operation from a cultural point of view, while at the same time it fixes its limits on the ground. Moreover, owing to the exploitations being fixed beforehand, and returning at fixed intervals to the same areas, it is possible to undertake sowing, planting, or other necessary works at the proper time and under the most favourable conditions for the assurance of their maintenance and success. It has also the merit of eliminating from a high forest the clear felling which is the expedient of an ignorance always to be regretted, and the final felling, which is an operation contrary to nature. Then it adapts itself in a special manner to each forest, showing clearly the result of the successive exploitations fixed by area. The irregularity and disorder of coupes by volume would never give this information.

A. F. G.

Wood for Tea-boxes.

The following additional information about tea-box woods in Assam may prove of interest. Besides the woods mentioned in the October number of the the "Forester," a large quantity of "shooks" are imported from Japan; they belong to some coniferous wood, probably *Cryptomeria Japonica*, and though they cost rather more than Simul at the outset, nevertheless as they are thoroughly seasoned and ready for dove-tailing, they can all be utilized without any loss.

Consignments of what is known in the trade as 'spruce' are received from Vancouver's island, and some red wood, probably a kind of *Dipterocarpus*, comes from Burma.

At first sight it may seem strange that, with her large forest area, Assam should have to indent for the tea-box woods from distant countries, but it is essential among other conditions, that for a wood to come into practical use on a large scale, the tree which yields it must be gregarious; it will never pay to employ a wood which is only found scattered here and there. Thus, though there are in the Dehra Dun forests several trees adapted for tea-boxes, it is probable that the planters of that district will eventually use either spruce or silver fir from the neighbouring Himalayan forests, as soon as their available supply of mango trees has been exhausted.

A. S.

Raising Box from Seed.

Box (*Buxus sempervirens*) is of course one of the valuable trees of the Himalayas. It grows in several localities in the Punjab, and ascends sometimes to a height of 8,000 feet.

In Bashahr the tree is found along the Nogli, the Ganwi, the Wangar, the Panwi and the Punang rivers. It extends to the vicinity of the dry zone above Wangtoo, but disappears at Sholtu. Like other trees of the moist zone it rises higher as the dry zone of climate is approached, for the obvious reason that the rainfall at high elevations is often great and very frequent, and heavy mists remain long over such areas during the monsoon months. Very fine specimens of box are still found in the much exploited forests situated in the basin of the Nogli river in the moist and sheltered localities along the banks of streamlets, generally in company with chestnut, maple, hazel, walnut, yew, ash and spruce. Here most of the trees attain a girth of 4 feet, and sometimes grow clean boles four times their girth in height. All these forests were felled over some time in 1885, when a large quantity of this timber was carried to Simla, but owing to the fall in prices it could not be profitably sold.

Natural reproduction in these forests was fairly satisfactory. It was therefore attempted to raise the tree artificially. For this purpose several nurseries were established in the most favourable sites. I remember I made a large nursery at Dankali in 1883. But all these nurseries are still as bare as the palm of the hand. I also believe that about that time experiments with regard to artificial reproduction of the tree were instituted in other divisions in the Punjab as well. But all efforts to produce the tree in a nursery have hitherto resulted in failure. A few days ago I visited a Box forest on the Nogli. A Zemindar of an adjacent hamlet, who had collected Box seed in October-November 1893, had left some capsules in a corner of a field. A dense crop of seedlings had come up there. On a careful examination I found that the seed which lay sheltered inside the fruit had all germinated, while the black grains which lay without the capsules, exposed to frost, had all of them got rotten. The *sine quâ non* for the germination of Box seed is therefore shelter from frost. The Box seed is not very oily. This fact renders its wintering a matter of some difficulty. It is for this very reason that the natural Box seedlings generally come up from under rocks or spring up on similarly sheltered places where frosts cannot destroy the vitality of the seed. In order, therefore, to raise the seedlings in a nursery on the Nogli, I would recommend that the entire capsules, when well ripe, should be sown, and I should not wonder if the seed sown in the rains—in the first week of July—would freely germinate.

BASHAHR:
10*th Febraury*, 1895 } MIAN MOTI SINGH.

The Flowering of the Thorny Bamboo.

Mr. Bourdillon's account of the Travancore teak is excellent. I wonder, however, that he did not note how much the shorter grained teak of the hills used to be preferred to the teak of the deep soiled valleys in the old Bombay dockyard, especially for "knees" and keels in ship-building, where great strength was required. Will you turn to page 468 where his remarks on my old friend "Bambusa arundinacea" are given. "It dies down at intervals of from 25 to 30 years, and 8 or 10 years must elapse before full sized culms can be obtained." Mr. Bourdillon continues :—"A general seeding occurred in South Travancore when 'Lieut. Ward was travelling through the country, and another in '1870. This last was confined to the area south of the Acchankovil 'river. North of this river the seeding occurred about 1879-80, 'and it has been impossible to get full sized bamboos in North Tra-'vancore ever since." From these observations I infer two things, both contrary to Mr. Bourdillon's initial theory. First, I infer that in South Travancore there was no general seeding between 1817 and 1870. Secondly, that more than 13 years are required for the seedling to develope and yield marketable mature culms.

At the special invitation of the Editor of the *Journal of the Bombay Natural History Society*, I roughly threw together my observations and the result of my readings on this subject. You will find my contribution at page 298, of Vol. VIII, No. 2, published on 15th October 1893.

Very few, if any, Europeans stay long enough in this country to witness a second general seeding on the same area, and of those few, probably hardly one would be an observer of Nature. I asked what hope there was of solving the question of the life period of the bamboo by native evidence. "Trustworthy evidence is not forth-'coming. It is in the hope that others, while pardoning my mistakes, 'will help to solve this puzzle, that I venture to indicate direc-'tions in which further enquiry promises." I believe I brought together all the evidence then available to me. You may care to read it, so I copy it from the pages of the Journal. You will see that Mr. Bourdillon's facts, but not his theory, agree with the general native belief which, in 1893, I adopted. You will, no doubt, be struck by the coincidence of the flowering in South Travancore and Jubbulpore in 1869-70, and of that in North Travancore in 1879-80, very nearly or quite simultaneously with isolated clumps at Nagpur, Narsinghpur, the residue of those left in Sleeman's Park at Jubbulpore, and shortly before the second known general seeding at Dehra Doon. So also, Lieut Ward's observation in South Travancore in 1817 coincides with the alleged flowering in the Weinganga valley when Appa Sahib Bhonsla lost his throne. But in the Weinganga country I think the next flowering was in 1866, just before the Jubbulpore exhibition :—

'My first recollection of the Katang bamboo is derived from 'Jubbulpore when Sleeman's Park was still the pride of the station. 'And the pride of the Park lay in the luxuriance of its bamboos. 'Next, at the Nagpore Exhibition at Christmas time, in 1865, 'the finest poles of the Balaghat District were shown. 'I can well remember their extraordinary length, but am too 'cautious to hazard figures. Anyone curious on this point had 'better hunt up an old catalogue of the Exhibition or apply to 'Colonel Bloomfield, an excellent authority on bamboos, who was 'the first Deputy Commissioner of the Balaghat District. The ex- 'treme length of those poles was accounted for in this way: the 'bamboo clumps grew on deep soil, in a moist valley, very close to 'one another; having no room for lateral expansion, they could 'live only by growing very tall."

'There were at that time, *viz.*, at the end of 1865, one or two 'enormons clumps of Katang in the Maharaj Bagh, the public 'garden at Nagpore, and on its outskirts a great number of young 'ones, all apparently of the same age not more than about ten 'years, possibly less.

'The Jubbulpore Exhibition was held at Christmas 1866. I 'believe there were no Balaghat bamboos exhibited there, and for 'this reason, that meanwhile there had been a general flowering of 'the Katang bamboos in the Upper Weinganga Valley, that is in 'the Bhandara and Balaghat districts. But on this point I have 'no personal knowledge; I have, at best, a faint recollection of what 'I heard long ago. It may be that the seeding in the Weinganga 'Valley did not occur till 1870. The rainfall of 1868 was a dis- 'astrous failure in the old Saugor and Nerbudda territories, and 'this, following on poor harvests in 1867 and the spring of 1868, 'severe famine ensued. In May of 1869 I was transferred from 'Nagpore to Jubbulpore. Passing Seoni, two or three miles of 'projected bamboo avenue were met. Small clusters of roots had 'been divided off from the parent clumps, and these roots, with 'four or five feet of stem, had been planted, fenced, and well water- 'ed. In Jubbulpore the rains of 1869 commenced very late, but 'were not particularly short in quantity. In the spring of 1870 'about four-fifths of the bamboos in Sleeman's Park and through- 'out the station burst into flower, seeded and died. The seed 'would have been all used as food but for the care of the District 'officers. Seed nurseries were formed, and a vast number of 'young plants were reared, and the surplus distributed far and 'wide.

'Early in 1881 I was a second time Deputy Commissioner of 'Narsinghpore, living in the house which had once been that of Sir 'William Sleeman, uncle of Colonel Sleeman, the last owner of 'the Park at Jubbulpore. In my compound stood two superb 'clumps of the *Bambusa arundinacea*. These burst into flower, 'seeded, and died in the hot weather of 1882. From their seed

'was raised a considerable supply of young trees, which were distri-
'buted in great part along the Great Indian Peninsula line of
'Railway. It was, to the best of my belief, in the same year that
'the remaining portion of the old clumps in Sleeman's Park at
'Jubbulpore and the old bamboos of the Maharaj Bagh at Nagpore
'seeded and died. Possibly I am wrong about the Nagpore
'Katangs. I remember that in or before 1879 the Forest De-
'partment, under the immediate care of Colonel Doveton, began to
'cultivate these bamboos at Telin Kerry, two miles west of Nagpur,
'for profit. The supply of Nagpore and Kamptee was aimed at.
'Possibly the seeds for this interesting experiment came from the
'old bamboos of the Maharaj Bagh.

'I learn that the general seeding of the Katang bamboos at
'Dehra, in the Doon, occurred in the spring of 1882. In the
'weather of 1885, I visited the upper valley of the (Cuttack)
'Mahanadi river, and the Jeypore Zamindari of Madras. Return-
'ing by the way of Dhamtari and of Rajim (where the Pairi river
'falls into the Mahanadi), I found a large number of bamboo
'clumps coming into seed. The Zemindars and Government
'officials promised to save all the spare seed for me, and this they
'kindly did. Two sacks of well-ripened seed reached me at Ghazi-
'pore, and thence it was distributed throughout India; some was sent
'to Australia, to Cyprus, to China, and even to Cornwall. The
'Secretary to the Agricultural and Horticultural Society of India
'took the rest for their corresponding Societies. He also kindly
'brought to my notice writings of Sir William Sleeman in the
'printed proceedings of some Society, possibly of the Asiatic
'Society, in which was noticed a general seeding of the Bamboos
'at Dehra Doon, in or about the years 1832. In 1886 I revisited
'Rajim to find that all the clumps had died off. Here and there
'was to be seen an exceptional stalk, and a few attenuated and al-
'most abortive shoots had sprung up from moribund roots. These
'were striving to flower and seed.

"This season I visited the Malkua hills, about thirty-five miles
'south-east of Rajim. Here also were dead clumps; around them
'young seedlings struggling for life, the outcome of the seeding
'of 1885. From several sources reports were heard that all the
'Katang bamboos in that mass of Vindhyan sand-stone hills, from
'amid which the Jonk river begins its northward course, had
'seeded in the previous year (1885). This mass of hills lies
'about thirty miles south-east of the Malkua hills, south of an
'imaginary village named as Tarnot on the Government maps of
'the Chhattisgarh Feudatory States.

'It was in this year (1886) that with a well known member of
'this Society (Natural History Society of Bombay), I saw the waters
'of the Udanti, a branch of the Tel, which again is an eastern affluent
'of the Mahanadi. The Udanti rises in the western side of
'the same mass of hills whence the Jonk runs northwards.

'The Udanti first runs southwards, then turns to the east. 'We had occasion to visit the favourite mud bath of an old 'solitary bull buffalo on the banks of the Udanti—not a dozen 'miles from its source. This spring was in the centre of a large 'thicket of Katang bamboo, said to have all grown from the seed 'of one isolated clump. I can only give a guess at the age of the 'young trees. My own re-considered impression is that the parent 'clump must have seeded after 1870, but before 1882. I hope the 'friend who put an end to the bull's career will be able to give 'a better estimate of the age of the young thicket.

'In 1878 I saw the beautiful bamboos of the Indore Residency. 'I know nothing of their history or pedigree, but imagine them 'to be of the same age as the young clumps I saw at Nagpore in 1865. 'In 1886 I saw a number of mature clumps at Gorukpore. These 'must now be very near the end of their life-period. In the spring 'of the current year, 1893, we had bamboo clumps flowering in 'the gardens of Queen's College at Benares and in the Civil Lines 'at Cawnpore. It is said (this is being verified) that the fine clumps 'at Dhariwal in the valley of the Ravee, near Gurdaspore in the 'Punjab, seeded last year.

'The building of Queen's College, Benares, dates from 1841-'1843. It does not follow that the gardens were laid out at the 'same time. Indeed it is believed that this was done by Mr. 'Griffiths. The present Principal, Mr. Wright, believes, on parole 'evidence or tradition, that the bamboos now seeding have been in 'the garden for forty-five years. But granting this, it does not 'follow that they are only forty-five years old. They may be older. 'They may have been transplanted forty-five years ago from a 'nursery, or they may have been then raised from roots partitioned 'off from a clump of some years' growth.

'Pass on to our native beliefs. First of all, to the *Bambusa 'arundinacea* is attributed a life period of fifty to fifty-five years. 'Next, natives tell one that its seeding is not gregarious; on the 'contrary, that, however widely distributed may be the progeny 'or the offsets deriving from any one general seeding, all the pro-'geny and all the offsets must flower, seed, and die simultaneously. 'Thirdly, they profess to believe that a general seeding coincides 'with drought or with scarcity after drought. It has been asserted 'that coincident with such scarcity will be found an unusual abun-'dance of the edible seeds of forest trees, such as the Sal tree, '(*Shorea robusta*), of the Nimar Anjan (*Hardwickia binata*), or 'the common Shisham (*Dalbergia latifolia*) and the like—a pro-'vision of nature for such a time of want. To this it has been object-'ed that whereas coincidence attracts attention, the opposite condition 'passes unnoticed. This is a theoretical objection of no great weight. 'Beyond question the flowering of the common male bamboo 'is rightly described as gregarious. Its life period seems to be 'about fourteen years. On the same hills I have seen large patches 'seeding in different years in 1870 and again in 1879.

'In the year 1874 I passed through the Pandooah jungle 'between Maldah and Dinagepore, in Lower Bengal, on so-called 'famine duty. Returning in 1875 I found all the thick thorny 'bamboos of that large tract—a variety strongly resembling, but 'smaller than, the Katang—had lately seeded. The general seed-'ing at Jubbulpore in 1870 followed the Bundelkhand famine. 'I have heard mention of bamboos seeding at the time of the 'Madras famine, but cannot vouch for the accuracy of the inform-'ation. I know of no noteworthy scarcity following on drought 'in or previous to 1882, or 1885, or 1893. On the second topic 'of belief, all the evidence I have to offer is this. In Seoni 'strenuous efforts were made to raise an avenue by laying down 'offsets from old clumps taken from the nearest source of 'supply, the station of Jubbulpore and Sleeman's Park. I 'saw these full of promise in 1869. By the following May 'they had prematurely budded from the stem, and were withering 'away with their abortive seeds. Although there may be no more 'evidence available, it would be rash to reject this native theory. 'At any rate it is pretty, and is not disproved. I cannot now 'refer to Sir William Sleeman's writings, but I cannot resist a 'belief that some of the clumps in his park at Jubbulpore and 'those in his garden at Narsinghpore came from the seeding in the 'Doon, about which he wrote. That seeding was about 1832. 'Moreover, there was a general seeding in the Doon in 1882. 'This gives an interval or life period of fifty years. Some late 'inquiries in the Doon elicited the curious answer that between the 'consecutive flowerings of this bamboo a child will grow to be a man, 'and his son will reach manhood. Nothing more definite could be 'learnt. Were I an interviewer, no doubt the words of a conversa-'tion of about 1879 in the Bhandara or Balaghat District would 'be forthcoming. Though they cannot be given, their substance 'is clearly remembered. Speaking of another old man my inform-'ant declared his friend to be old beyond computation—a hundred 'years old or more. Well, if the Sahib was not content with that, 'surely it was enough to say that his friend had twice in his life-'time eaten the seed of the great bamboo. Gently pressed to try 'to merely fix the earlier time, the old man at last gave a clear 'clue to it. He had often heard his absent friend speak of having 'had to eat the seed of the Katang bamboo in the year when the 'Raja Appa Sahib Bhonsleh lost his kingdom. All the villages 'were burnt by the Gonds, who rose in rebellion for the king's sake, 'and but for the seeds and roots of the forest, people had died of 'hunger. There is no valid reason for disbelieving this unpremeditated 'story. It may then be concluded that there was a general seed-'ing in the Upper Weinganga Valley in 1818, and another 'between 1865 and 1870—an interval of some fifty years."—I am now writing from Najibabad, in the Bijnour district, not far away from Dehra Doon. Here we have most luxuri-ant and lovely growths of this bamboo. These assuredly have no

connection with the general seeding in the Doon of 1882. Probably the age of these Najibabad clumps is about twenty-five years. If I am right, they point to their seeding of 1869-70.

Mr. Bourdillon thinks that clumps will yield mature culms in ten years or less. My own belief, derived from experience, is that no clumps can be said to come fairly into bearing in less than fifteen years. You will be able, if you accept this opinion, to apply the analogy of other natural products of semi-tropical lands. What is ordinarily the proportionate space of immaturity, compared with the duration of a plant or of a tree's matured life? Freaks of nature we see in the individual, but regularity of operation is the first of Nature's laws.

NAJIBABAD:
8th January, 1895. } JASPER NICHOLLS.

A large Banyan* tree.

The following information with regard to the size attained by the Banyan tree in the sub-Himalayan tract of the North-West Provinces may be of interest to some of your readers. I had occasion to go through the waste lands of the village of Haidarpur Hinduwala, in the Saharanpur district, which adjoin the Government reserved forests on the southern slopes of the Siwaliks near Barkala, a place about 9 miles east of the Jumna where that river enters the plains of India. The waste lands referred to lie between the Eastern and Western branches of the Barkala *Rau*†. The Banyan tree stands near the Western edge of some scrub jungle which is much grazed over, and the trees of which are lopped annually to provide material for making hedges to keep cattle and wild animals out of the fields. It forms a very striking object from the outer spurs of the Siwaliks, where it stands out very definitely, from contrast, probably, to the poor scrubby trees by which it is surrounded.

The girth of the central stem, leaving out the aerial roots which have been thrown out near it, measured at breast height, is 27 feet 10 inches. There are in all 127 distinct aerial roots which vary in girth, measured at breast height, from 7 feet 1 inch to 7 inches. The height of the tree was measured with an Abney's level and a 100 feet chain, and was found to be 53 feet. Two diameters of the crown measured at right angles to each other, with a 100 feet chain were 183 feet and 150 feet respectively. The circumference of the crown measured with the same chain was found to be 523 feet. The foliage comes down very much nearer to the ground on the south than on the north side of the tree, and two strikingly distinct kinds of foliage are seen. On some branches the foliage consists of large shining green leaves, while on both sides of this portion of the crown the leaves are very much smaller and

* Ficus bengalensis *Linn.*—Vern. *Bar*, *Bargat*.
† Bed of a mountain torrent.

not nearly so shiny. The central part of the crown consists of large vigorous leaves, while the two sides of the crown are made up of much smaller and more greyish green leaves. The difference between the foliage of the different parts of the crown is so distinct that it must strike even the most casual observer. The tree is said to be 1,000 years old, and it may well be that age. The tree is still very vigorous, and shows no signs of decay, or old age, unless this be indicated by the smaller leaves on some parts of the crown.

BARKALA :
9th February, 1895 } C. GILBERT ROGERS.

II—CORRESPONDENCE.

Commutation of Rights.

We have thought over 'B. H. B-Ps' letter in our February Number, and think it right for us to say that while it gives a most useful opinion on the question of forest rights, we cannot agree with him in his views of the powers of a Forest Settlement Officer; we will go further and say that we are glad that our Government does not take the same view. We think it would be a dangerous thing to allow a Forest Settlement Officer such a large margin and permit him "in his pleasure or equitable discretion (subject to 'appeal) to admit or reject claims" and "allow all that he considers may equitably be allowed as *rights*," even when not proved to be legal easements. Many Forest Settlement Officers are young civilians or members of the Provincial Civil Service to whom we hardly think the Governments ought to delegate such extensive powers. The Government of India in 1886 laid down : "There is nothing in 'the Forest Act that justifies the Forest Settlement Officer in pro-'viding for the prospective wants of non-existing settlers or of a 'future and possibly more numerous generation : nothing that 'permits the concession by a Forest Settlement Officer of more 'extensive rights than those to which he finds claimants to be 'entitled at the time of settlement. The rights claimed must be 'actually existent rights, vested in an individual or person or 'in a definite body of persons like a number of co-owners or a village 'community." In the Madras 'Rules for the guidance of Forest Settlement Officers,' which we believe are the only ones of the kind published, careful instructions are given which shew that that Government intends the Forest Settlement Courts to be Civil Courts, and their procedure that of the Civil Procedure

Code, and this is, we think, the right view of the law. A Forest Settlement Officer should decide cases of claims entirely by law, and if he considers it necessary to do so, should advise the Government to confer rights, or to grant 'privileges' or 'concessions', of a limited, carefully defined character. Forest Settlement in most provinces has already been completed luckily, otherwise the views of such an accomplished authority on Forest Law as our correspondent, might do a great deal of mischief. And so we would express the hope that in Forest Settlements to come the Government will adhere to the kind of principle which is laid down in the Madras Rules and not give Settlement officers a free hand, but keep to themselves instead the power of constituting 'rights' where customary practices require their admission. We quite agree with 'B. H. B-P.' that the Department desires not to 'curtail,' but only to 'regulate' claims whose equity is admitted, but we maintain that though, of course, the Forest Settlement Officer may have to make the enquiries and recommend what should be done, it should rest with the Government alone, and not with one possibly inexperienced or strongly opinionated officer, to decide whether they should be made 'rights,' or granted as concessions or what not.

HON. ED.

Acorns as a Tanning Material.

SIR,

Attention was directed by Captain Wood in 1885 to the possible use of acorn cups as a tanning agent; but, unfortunately, an experiment with them has resulted in failure. In September last I sent about a maund of cups of *Quercus dilatata* to Messrs Cooper, Allen and Co., Cawnpore, and have just heard from them that the sample contained apparently little or no traces of tannin. Good tanning agents have therefore still to be found, among the Indian oaks.

F. A. LEETE.

Eucalyptus Oil.

Dear Sir,

I should be very glad to receive any information as to the methods of extraction of Eucalyptus Oil from the Blue Gum. If the process is not very elaborate, a profitable industry might well be made out of it.

F. A. LEETE.

[NOTE.—The manufacture of Eucalyptus Oil is now a regular industry in South India, and perhaps one of our readers from those parts will oblige us by kindly answering Mr. Leete's question.—HON. ED.

Bamboos and Famine.

SIR,

Now that the views and wishes of the Government of India have been so clearly expressed with regard to the management and development of the forests throughout a great part of Peninsular and Continental India—that is, excluding the densely wooded tracts of further India, form Assam down to Tenasserim,—I think it might prove of benefit if you could see your way to reproduce the opinions and advice of the late Mr. Sulpiz Kurz, as stated on pages 258 to 261 of Vol. I of the *Indian Forester* (No. 3. January 1876). As in all likelihood comparatively few Forest officers have ready access to the first volume, published nearly 20 years ago, it may perhaps be permissible and advisable to quote in full the passage I refer to, which is as follows :—

"From my own observations, and they extend over 20 years, 'I must concur with the general notion of natives that drought 'greatly encourages flowering, although a certain age, or say 'rather state of debility, seems quite requisite before this favour-'able influence can fully come into play. So, for example, I have 'observed in Burma pygmæan plants of Tinwa (*Cephalostachyum* '*pergracile*) of only about half to one foot in height, which had been 'continuously burnt down by jungle fires, and which flowered to-'gether with their unhurt companions of 30 to 40 ft. in height. But 'stragglers from seeds that germinated at a latter date (say the 'subsequent year) may also be seen occasionally amongst the 'patches of flowering bamboos without producing a single flower. 'In such cases we have to generalize upon the broad facts before 'us, and leave stray exceptions as interesting hints for the con-'sideration of casual phenomena. Both dry seasons that I spent 'in Burma were described to me as extraordinarily hot ones, such 'as the oldest people could not remember, and my harvest of 'flowering species of bamboo was remarkably large, so much so 'that I missed the flowers of few species only, and these were such 'kinds as grew in tropical forests or near water, and hence were 'not likely to be affected by drought. Never were so many species 'of bamboo in flower in the Calcutta Botanical Garden as in '1874, a year of drought and famine. Flowering of bamboo during 'time of famine is very usual, and there is a saying with the Indian 'that "when bamboos produce sustenance, we must look to heaven 'for food." The correctness of this proverb has been challenged, 'but I believe, upon very insufficient grounds, for although bamboo 'may and does flower and fruit in years when the most beautiful 'crops are harvested, it does not follow that there was no drought 'in that season. How important an event the general flowering 'is in time of famine may easily be gathered from a few facts. In '1812, in Orissa, a general flowering of bamboo took place, and

'prevented a famine. Hundreds of people were on the watch day 'and night in order to collect the seeds as they fell from the 'branches. Mr. Shaw Stewart, the Collector of Canara (Western 'coast of India) states, that in 1864 a similar event took place in 'the Soopa jungles, and that a very large number of persons, 'estimated at 50,000, came from the Dharwar and Belgaum dis- 'tricts to collect the seeds. Each party remained about 10 'to 14 days, taking away enough for their own consumption 'during the monsoon months as well as some for sale, and he 'adds that the flowering was a most providential benefit during 'the prevailing scarcity. Mr. Gray, writing from Maldah in 1866, 'says: 'In the south District, throughout the whole tract of 'country, the bamboo (probably *Bambusa Tulda*) has flowered, 'and the seed has been sold in the bazaar at 13 seers for the rupee, 'rice being 10 seers, the ryots having stored enough for their own 'wants in addition. Hundreds of maunds have been sold in the 'English Bazaar at Maldah; and large quantities have been sent 'to Sultangunge and other places 25 to 30 miles distant, showing 'how enormous the supply must have been. The bamboo flower- 'ing has been quite providential, as the ryots were on the point 'of starving.

'Here we have at once a key in dealing with the mitigation 'of famines in India, and bamboo reserves for famine years 'would no doubt be preferable to Mahogany and other timber 'plantations under the shade (?) of which the Bengalee ryot 'could only study the effects of hunger. Such reserves are the 'more recommendable, as there are many wastes now uncultivated 'which might be used as such, and along the Ganges endless 'savannahs expand which might profitably give way to reserves 'of bamboo. But only few bamboos would be eligible for this 'purpose, and of these Behoor bans (*Bambusa arundinacea*), Dyowa 'bans (*Bambusa Tulda*), and Basini bans (*Bambusa vulgaris*) would 'be the preferable ones, the first one being adapted also for drier 'climates, like the Upper Provinces; the two latter ones are 'preferable for damper climates, as Lower Bengal, etc. There 'are other freely flowering bamboos, especially the so-called male 'bamboo, a kind which grows, unlike the above noted, also on 'sterile rocky hills, but the seed of this kind, although larger, 'has a pretty large pericarp, and is by no means so productive as 'those kinds named above. Indeed, while here 1 to 3 seeds to 'the spikelet are found, there are as many as 4 to 8, which latter 'do not require to have the pericarp first removed, as is the case 'in the male bamboo. Unfortunately we know nothing about the 'exact quantity of seed which every stock yields, but we may 'presume that it must be enormous. We have, however, much 'to learn yet of the life-history of these bamboos before we can 'advantageously employ them for famine purposes, and first of all 'we require to know the exact age at which flowering can take

'place. Besides, yearly after sowings are necessary so as to 'ensure regularity of crop, etc. Such bamboo reserves would 'at the same time contain also other food plants, as, for example, 'Aloo, diverse kinds (*Dioscorea sp.*) say about 3-4 plants to each 'stock; *Tacca pinnatifida*; Ol (*Amorphophallus campanulatus*); 'varieties of Kuchoo (*Colocasia antiquorum and C. indica*); Tapioca 'or Cassava (*Janipha Manihot*), and such-like tuberous plants as 'do not interfere with the plantation, while their value would be 'enhanced, provided that the people could be prevented from 'using these products without a regulated control. Trees, like 'mango and jack, and in drier districts the Muhooa (*Bassia 'latifolia*) and the carob-tree (*Ceratonia siliqua*), the latter on 'calcareous sub-soils, might be added or interspersed in the bamboo 'groves. Add to the above bamboo-reserves, revised and strict 'rules regarding fisheries (for fish is an important article of food 'to a great class of natives); an attempt on the part of the 'forester to redeem the numerous courses of rivulets that are now 'dried up in the arid hills of the Peninsula, Behar, etc., by replant-'ing their sources with trees, and thus to recreate their flow, and 'have these sources combined with a judicious extension of irriga-'tion works, and I see not why famine could not be banished, or at 'least greatly diminished, so as to dwindle down to temporary 'scarcity."

There seems to be a great deal of truth in these remarks of Mr. Kurz, and they are well worthy of the attention of all officers whose lots are cast in places where action on the above lines is possible.

DEHRA DUN, N.-W. P.,
25th January, 1895. } J. NISBET.

Departmental Fellings in the C. P.

SIR,

Within the last couple of years the order has been to have departmental fellings and forest depôts at convenient distances in all Ranges. This is a simple matter where there is a fair demand for the produce cut, but where there is not—what then? Owing to the unrestricted and unregulated fellings formerly in force there is very little straight timber left in many if not most of the forests, the remark applies specially to the areas in the vicinity of large towns and markets. It is true that of late years certain species were protected from these general fellings, but the mischief had already been done, and what trees were left were mainly crooked and unsound. As a consequence, the departmental fellings (now in

progress everywhere) show that there is extremely little of building material available for sale, while the material fit for fuel is very considerable. For the former there is a ready demand and also for the latter in a few localities adjacent to large towns. But in out-of-the-way localities (and this refers to much the greater portion of the C. P.) there is little or rather no demand for the fuel material, because as regards fire wood, fencing material and grass the private and *malguzari* waste lands are practically inexhaustible. As regards timber, the *malguzari* forests are much worse than the Government Reserves, and contain very little straight wood. Therefore it is incumbent on Government to work its forests with a view to producing wood fit for building and agricultural purposes.

No good can possibly result by a relapse to the former system of commutaton and unregulated fellings to which is due the present sad condition of the Reserves. During recent years, the C. P. has been formed into two Conservators' Circles and a Forest Officer appointed to each district.

It was no doubt thought that Revenue would correspondingly increase, but this was utterly impossible while *malguzari* and others held in the aggregate such vast areas under forest, and also lands for pasture and grass. Probably, ere long, there will be a return to the old régime of one Conservator and one Divisional Officer for two or more districts, or the forest Divisions may be formed according to the lie of the ranges without regard to district limits. At present in some of the districts where there is little demand for *produce* from the Government Reserves what need can there be for a separate Divisional officer ?

'COO-EE.'

1st February, 1895.

II.—OFFICIAL PAPERS & INTELLIGENCE.

Notes on Forest Operations.

We have received from the Inspector-General copy of the following Circular (No. 2 of January 31st 1895) which will speak for itself. We only hope that the effect of it will not be disastrous to the maintenance of the 'Indian Forester'. The 'Notes' which

accompanied the Circular, some of which we hope to reproduce as occasion offers, and one of which we give in this number, are all of much interest

'I have been instructed by the Government of India to send 'you copies of notes on the conduct of certain forest operations 'in Burma. The notes are eminently practical, and will no doubt 'be read by you, and by Forest Officers serving under you, with 'much interest.

'My chief reason, however, for sending you these papers is 'that I beg to invite you, and every Forest Officer of sufficient 'experience, to collaborate in the preparation of similar notes 'embodying the practical experience gained in each Forest 'Division and Circle; for one of the weakest points of our forest 'administration is that the experience and knowledge gained by 'an officer is but too frequently lost with him, instead of being 'made available for others. The administration of the Government 'forest estates is intimately connected with the welfare of the 'people, especially with the welfare of the agricultural classes. 'They depend on these resources for timber, fuel, fodder, grazing 'and minor forest-produce, and are primarily affected by the 'methods of forest management or any changes therein. Our 'forest working-plan reports are the place where the following 'questions are necessarily discussed—what are the local require- 'ments of the rural population with reference to any special forests; 'to what extent can such requirements be met therefrom; and in 'what degree and by what means is it possible to reconcile the 'rational treatment of the forests with the necessities and con- 'venience of the people? Such working-plans are studied by the 'Divisional Forest Officers concerned, which suffices for the in- 'dividual cases in question; but it would be of great advantage to 'make available, for wider and easier reference, the knowledge of 'practical forest work acquired by experienced officers of the 'Department, as well as of the methods employed in satisfying the 'local needs of the people.

'The plan I propose for your consideration is that all Forest 'Officers above the rank of Ranger should be asked to note down, 'in a comprehensive manner, particulars as to the practices which 'have gradually developed in their respective charges (be they 'Sub-divisions, Divisions, or Circles), and which have stood the 'test of actual application. These notes would then be examined 'by the Conservators, who would select, edit and print them in a 'small volume for each Circle, provision being made for the 'addition of new matter from time to time. Under my proposals, 'these volumes should be interchanged amongst the several Forest 'Circles, and I sincerely trust that the officers of each Circle will try 'to beat the record.

'It is essential that the general arrangement of the notes should 'be the same in each Circle, and I would suggest the following 'as a basis:—

'I. Creation and consolidation of forest estates, including:—
'(*a*) Forest settlements.
'(*b*) Demarcation.
'(*c*) Surveys.
'II. Administration of Forest estates, including—
'(*a*) Protection in all its branches [with special reference 'to the various systems of fire-protection].
'(*b*) Sylviculture in all its branches, including the different 'methods of forest regeneration; as well as improve-'ment fellings and all artificial measures adapted to 'effect or assist reproduction.
'(*c*) Methods of exploitation, transport and disposal of forest-'produce.
'(*d*) Communications and buildings, and other engineering 'works.
'(*e*) Systems of organized working.
'III. Financing the forest estates.
'IV. Local needs of the people, and the best method of 'satisfying them as regards—
'(*a*) Timber and fuel.
'(*b*) Fodder.
'(*c*) Grazing.
'(*d*) Minor forest-produce.
'V. General administration, referring to all matters connected 'with establishments, etc.
'VI. Miscellaneous matters.

'The Government of India have recently directed that the 'policy of forest administration in India shall be to subordinate 'within certain broad limits the technical administration of the 'requirements of the agricultural population; and it is, therefore, 'desirable that it should be shown in what degree and by what 'means this has been done with reference to head II and its sub-'heads as well as to head III, but it is also desirable to treat the 'question concerning local requirements separately under IV.

'The notes in question should, I consider, be strictly confined 'to a record of experience based on practical work; for it is not 'intended that they should contain either sylvicultural essays, or 'suggestions and proposals, administrative or otherwise, which, 'however useful they may be, are more advantageously treated in 'special communications, or should find a place in working-plan 'reports.

'Before the work is practically started, I should feel obliged if 'you would inform me, at an early date, whether my proposal, 'as regards the manner in which the notes should be collated and 'compiled, meets with your approval, and whether you agree in the 'arrangement sketched by me above. If you do agree, I 'beg that you will favour me with your suggestions on either or 'on both points."

Notes on Girdling in Tharrawaddy.

(By H. Slade, Deputy Conservator of Forests.)

By "girdling" is meant the killing of teak trees for extraction. Green teak logs will not float, and it has consequently been laid down that all teak trees must be killed and left standing for three full years before being logged and put into the streams.

For the purposes of this note three sorts of girdling are distinguished, namely :—

I.—Girdling inside reserved forests.

II.—Girdling in unreserved forests not likely to be cultivated.

III.—Girdling in unreserved forests about to be cultivated.

The note will conclude with a few remarks on girdling as carried out in Upper Burma.

I.—Girdling inside reserved forests.

Locality.

The locality in which the girdling is to take place is laid down by the working plan of each working circle. As a rule in Burma the number of trees to be girdled in any particular compartment is not specified ; the working plan only lays down the compartments that are to be girdled over during the sub-period, and the maximum number of trees that may be girdled in those compartments during the sub-period. There are two things to be careful about :—

(1) Only to girdle within the compartments laid down.

(2) Not to exceed the maximum number of trees for the sub-period.

Season

Girdling may be carried out at any season of the year, but in the hot weather water is usually scarce and the coolies will only work during the cool hours of the morning. If an European officer is in charge of the girdling, it is almost impossible for him to work during the rains, and from December to March is undoubtedly the best season; if a Burman is in charge, it is very much better to try and get the work done during the rains, so that the revising officer has the whole of the cold weather to inspect his work.

Rules for girdling.

Within reserves gazetted Forest Officers only are allowed to girdle. Generally, the working plans lay down that in moist forest no healthy tree under 7′ girth and in dry forest no healthy tree under 6′ girth shall be girdled. Moist forest is distinguished by the presence of Tinwa, Kyathaungwa, &c., and dry forest by Myinwa. No solitary tree that will not yield a marketable log, unless, as sometimes happens, there is a hollow, worthless tree shading and over-topping healthy

trees of smaller dimensions, the killing of which would be an advantage to the forest. It is further ordered that all "*Nyaungbats*" (*i.e.*, trees attacked by *Ficus*) should be felled at once and not girdled. This will be referred to later on.

These are the principal rules for girdling in reserved forests and, if carried out to the letter, the operation cannot be said to be bad, though it may be injudicious, for, although the working plans prescribe that no tree under a certain girth shall be girdled, it is not to be inferred that every tree above the *minimum* girth (provided it is not a solitary or unmarketable tree) should be girdled. Far from it. It is incumbent on the girdling officer to leave for the next generation a fair proportion of the trees that he considers capable of producing good sound timber the next time the same area is girdled over. This may be considered as 30 years hence on the average. The exception to this rule occurs in places whence timber of large dimensions cannot be extracted. It is obviously useless to leave a tree of 8′ girth to attain a girth of 10′ or 12′ when no log above 8′ girth can possibly be worked out from that locality.

As an amplification of this rule it may be said that no tree of the *minimum* girth growing on the banks of a floating stream or within an easy drag of such a stream should be girdled, unless it shows signs of having reached maturity. The trees themselves will usually be the surest guide. For instance, if in a dry forest the officer notices that every tree begins to decay when it has reached a girth of 7′ it is useless for him to leave a healthy tree of 6′ 9″ in the hopes of its attaining large dimensions. The probability is that it will reach maturity within the next few years and be wholly or partly burnt before the end of 30 years.

In the same way, if in a certain forest (happily such forests are rare) he finds that but few trees reach the minimum of 6′, but begin to decay when they reach, say, 5′ 6″, he should use his discretion and girdle such marketable trees as show signs of having actually reached maturity; further, it may be laid down as a general rule that any tree, of whatever girth, showing signs of approaching decay should be girdled, provided it will yield marketable timber, and is not required for purposes of reproduction.

Unless natural reproduction is very good, a few seed-bearers should be spared along the tops of the principal ridges. Moreover, if it is a question which of two trees should be selected for girdling it is safe to say that *cæteris paribus* the one on the lower should be chosen in preference to the one on the higher ground: the area of utility of the latter as a seed-bearer is so much greater than that of the former.

Modus operandi.

We will suppose that the girdling officer has pitched his camp within a convenient distance of the place where he intends girdling. He will require two girdling hammers, one measuring tape, a good map, a

good guide, a trustworthy hammer-gaung (usually a Forest subordinate), pencils, paper, and a gang of coolies. The best number of coolies is from 10 to 15, according as the trees are scarce or plentiful. Each cooly must provide himself with a "*pauksein*" and a "*dama*;" a chisel or two are also useful for cutting through the sapwood of trees with irregular grown stems. In Upper Burma the "*kun*" (a long-headed wooden mallet armed with a broad chisel at one end) is generally used, and this excellent instrument serves the purpose of both pauksein and chisel. The guide is usually the Forester in charge, but, if he does not know the country accurately, it is better to call in local aid as nothing is more distracting than having to keep on referring to the map. The girdling officer takes one of the hammers, a tape, pencil, and paper and hands over the other hammer to his hammer-gaung. Having selected his tree, he orders one of the coolies to make a blaze on it as high up as he can reach. On this blaze he impresses his hammer-mark, writes the number of the tree in pencil on the sapwood of the blaze (it will be legible for a long time), enters this number on his list, and against it the girth of the tree measured at 6′ from the ground. The whole operation takes only a few seconds and he then goes on to select his next tree. He of course numbers the tree serially.

The cooly who has made the blaze on the tree girdles it and makes another blaze as near to the ground as possible. When trees are growing on a slope, this second blaze should be made on the lower side to prevent all risk of its being destroyed when the tree is felled.

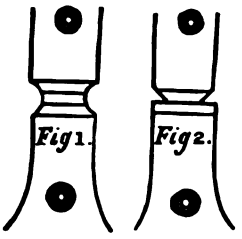
When the tree is completely girdled the hammer-gaung impresses his hammer on the lower blaze, copies the number of the tree on to his list, and against it enters the name of the girdling cooly. He then goes on to the next tree and from the numbers on his list can tell at any time whether he has missed a tree—not a rare occurrence where trees are scattered. The hammer-gaung is responsible that each tree is properly girdled, and he is forbidden to mark a tree without first going carefully round it and seeing that the work has been properly done. The coolies too should be warned against leaving the trees they have girdled until they have seen them marked and their own names entered in the register; if the hammer-gaung is delayed, they must wait by their trees and call out to him from time to time to let him know where they are.

Blazes.

Each blaze should show at least 4 inches square of heartwood and the surface should be smoothed off with a dama, or the hammer will not make a good impression. Two or three distinct hammer-marks should be put on each blaze on the heartwood; they will be visible for years.

Girdling.

The coolies should be instructed to cut a ring round the tree as low down as possible. This ring should show a width of at least 2″ of heartwood, free from sapwood, all round. If a fragment of sapwood is left, the tree will not die and the bark will gradually grow over the wound.



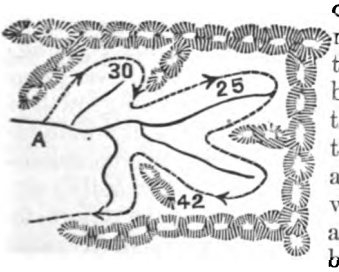
A tree properly girdled should appear as in Fig. 1, but, unless warned about it, the coolies are almost sure to girdle the trees as in Fig. 2. There is then far more chance of small connections of sapwood being left, and it is often difficult to tell if the tree has really been properly killed.

Registers.

On return to camp the registers are made up. The girdling officer from his list compiles a statement showing the number of trees of each category of girth girdled and from the hammer-gaung's list he ascertains the number of trees girdled to the credit of each cooly.

Working the forest.

It is most important that the whole of the teak-bearing area within the prescribed limits be thoroughly gone over by the girdling party. Nothing is more likely to lead to mistakes in this respect than continually crossing from ridge to ridge. Each ridge should be taken separately and thoroughly worked before another is begun. The simplest rule is to keep the hill to your right (or left) during the whole day unless you change ground altogether. Thus in girdling the head waters af a stream as here shown the arrows indicate the route that should be taken. In this case starting from A the hill is always to the left. The girdling officer should also carry a sketch map of the compartment and enter upon it the total number of trees girdled in different parts of the compartment.



From some compartments or parts of compartments it is absolutely impossible to extract timber owing to the difficult nature of the ground. A practical timber contractor is the only man who can advise the girdling officer in these cases, and it is always useful to consult a man of this class when any difficult ground is anticipated ; it is obviously useless to girdle timber if it cannot be worked out.

It is also important to make the coolies themselves hunt for trees ; it is heartbreaking work to have to rush up and down steep slopes looking for trees, whilst the coolies walk quietly along the main ridges. They often object at first to look for trees, but in a

few days they know exactly those that will be selected, and are as keen as terriers to find them. Those who hunt the best get the most trees and the most pay.

Rates.

In Lower Burma the ordinary rate paid to the coolies is Re. 1 for five trees; in Upper Burma it varies from two annas per tree. It is probable that the work could be done for two annas a tree in Lower Burma if additional rates were paid for particularly difficult trees. Extra rates should always be paid in fact for such trees, whatever the rate, or the coolies will shirk them, and as a rule these are the trees that require girdling. There is no difficulty in promising a cooly an extra anna or two and noting it on the list of trees.

Nyaungbats

These are doubtless a difficulty. In the older working plans it was laid down that such trees should be felled at the time of girdling instead of being merely girdled. Since then the excellent custom has been introduced of going over, before the girdling commences, the whole area to be girdled during the same year with a gang of coolies who girdle all trees that are dominating and suppressing the young teak, cut all creepers, and who lately have been also ordered to fell all Nyaungbats. The girdling officer can inspect this work whilst he is girdling, and if all the Nyaungbats have been already felled his work is considerably simplified.

The utility of felling Nyaungbats may be looked at from two points of view. First, as an attempt to exterminate the Ficus. From this point of view it is obviously useless to fell only *teak* Nyaungbats, and Nyaungbats of every species should be felled. Even then the propagation of the Ficus is so easy and its rapidity of growth is so enormous there is little doubt that in a few years it would be re-introduced from another compartment and would have completely re-established itself before the next revolution. Secondly, the killing of Nyaungbats may be considered merely as an effort to save the timber of the trees attacked. Once the Ficus has firmly established itself on a tree that tree is doomed; never can it increase in girth to any extent, and its decease is merely a matter of time. In practice the felling of Nyaungbats cannot possibly be carried out at the same time as the girdling; some of the trees would take a whole day to fell and almost as long to girdle. Knowing this the girdling officer would be forced to pass by any such trees he found, and then there is little chance of the timber finding its way to the market. The only method for that tree to be prepared for the timber contractor is for the tree to be felled, and the only way in which it can be felled is for the coolies to fell it independently of the girdling party.

With this allowed, the answer to another important question "How much Ficus on a tree makes that tree a Nyaungbat?" is obvious. Every teak tree so covered with Ficus as to render the

girdling of it a long and difficult operation is a Nyaungbat and must be felled when the works of improvement are being carried out. The girdling officer will of course select for girdling any tree in the least attacked by Ficus, provided the market value of the tree is not outweighed by its utility in the forest as a seed-bearer. Thus all the teak attacked by Ficus in any degree will be felled or girdled. With the present subordinate staff the writer cannot urge that a war of extermination be declared against the Ficus *per se*, but would confine himself to turning into cash value the teak trees attacked by Ficus.

II.—Girdling in unreserved forests not likely to be cultivated.

The main difference between this and the foregoing is that the work may be, and usually is, entrusted to a non-gazetted officer not below the rank of ranger. The old rule used to be that they girdled all teak over 6′ girth not being solitary or unmarketable trees, but there seems no reason why the limits of girth should not be the same as for reserved forests. The *modus operandi* and the rules regarding blazes, &c., are exactly the same. As a rule no works of improvement are carried out in unreserved forests previous to girdling, so the ranger has to do the best he can as regards Nyaungbats, girdling those least attacked and leaving those that cannot be girdled. If the latter are numerous, it may be as well for him to mark their position on the map and have them felled later. In the Toungoo division, however, creeper-cutting has been carried out by a gang of coolies distinct from the girdling coolies, and this practice most certainly recommends itself where possible.

This girdling work being entrusted to a ranger, it must be inspected by a gazetted officer called the "Revising officer." The chief points for this officer to note are :—

(1) Whether the trees are completely killed.

(2) Whether the blazes are correctly placed and cut to the heartwood.

(3) Whether the general rules concerning selection, limit of girth, &c., have been observed.

(4) Whether the trees have been properly marked.

(5) To check the number of trees.

Before starting, the ranger is provided with as good a map as possible of the area to be girdled over, and on this he carefully notes the number of trees girdled on any stream, ridge, or other natural feature. It is the duty of the revising officer to check a certain number of these areas and count the trees girdled to see if the number is correct.

To check the *manner* in which the work has been performed at least 10 per cent. of the trees should be carefully examined and the revising officer should walk round each of these trees and

examine the girdle, the blaze, the hammer-mark, the selection, and check the girth as given by the register. To check the *number* of trees girdled at least another 15 per cent. should be *counted*. As each tree bears a number the revising officer can commence from any tree and, following up the numbers in either directions, he can see whether any have been missed. The ranger will always accompany the revising officer when his work is being inspected.

III.—Girdling in unreserved forests about to be cultivated

Here the object is to girdle every tree that has a marketable value and the minimum girth will depend on the market. With this important exception the rules are exactly the same as for girdling in unreserved forests not likely to be cultivated.

Girdling in Upper Burma previous to 1890.

It must be remembered that the state of affairs in Upper Burma was perfectly different to that in Lower Burma. There were no compartments, no working plans, no reserves even ; the area over which the girdling was to be carried out was limited only by the extent of the teak forest available, and this is to a certain extent still the case. The extent and very often the position of the teak forests were unknown, and had to be determined by the girdling officers. The number of trees to be girdled was also practically unlimited ; a *minimum* of 30,000, 40,000 or 50,000 was fixed, but seldom, if ever, worked up to. It was obviously impossible for one or two girdling officers to personally select this huge number of trees in any one season, and this work had to be entrusted to rangers and other subordinates ; but as the girdling was in reality but the first step towards the examination and subsequent reservation of the forests the work had to be closely supervised.

The following rules were laid down :—

(1) No worthless or solitary tree to be girdled.
(2) No tree under 6′ girth to be girdled.
(3) One-third only of the marketable trees over 6′ girth to be girdled.

It would have been better if the limit of girth had been 6 feet for dry and 7 feet for moist forest, and these limits have since been adopted. Rule 3 was meant as a rough and ready working plan, it being the intention to girdle over the same ground once every 10 years, so that the whole number of marketable trees should be extracted in 30 years. Each gazetted officer had under him four or five subordinates whom he had previously initiated into the mysteries of "selection;" each subordinate had under him 12 or 15 coolies, the whole working from one camp or from camps close together.

The only possible way for the revising officer to check the work was by the numbers on the trees. Lists were kept as mentioned under "Unreserved forests" and the revising officer could begin from any girdled tree, following the numbers backwards or

forwards, taking their girths and checking them on return to camp. If any particular number or series of numbers could not be found, the girdling officer had to come and point them out. The advantage, from the revising officer's point of view, of working out each ridge systematically will be apparent.

One cooly was told off each day with each party to cut creepers, for which he got eight annas. It was usual for the coolies to take turns at this work as girdling was usually much more lucrative. The lists showed the name of the cooly responsible for the creepers in each locality, and, if the work was badly done, he could always be detected and fined.

The work began during the first week in December, and was carried on uninterruptedly till the end of May. Relays of coolies used to come out (by previous arrangement) about every month.

The above remarks, as far as regards "Upper Burma," apply only to the Chindwin division, the only division of Upper Burma of which the writer has any experience.

IV.—REVIEWS

Annual Forest Administration Report for 1893-94 for Madras.

This is the first of the 1893-94 Reports which has reached us, though, indeed, it is not accompanied by the Government of India Review. However, there is a full Review by the Madras Government to whom we are indebted for an early copy.

This year, there is a new departure. On the suggestion of the Government of India the greater part of the Report was written by the Senior Conservator, the rest by the Board of Revenue. For the future it has been laid down that—

"It is the intention of His Excellency the Governor in Coun-
'cil that all technical subjects shall in future be reviewed by a
'professional officer; and it is hoped that the want of scientific cri-
'ticism noticeable in previous reports may in this way be avoided.
'The present system is also open to objection on various other
'grounds, and its improvement is under further consideration."

The area of Reserved Forest on June 30th, 1894, was 10,786 square miles, fairly evenly distributed among the three circles, though, of course, the Southern Circle, with its large area of private estate in districts like Malabar, which are otherwise well-wooded, has the least. When the settlement is completed, it is expected that the area of reserved forests in the different districts will amount to the following :—

	Districts	Maximum area that wi eventually b reserved.
	1	2
		Sq. Miles.
Northern Circle	Ganjam	743
	Vizagapatam	403
	Godavari	1,019
	Kistna	1,185
	Anantpur	567
	Bellary	1,089
	Kurnool	2,677
	Total ...	7,683
Central Circle	Nellore	1,132
	Cuddapah	2,640
	Chingleput	281
	North Arcot	1,229
	South Arcot	1,059
	Tanjore	62
	Trichinopoly	373
	Salem	1,830
	Total ...	8,603
Southern Circle	Madura	651
	Tinnevelly	493
	Coimbatore	2,447
	Nilgiris	437
	Malabar	649
	South Canara	1,424
	Total ...	6,101
	Grand Total ...	22,387

This will be a fine estate, but it will take time to bring it all under working plans and systematic management calculated to improve the crop and the yield of the forests. To do this fully a much larger trained subordinate staff will be required than the Presidency at present possesses, and it may be that considerable simplification of the tendency to increase office business at the expense of the practical work of range officers will be required.

The following orders regarding the maps to be used in the Department will be read with interest elsewhere:—

"During the year under report, instructions were issued for 'the maintenance of uniform set of maps of the following descrip-'tion in the District and Range offices :—

'(1) A district forest reference map, being the office refer-'ence maps on 4 miles to the inch scale published by the Survey 'office, posted up with all reserves, roads, buildings, forest stations, 'range divisions, &c.

'(2) A range forest reference map, being the 1 inch to the 'mile topographical map of the Survey office, posted up as in the 'case of the district reference map, but in more exact detail, and 'showing names of hills and streams, minor forest stations, &c.

'(3) Separate maps for each reserve with topographical 'features usually on the 8 inches to the mile scale, or any other scale 'that may be found suitable and showing all enclosures, rights of 'way, forest roads and stations, compartment lines, &c. These 'would be prepared by enlargements from the Range maps or 'reductions from village maps or furnished by the Survey of 'India Party.

'(4) Separate working circle maps usually on the 8 inches to 'the mile scale, or on such other scale as may be required in 'each case.

'Each District Forest-officer has been ordered to have a set of 'all the above maps mounted in book form ; and each Range officer 'to have one copy of Nos 2, 3, and 4 mounted in book form and 'also one additional copy of Nos. 3 and 4 mounted in scroll form 'for computing areas, &c."

To us, of course, the progress of working plan work is, naturally, of the greatest interest, but the information given does not shew much of it. Some, however, has been made, though the work would seem to be rather desultory, and to require better final supervision. If only the arrangements in force in the provinces under the Government of India, whereby the Inspector-General with his Assistant have to examine and pass all working plans before they are put in force, could be extended to Madras or Bombay, we believe it would be a good thing, but we suppose that under present official circumstances it would be impossible. We note that in the Babul reserves in the Kistna District, after leaving 5 or 6 standards per acre, the coupes gave 5·6 tons of large wood, 1·6 tons of small wood and 60 yoke loads of thorns on an average. Revision of the Nilgiri Eucalyptus working plans is proposed, and it is suggested that the pure coppice should be changed to coppice under standard or even high forest, as the demand for fuel is so bad. We suppose that the local officers have succeeded in discovering a means of utilizing blue gum for timber—a purpose for which we should hardly have thought it suitable owing to its great tendency to split.

We are glad to note that the Board of Revenue do not consider that the working of the penal provisions of the Forest Act can be easily gauged from statistics only, and that so far as the information supplied goes, they see no reason to suspect any serious excess of zeal.

Fire protection seems to have been fairly successful, 94 per cent. of the area attempted having been saved, and the cost per acre being 2·7 pies. The remarks on protection in the Sandur leased forests of Bellary and in the Nallamalai hills of Kurnool will be read with interest by those who know the localities. We are glad to see that the mischief of the Chentzu settlement is now acknowledged. They ought to have been settled properly like the Karens in Burma, and perhaps this may still not be impossible.

"In *Bellary* the most careful fire-protection is attempted. 'There were three fires in each range. In the north-east Range 'the fires were attributed, one to a fire crossing from the Raja's 'forest, one to carelessness of a traveller, one to incendiarism. 'In the Ramandrug range the fires were attributed, one to 'accident when burning the fire lines, one from fire from the 'Raja's forest, one from lightning. In the Donimalai range 'two fires came from the Raja's forest, and one is attributed 'to lightning. Considering that the hills here are masses of 'iron, the lightning theory is not impossible. There is no 'doubt that the great danger this year was from the 'Raja's forest, and the Board regrets to notice the absence of the 'cordial co-operation in fire-protection which was given by 'the late Raja. It is surmised that burning the Raja's forest was 'favoured rather than otherwise by the authorities. In *Kurnool* 'about 39 square miles out of 111 square miles were burnt. 'These results are undoubtedly due to deliberate incendiarism by 'Chentzus, who are about the most impracticable forest tribe in the 'Presidency, but who have rather unfortunately been conceded 'rights at settlement which place them almost beyond control. 'There is probably another element at work besides the usual 'proclivities of forest men to fire forest for facilitating locomo-'tion, for driving game, or for pure mischief, and that is bribes 'from graziers. It is useless attempting to protect large areas 'under the present conditions in these forests. The advisability 'of firing certain parts of the forest to save the rest, should be 'carefully considered by the local officers."

There is no doubt but that the fire protection of the Nallamalais is a very difficult nut to crack, but in our opinion two things are wanted, *first*, the settlement of the Chentzus; *secondly*, the marking off of the timber producing areas of the lower hills and 'terai,' and the making of a working plan for them, with a scheme of organized fire-protection; and, *thirdly*, the making of proper provisions for the management of the great grazing and bamboo forests of the interior with a less costly protection system.

The *grazing* revenue in Madras amounted to Rs. 2,66,891, the District which produced most being Kistna in the Northern Circle, where the arrangements recently made have been described as follows :—

"This is the great grazing district of the Circle, and the District 'Forest-officer paid much attention to the question of regulating 'the grazing departmentally as far as possible, to the exclusion of 'contractors. The main principle is the dividing up of the forests 'into grazing parcelles of some 5,000 acres each. A separate fee 'is charged for each parcelle, but a guarantee is given that only 'a certain number of cattle will be admitted into each. There 'was some opposition last year, but the system was further develop-'ed during the current year with good results in the increase of 'revenue, and absence of complaints."

The following remarks are made on the subject of the attempt to utilize the abundant grass in the Sandur leased forests as forage for the Commissariat.:—

"Bellary was the only district in the Northern Circle where 'grass-cutting was attempted. 150,000 pounds of grass were 'collected and supplied to the Commissariat Department. The 'cost was Rs. 833-8-6 and the receipts Rs. 1,200. The grass was 'not real hay. The attempt at regular hay-making last year was 'unsuccessful. Part of the difficulty is that it is extremely diffi-'cult to separate all the debris of last year's grass from hay made 'in a reserve where fire is rigidly excluded, and complaints were 'made on this score."

To us the experiment seems to have been very successful as a beginning, and we hope it will be continued. By treating fixed areas under regular cropping the difficulty about the old grass ought to disappear.

The Notes on *Natural Reproduction* are interesting and shew that the forests, and especially those in the dry districts, are improving under protection. The most interesting remarks are those regarding Tinnevelly which we reproduce :—

"In *Tinnevelly* it is believed that the treatment of the forest 'under the coupe system (coppice under standard) is materially 'improving the general growth at the foot and lower slopes of the 'hills. Teak seedlings appear in large numbers, but dry down in 'the hot weather. It is believed that a fair percentage, however, 'maintains its vitality. It is noted that sandal-wood seedlings are 'coming up well in the Alagarcovil valley of the Sriviliputtur 'taluk, which is remarkable because there are no sandal-wood trees 'any where in this locality. For the 49 coupes, over an area of '2,404 acres, the Conservator calculates the average outturn of 'wood at eight tons an acre, and the net profit at Rs. 8 an acre. 'At a sixteen years' rotation, this would give an income of eight 'annas an acre. However, the value of the standard trees seems 'not to have entered into these calculations. More than half the

'yield is worked up into charcoal. In the evergreen forests the 'reproduction of the tree which is most in demand (*Hopea 'Wightiana*) is good."

Bamboos (both kinds, but chiefly *Dendrocalamus*) seeded in Godavari, Cuddapah and South Coimbatore.

In regard to *Artificial Reproduction* one important matter noted is the fact that *Inya dulcis* and other trees are replacing *Casuarina* in the coast plantations. This is decidedly as it should be: the *Casuarina*, in our opinion, should be regarded only as a temporary species designed to reclaim the sands, but as after 8 to 10 years it usually shows signs of failure to reproduce itself or to be easily reproduced artificially, and as besides, as was recognized in 1890, it is very liable to the attacks of a fungus not unlike the *Polyporus Sulfureus* of Europe, it is an excellent thing that indigenous trees are found to succeed in replacing it, and we think that every assistance should be given them in doing so. The new plantings of *Casuarina* in Nellore have been carried out at a cheaper rate than before, *viz.*, Rs. 30-8 per acre, and this is very satisfactory.

It is noted that orders have issued to stop the planting of *Eucalyptus* in Nilgiris, but we remember such orders being given long ago. It is not clear from the Report how far the advice of Sir D. Brandis is being taken in continuing the planting of conifers likely to make good timber trees. We are glad to see that the Mahogany trees planted at Kullar have succeeded.

The Board's Review is noticeable for its more friendly tone and for the notices of praise given to Messrs. Peet, Popert, Lushington and others, and for some remarks which we reproduce in connection with a recent circular of the Government of India, which however applicable it may be have been to one or two special Provinces, was not so to others, and was certainly not so as regards the Government of Madras, whose chief anxiety has been, it is well known, directed to safeguarding the interests of the agricultural population. In a province where the land-tenure is raiyatwari for the most part such an anxiety is very natural on the part of all officers of Government. We have no intention of discussing the Circular referred to just yet, all we will say is that it is a pity that it was not made applicable only to the Province (whichever it was) whose arrangements evoked it, instead of being issued for all in general, with the obvious result of possibly disturbing relations which have been recognized as satisfactory. That it would be greatly misconstrued might be expected, and the article on it in the *Times*, which is noticeable for inaccuracies, as well as those in the 'Pioneer,' which were not much better, show this to have been the case.

"The area proposed for reservation may, moreover, require con- 'siderable modification in the light of the policy recently enunciated 'by the Government of India. In its review of the report for

'1892–93, that Government remarked that 'the adequacy or 'inadequacy of the proportion reserved in each district' appeared 'to require further examination. The Board was requested to bear 'this fact in mind when preparing the present report. The matter 'would seem to have been overlooked for the question of the 'adequacy of reservation is not discussed, although a statement has 'this year been added to the report showing for each district the 'percentages of the area already under control and of the maximum 'area proposed for reservation. It is, however, impossible to 'institute any such examination until the vital question of the 'future policy of the department has been decided. The selections 'and proposals made during the last four years in each district 'have been framed upon the lines laid down in an order of October '1890. In this order, His Excellency the Governor in Council set 'forth the principles on which the administration of the forests in 'the Madras Presidency was in future to be based, and the scheme 'has been fully carried into effect in some districts, whilst in all 'others final proposals for reservation are in course of preparation. 'The policy embodied in the Government of India Resolution of 'October 1894, coincides in its main principles with the Madras 'orders of October 1890, but some differences arise in regard to the 'method of carrying the policy into effect. The strict enforcement 'of the orders of the Government of India would involve the 'abandoment of large areas which have already been reserved for 'the purposes of supplying fuel and fodder or for grazing only, and 'proposals for further reservation would require to be entirely 'remodelled. To the adoption of such a course, His Excellency the 'Governor in Council is strongly opposed, and a reference has been 'made to the Government of India, but until final orders are re-'ceived, it is not possible to assert that reservation in any district 'is either adequate or inadequate."

The Financial reports of the year were :—

	Rs.
Revenue	19,43,715.
Expenditure	13,68,411.
Surplus	5,75,304.

which was the largest yet recorded.

V.—SHIKAR AND TRAVEL.

"Pig Sticking Extraordinary."

The following novel method of pig-sticking may interest your readers. One evening last December I arrived late after a long march at a small Burmese village, and while at dinner was waited on by a deputation of the headmen, with a request that I would lend them some rifles for the night to shoot pigs with, as the pigs came every night to feed on the ripe paddy which was now being reaped. On my asking them why they didn't frighten them away by shouting, they informed me that that was no use, as the pigs were so bold that one could ride up to them on buffaloes and stick them with a spear. Anxious to try this, I went off to the paddy fields, and there, sure enough, in the bright moonlight were to be seen the ghostly looking forms of several buffaloes being slowly ridden about by spear-armed Burmans. Already one rider had speared a pig, but the spear not having been driven home the pig escaped. I tried to mount several of the "steeds," but not one of them would allow me anywhere near, much less on its back ; the village elder politely explaining that "the buffaloes could not stand the stink of my Lord." I thereupon watched in the field, hoping to see a spear, but about one o'clock the mist came down and covered everything, making the cold too deadly, so I returned to camp, leaving a rifle with the headman who shot a large boar, not more than half an hour after I had left, having ridden up to within a yard of the animal. The spear used is about 10 feet long of native manufacture, with a heavy blade barbed on one side. The villagers informed me that they sometimes speared a Sambhur, in the same way, in the fields at night.

The extaordinary thing to me is that the pig or Sambhur does not wind the man riding, as I guarantee most Europeans could at more than one spear's length ; as of course "the animals being so bold" is all humbug, or else one could walk up to them, which one cannot do.

TAWKWE.

Elephant Catching Operations.

SIR,

I have read with much interest Mr. Bryant's account of elephant capturing operations in the Anamalai Hills, in the January Number. I notice, however, certain changes have

apparently been introduced in the rules which were published by the Board of Revenue in September 1892, and I question whether any advantage has been gained by the changes.

The rules prescribed for pits 12 ft. by 12 ft. at top and 9 ft. by 9 ft. at bottom. The sloping sides are, as mentioned in the rules, intended to break the fall. Mr. Bryant ignores this precaution, and substitutes for it the filling up of the pit with brushwood. Now I really question whether brushwood is really efficacious, and there is one great objection to urge against its use. To be of any effect at all the brushwood must constantly be removed, with a result that the cover of the pit has to be removed from time to time, causing disarrangement of the soil, which is likely to attract the notice of the wild elephants and render the whereabouts of the pits known,

Mr. Bryant has produced no reasons for preferring pits with vertical sides, except the success which has attended his operations in recent years. He has, however, noticed the injury to the face, so often noticeable in captures, and states that he has had no accidents of this kind of late years. It is, I consider, more a question of good luck than good guidance, as this injury is not caused, as he supposes, by the fall, but by the subsequent attempts on the part of the captive animal to escape from the pit. It is on this account that cows more often suffer from this injury than tuskers, as the former in lifting their heads break their chisels short against the sides of the pit, and afterwards the broken chisel adds to the injury when the animal rubs against the side of the pit. This injury is, I maintain, more likely to happen when the sides are vertical than when they are sloping.

Again, Mr. Bryant calls attention to his recent successes, and shows that none of his late captures have died. Is it not a little early to judge? (I notice in passing that he has accidentally omitted from his tabulated list one of his 1891 captures which died). Of the 18 captures, 6 have died. Of these the date of capture and death of two is not known; of the others one died from an injury in the face. The other three all lived for more than six months, and two for nine months after capture. Admitting that his 1893 captures have passed the dangerous periods, is it not possible that there may be casualties amongst the four captures in 1894, which form a considerable percentage of those still left alive? I do not wish to be a bird of ill omen, but the height of no less than three out of the four exceeds the height prescribed in Rule 4; and judging from their height alone it is not unlikely that they will die, not from injuries but through pining, as they are probably advanced in age.

Mr. Bryant asks us to judge by results; but after all, are these results so successful as to induce us to alter our mode of operations? Out of 18 elephants captured in the Anamalais, six deaths have occurred. In this district 24 have been caught, out of which four old cows have been released from the pit. Of the remaining 20, two have been sold, one young tusker realising the fancy

price of Rs. 4,800, and three have died. Fifteen are still living, of which one was caught in 1893 and two in 1894. Of the three that died, one was the second capture made, which died from pining, and should have been released from the pit instead of being taken to the kraal, and one was a very small baby, only a few months old, which died of diarrhœa brought on by incautious feeding. Result—seventeen living out of twenty.

Two other points of comparison may be of interest to your readers :—

(1). In Malabar the mode of bringing to the kraal slightly differs from that employed in Coimbatore. It is found very necessary to have two tame elephants, one on either side, as well as those mentioned by Mr. Bryant, before and behind. Otherwise some of the larger elephants break away whilst being led to the kraal. But the circumstances differ, for the lead here is from 12 to 15 miles, and not two miles as in Coimbatore.

(2). Mr. Bryant gives three months as the time for being kept in the kraal. This is sufficient to tame, but here the elephant is not only tamed, but also schooled in the kraal, and is therefore confined for six months. The two elephants transferred from Coimbatore were tamed, but not schooled ; and had to be put in the kraal for two months subsequent to their arrival.

One word more, although I fear that I have already trespassed on your space. Mr. Bryant says that the size of the captured elephant's neck is estimated, but has omitted to say how the estimate is made. Whilst in the pit the height of the elephant is measured as follows :—One man puts a stick alongside the animal, holding it upright ; another man from the side with a stick covered with mud cuts the upright stick just above the withers of the animal. This gives the height of the elephant. The measurement of the neck is found by deducting one-eighth from the height measurement. This hint may be useful to officers engaged in elephant catching operations if they are not already aware of it.

NILAMBUR :
1st Feby. 1895. } G. HADFIELD.

VI.—EXTRACTS, NOTES, AND QUERIES.

African Mahogany.

The *Southern Lumberman* says that mahogany logs from the east coast of Africa have got as far west as Louisville, Kentucky, and adds that it is much cheaper than the mahogany from Central America and Cuba. From these mahogany forests in Africa,

it is said that twelve million feet of lumber have already been cut and exported, and they promise to yield an immense revenue to British and French colonists who have seized upon the territory. The wood has a tinge of pink in contrast with the somewhat reddish colour of the American variety, and some of the squared logs which have been imported are two by three and a half feet in size. We may add that this African mahogany is the wood of *Khaya senegalensis*—a tree which belongs to the same family as the true mahogany, and is closely related. It is not so desirable a cabinet-wood as the Mexican or Cuban mahogany, but is more like the Central American wood. Occasionally there are logs richly figured, and these have been manufactured here into very attractive veneering.—(*Garden and Forest*).

The Forests of the National Domain in America.

The small company of forward-looking people who, in the face of almost universal apathy, had been for years urging the necessity of some rational system of management for the forests on our national domain, felt greatly encouraged ten years ago when President Arthur was moved to mention the subject in one of his annual messages. We have no systematic forest policy yet, nor even the beginning of such a policy, but we are no longer surprised or unduly elated over the fact that men in places of high authority consider the matter worth talking about, at least. President Cleveland, like his immediate predecessors, in his message to Congress, which assembled last month, strongly advised that some adequate protection should be provided for the areas of forests which had been reserved by proclamation; and he also recommended the adoption of some comprehensive scheme of forest management. He condemned the present policy of the Government of surrendering for small considerations immense tracts of timber-land which ought to be reserved as permanent sources of timber-supply, and urged the prompt abandonment of this wasteful policy for a conservative one, which should recognize in a practical the way importance of our forest inheritance as a vital element of the national prosperity.—(*Garden and Forest.*)

Timber of the Sandwich Islands.

Those familiar with lumber matters know that an important consuming section to the manufacturers of lumber on the Pacific coast of the United States is made up of the Sandwich Islands. It is somewhat surprising to learn, therefore, that these islands

have some timbers of commercial value, though the fact that they are hardwoods makes it necessary to import the softer wood desirable for building purposes. The islands were at one time well covered with forest, but the development of the sugar and coffee industries has caused the clearing away of considerable portions of them.

The *Timberman*, of Chicago, has been favoured with a call from Mr. Philip Peck, of Honolulu, who has extensive coffee plantations on the island of Hawaii. Mr. Peck is the owner of large tracts of land, on which grows a wood which he thinks should be of high commercial value. This is the ohia (pronounced o-*hee*-ah). It is a tree that grows to a maximum of perhaps 30in. in diameter, and to a height of from 40 to 60 feet. Its trunk is straight and clear of branches, with a small top, much like that of the palm tree. The tree bears a beautiful red blossom, and its fruit is a brilliant red, shaped something like a mushroom. The wood itself is of an olive colour, approaching a red towards the centre; in fact, in the larger trees, a mahogany colour will be reached at the centre. The appearance is rather difficult to describe. Some compare it to Mexican onyx in its gradations of colour. Its texture is something like mahogany, having the fine markings characteristic of that wood, but the cells are inconspicuous, and the wood is fine-grained and hard. In spite of its hardness, however, it easily takes a beautiful finish with a silky surface.

Much of this timber is evidently of curly grain, as packing boxes made from it often show this marking. It is used for finishing purposes somewhat in the islands, but that industry is so little developed there that the native woods are chiefly used for rough purposes. The ohia is largely used for dock planks. They become so slippery, however, that horses cannot stand on them, and consequently they are covered with fir. This indicates something of the character of the material. This wood is confined to a certain district in Hawaii. It is heavy, and a piece at hand, measuring 37 inches in length, 10 inches wide, and 12½ inch thick, several years old and thoroughly dry, weighs 34½ lb. It is thought that if furniture and cabinet makers could see this wood and have an opportunity to test it, it would have a regular demand. It is cheap in Hawaii, and the principal expense would lie in logging and transportation.

Mr. Peck commented on the other woods of the islands in an interesting way. He said the koa wood was the ancient royal and sacred wood of the islands. The chiefs were buried in it, and it was held in particular regard by them.

The mountains of the islands used to be covered with sandalwood, and the old civilizers of the islands say that John Jacob Astor made an immense amount of money from handling Sandwich Island sandalwood. This wood, however, has almost disappeared, resulting from a peculiar combination of circumstances. The chiefs sold it to traders for a song, trading it for trinkets and

other articles of barter. They set the common people of the natives to dragging the sandalwood down from the mountains, which labour had to be performed at the order of the chiefs without compensation. Therefore, to avoid this unremunerative labour—and labour of any sort is not congenial to the Sandwich Islander—the natives burned the forests. Recently, however, surveyors who have been on the mountains say that sandalwood is again springing up from the old roots, promising to re-forest the districts which it formerly occupied.

Another remarkable wood of the island is the kawilla. It was used for spears and such purposes, and for this was seasoned in the sea for ten years, during which time it became heavier than iron. Many specimens are still found thus seasoned, and something of the sort is still done.—(*Timber Trades Journal.*)

Red Cedar Doors.

The *Puget Sound Lumberman* refers to a shipment of 500 red cedar* doors and a quantity of window frames, by a Tacoma concern, to Johannesburg South Africa. That journal regards this shipment as marking another step in the door trade of the Pacific north-west. It goes on to state that only three years ago the coast cedar door trade was unknown east of the Cascade mountains, which divide eastern and western Washington. The bulk of the doors used at Spokane, Walla Walla, and in other eastern Washington towns, came from Minneapolis. Montana's doors came from Anoka, Minneapolis, and St. Paul, while Utah and Colorado obtained their doors largely from Muscatine, Ia., and Kansas City. Now things have changed. White pine doors have been driven out of eastern Washington, and Montana, Utah, and Colorado are beginning to find that cedar makes excellent doors, and the result is that shipments are being made from coast ports every month. Not only so, but the States further east are being invaded by doors from the Pacific north-west. During the past year, Iowa, Minnesota, Nebraska, and Missouri dealers have bought coast cedar doors, and the Tacoma paper predicts that within two years they will be as rife in the States east of the mountains as red cedar shingles have become.

A year ago a Tacoma firm began work on the Atlantic coast. The first shipment of doors went to Bangor, Me. Since then shipments have been made to New Jersey, New York, and Pennsylvania. A recent shipment went to Philadelphia. It is said that at Oshkosh, Wis., a sash and door concern, seeing possibilities in red cedar doors, is making an article veneered with cedar, and an Iowa concern is experimenting with a solid cedar door. Within the past year red cedar doors have been introduced into Japan, China, and Hawaii, and a British Columbia firm will send a few to England and France as an experiment.—(*Timber Trades Journal.*)

* NOTE :—*Juniperus virginiana*, we believe.—HON. ED.

Buried Wood

The French Consul at Montgze, in Upper Tonquin, tells of a very curious mining industry which is carried on there, which represents a source of great wealth. This is comprised in certain mines, where are found buried the trunks of enormous pine-trees which have been swallowed up in some long-forgotten convulsion of nature. Many of these trunks are a yard in diameter, and the wood they furnish is of an imperishable nature. For this reason, the Chinese value it for making coffins, the sanitary advantages of earth-to-earth burial not yet having reached that part of the world. (*Chambers Journal.*)

Planting Shifting Sands.

Tree-planting by the sea-coast, even under the most favourable conditions, is always attended with considerable difficulties, but when shifting sands, such as those of the Norfolk coast, have to be dealt with, the crosses to be encountered in so doing are usually considerable. One of the most successful experiments of late years in reclaiming waste sandy lands on the sea-coast is that which has steadily been prosecuted since 1850 on the Holkham sandhills, the property of the Earl of Leicester. Formerly these sandhills were rabbit warrens, but by a carefully arranged and judicious system of planting, the formerly shifting and blowing sands have gradually been converted into a thriving plantation, thus forming a shelter to the adjoining pasture land and a distinct and ornamental feature of the landscape as well.

The sea lime grass (*Elymus arenarius*) and the still more valuable marrum or sea matweed (*Psamma arenaria*) have been largely used in the binding of these shifting sands, the running root and spreading growths, and still more the particular nature of the plants in being able to succeed, nay, even luxuriate in such meagre surroundings, soon binding together the dry and loose sand, and thus acting as pioneers to other more valuable forms of growth.

The trees employed in conjunction with the above grasses are the Cluster, Corsican, Austrian, and Scotch pines (*Pinus Pinaster, P. laricio, P. austriaca, and P. sylvestris*, and to show that they have succeeded well we need only add that many of the trees are now 40 feet high, and well clothed with the thickest and freshest of foliage. The Corsican pine has succeeded probably best of any. (*Timber Trades Journal.*)

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

February 5th, 1895.

EAST INDIAN TEAK—The deliveries from the docks in January start the year well with 843 loads against half that quantity in January 1894. The dock stock keeps low, and compares very favourably with that of last year. The visible supplies for arrival continue to be disposed of far ahead for naval and general purposes, so there is much in favour of a recovery from present low values, although hardly a shade of improvement can as yet be chronicled.

ROSEWOOD, EAST INDIA.—There is no stock, and fair prices could be made for small lots of large, good logs.

SATINWOOD, EAST INDIA.—There is very little stock, but the chief enquiry is for finely figured logs.

EBONY, EAST INDIA.—Small shipments of sizeable pieces, sound, and of good colour, would realise fair prices.

PRICE CURRENT.

East Indian Teak	per load	£10s.	to	£16
Rosewood	„ ton	£5.	to	£8.
Satinwood	„ Sup. foot	6d.	to	12d.
Ebony	„ ton	£6.	to	£8

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, February 1st, 1895.

Cardamoms	per lb.	2s.	to	2s. 6d.
Croton seeds	per cwt.	20s.	to	27s. 6d.
Cutch	„	20s.	to	32s.
Gum Arabic, Madras	„	10s.	to	30s.
Gum Kino	„	£15	to	£18.
India Rubber, Assam,	per lb.	1s. 7d.	to	2s.
„ Burma	„	1s. 7d.	to	2s.
Myrabolams, Bombay,	per cwt.	7s. 9d.		
„	„	3s. 6d.	to	4s. 3d.
„ Godavari	„	5s. 6d.	to	6s. 6d.
Nux Vomica, good	„	6s.	to	10s.
Oil, Lemon Grass	per lb.	1⅞d.		
Orchella, Ceylon	per cwt.	10s.	to	22s.
Redwood	per ton	£3. 10s.	to	£4
Sandalwood, logs	„	£35	to	£55
„ chips	„	£9	to	£30
Seed lac	per cwt.	30s.	to	90s.
Tamarinds	„	8s.	to	9s.

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The Diseases of Trees.

Apart from the natural processes of death and decomposition, to which all organisms are liable, the vast majority of the individual species of animals and plants seem to be subject to diseases of one sort or another at different stages of their development. Naturally, those which affect man have from time immemorial received the first and closest attention ; next come those interfering with the usefulness of the animals, which man has made subservient to his purposes for agriculture, trade, and locomotion. But it is only within comparatively recent years that any great amount of attention has been bestowed upon the diseases of plants.

As might be expected, the analogy between animal pathology and vegetable pathology is usually close, except as regards the heredity of certain classes of diseases, which is confined entirely to animals. Abnormal and diseased conditions are produced in both by unfavourable external circumstances; death and inability to regenerate themselves are with many different species of plants and animals the results either of exposure to excessive heat or cold, or of prolonged existence in solar and atmospheric conditions dissimilar to those obtaining in the localities to which they are indigenous ; organic disturbances are known to affect and heighten the normal temperatures of the blood of animals, whilst certain physiological disturbances have been proved to heighten the normal temperature of the sap of plants; and both are subject to infectious diseases occasioned by lowly organisms, whose biological position is in the almost undefinable borderland forming a sort of neutral zone between the Animal and the Vegetable Kingdoms. This latter class of pathological causes is by far the most important to the human race, both as regards the diseases of animals and those affecting plants ; for the *parasitic diseases*, in addition to creating physiological disturbances in the individual, often resulting speedily in death, have the unfortunate power of being communicable to other individuals by infection or contagion. Such are

the zymotic or inflammatory diseases which often become epidemic and extremely fatal to man and the lower animals, and the fungoid diseases, many of which also exhibit epidemic tendencies, among plants.

Since the foundation of the new science of Mycology by Berkeley, de Bary, and Tulasne, much has been done towards building up a knowledge of the biology of fungi, both in Europe and in America; whilst the laboratories of Hartig, von Tubeuf, Frank, and Sorauer in Germany, of the Government Mycologist in the United States, and of Marshall Ward in England are constantly busy with the elaboration of contributions towards a more complete knowledge of the parasitic fungi occasioning diseased conditions in plants of agricultural or sylvicultural value. There can be no doubt that if the work of the mycologists were more closely studied by doctors of medicine than it is, many useful hints would be obtainable, which might lead to important discoveries regarding the cause of disease in man. The following example will indicate what I mean. The shoots of the Scots pine are liable to be attacked by a fungus *Cæoma pinitorquum*, whilst the foliage of larch suffers from the attacks of a very closely allied species, *C. laricis*. Each of these fungi is unable to reproduce itself by direct generation ; it must first of all pass through an æcidial form, or indirect stage of generation, as a *Melampsora*, before it can become regenerated in the original forms of *C. pinitorquum* or *C. laricis*. Now comes the striking part of the matter, for there is very good reason to believe that *C. laricis* and *C. pinitorquum* can both of them pass through their æcidial stage either as *Melampsora tremulæ* on the aspen, or as *M. betulina* on the birch ; and in the same way each of these two forms of *Melampsora* may develop either into *C. laricis* or *C. pinitorquum*, according as the spores chance to settle upon and manage to infect the young shoots and foliage of the larch or the pine. This is something quite different from the 'parthenogenesis' and the change of generation often seen in the animal kingdom, as, for instance, among the *Cynipidæ*. Thus, the pine-shoot fungus may become a rust on aspen foliage, or a different rust on birch foliage; and in the succeeding form it may become either the pine-shoot fungus again, or the rust to be found on the foliage of the larch. And in the same way the larch rust may affect either the aspen or the birch in its æcidial stage, and may then revert to the original form, or else become transformed into the pine-shoot fungus. The possibilities that are thus opened out to medical science are immense. Take, for example, the recent epidemics of influenza. There is no reason why the bacterium, which most probably causes this wide-spread and now oft-recurring epidemic disease, may not have a change of generation with some other disease, perhaps even a very minor disorder, affecting either human beings, or cattle, or domestic animals. And, arguing from analogy, as one seems perfectly

justified in doing, there is no reason why the germ causing the disease influenza may not have a change of generation with a bacterium causing what appears to be quite a different species of disease. Hence, careful study of, and investigation into, all the diseases that are or have been either precedent to or concurrent with any recent outbreak of influenza, might ultimately lead to a true knowledge of the cause of the disease, which must ever be the first step towards combating it most successfully.

Whilst Pasteur has been the leader and the most eminent of the workers in this new domain of knowledge as affecting the medical profession, Professor Robert Hartig, of Munich University, has been the Pasteur of the diseases of forest trees; although the credit of having been the first to stimulate interest in this direction undoubtedly belongs to Moritz Willkomm, who published *Die Mikroscopischen Feinde des Waldes* in 1866-68. More than twenty years ago, while Hartig was Professor of Botany at the Imperial Forest Academy, Neustadt-Eberswalde in Prussia, he published (1874) his celebrated work, *Wichtige Krankheiten der Waldbäume*, or "Important Diseases of Forest Trees." The value of this contribution to forest literature was not adequately or speedily recognised by the teachers of forestry of that day; and a good deal of ridicule was cast on a study which is now, by every scientific forester on the Continent of Europe, admitted to have a very distinct and direct practical value. The scoffers maintained that the fungi found on trees were *secondary*, or results, and not *primary*, or causes; but Hartig was able to prove his case by experiments in which healthy woody-plants were brought into a diseased condition through artificial infection. Various works, papers, and brochures were published by Hartig before the issue of his *Lehrbuch der Baumkrankheiten* in 1882. A second edition of this work appeared in 1889, embodying the results of the active advance of mycological science; and now what is practically a third edition has just appeared in an English form as a *Text Book of the Diseases of Trees*, by Professor R. Hartig, translated by W. Somerville D. Oec, of the Durham College of Science, and edited by Professor H. Marshall Ward, of Coopers Hill College, (Macmillan and Co., 1894).

During the generation that has just passed since the formation of the Forest Department under the Government of India, and the introduction of Forest Administration into the various provinces under its rule, the officers of the Forest Department have had too much to do—in the way of organizing work, selecting and demarcating reserves, improving the methods of extraction, trying to form a market for fine woods which have as yet little or no market value beyond what is merely local and comparatively insignificant, improving communications, protecting the better and more valuable tracts from the destructive effects of jungle fires, overgrazing, &c.,—to admit of their devoting any attention to such apparently trivial

matters as the diseases of trees. But it is only reasonable to suppose that as time goes on, and forest work in India becomes more intensive, this new branch of scientific forestry will gradually receive more or less of attention. And for those who wish to devote a portion of their leisure time to the interesting study of the pathology of Indian forest trees, there can be no better guide than Hartig's text-book in its English form.

We know, for example, that many of the oldest teak plantations throughout India were formed on rich alluvial soils which, owing to their comparative fertility and to their richness in the soluble salts forming the food of plants, are never likely to yield such hard, heavy, close-grained wood as that produced on the drier hillsides, from which timber of the finest quality is obtained. Though producing a very much quicker growth of teak, these alluvial plantations can never be expected to furnish supplies of the finest quality of timber ; and if the degree of fertility exceeds a certain (indefinite) limit for the given circumstances of soil and situation, then it seems almost certain that there will be at least a *predisposition towards disease* either in individual stems or as a general characteristic of the whole crop.

This being the theoretical statement of a case which is of vast practical value with reference to plantation work, the question immediately suggests itself,—*Can any such results be proved as having actually occurred?* My answer is '*yes*'; for I find the following extract in my diary of 29th January 1881, during my inspection of the Hill tracts of Norther Arakan :—

"*Teak.*—Up to 1879 a police guard was stationed at Sawa, and, as 'was done at every other guard seven or eight years ago, an experiment-'al teak plantation was likewise formed here. It is now a clump of about '200 poles, growing over level, rich, very deep, alluvial deposit in prox-'imity to the river's bank. As in the case of all the similar plantations 'I have reported on, this clump is badly in want of being thinned out to 'the extent of about 50 per cent. Its crowded condition may be judged 'of when it is said that in girth the poles vary from the circle formed by 'thumb and forefinger up to three full spans. The average height of the 'dominating poles is about 35ft. to 40ft, and the mean girth 14in. to 15in. 'The maximum girth of three spans is attained by six individual poles. 'The distances at which the plants were planted out seem to be very 'irregular, but the whole covers about one-fourth of an acre.

'With reference to what I have remarked about the Myauktaung teak 'plantation, *viz.*, that the excessive richness of the soil (combined with the 'questionable drainage of the area during the rainy season), it being so 'much in excess of the fertility of the soils on which teak is indigenous, 'and over which it attains its greatest perfection, *would probably induce 'a spongy growth or fungus development before the trees arrived at the 'age of maturity*,—an example from the Sawa plantation may be quoted. 'One of the largest of the poles that had been growing at the north edge 'of the plantation (*i.e.*, in the position most sheltered from the winds),

'with a fine, normal development of branches, and hence of the root-sys-
'tem (that developing *pari passu* with the branch system), had, without
'any good and sufficient reason, simply fallen down, broken off just about
'three-inches above the ground. It was no rugged tear as if the pole
'had been thrown by the force of the wind. On examining it, no trace of
'insect-boring, or other visible cause, was assignable. On chewing a bit of
'the wood, however, the taste felt was decidedly that of vinegar, showing
'that from the combined effects of excessive fertility and imperfect drainage
'of the soil, the sap had been interfered with, had become decomposed, and
'undergone fermentation resulting in the death of the tree.....Although
'the woody, fibrous parts thus exposed were in an unhealthy condition,
'yet the bark, and stem, and branches had outwardly quite a healthy and
'vigorous appearance."

So much for too great fertility in the soil. But the opposite extreme may be productive of very similar results—a predisposition to fungous diseases. Insufficient supplies of food in the shape of soluble mineral salts, and more particularly want of a sufficiency of soil-moisture for the supply of the physiological requirements with regard to water of transpiration, produce very much the same practical results as when the root-hairs of the plants tend to gorge themselves with rich food beyond the actual physiological requirements of the individual plants. As this, however, is again a purely theoretical statement of the case, it must also be met with the question as to whether or not practical examples can be pointed to; and here, too, practical experience and theory harmonise, as may be abundantly proved on the limestone hills of Bodyar in the Jaunsar Division of the School Circle, N-W. P.

The re-wooding of these bare hillsides, with their shallow soil and their hot southern exposure, forms a difficult sylvicultural problem. Whilst the ultimate object to be aimed at is to clothe them with forest in which the ruling species shall be the valuable Deodar, this object will practically only be attainable by indirect means, and after a considerable lapse of time. As the elevation is above that at which the Chir pine (*P. longifolia*) occurs frequently in this part of Jaunsar, the principal tree to be made use of as a nurse, under whose shelter the Deodar can be raised, should be the Kail (*P. excelsa*), which is not infrequently found seeding itself naturally here and there, and forming a lightly foliaged patch of young trees, beneath whose grateful shade Deodar seedlings find the conditions apparently most suitable to their initial growth and development, namely, sufficient overshadowing of the ground to help to retain the soil-moisture, and to prevent the seedling suffering from the effects of the excessive transpiration that would be induced by complete insolation. Various methods of sowing and planting appear to have been tried in the past, mostly with but poor success; and the present method is the somewhat expensive one known as '*basket-planting*.' But even with the minimum of disturbance thus secured to the young nursery-bred Deodar,

the effects of exposure to the full blaze of the scorching sun on these hot, dry, southern exposures has in very many instances led to the foliage becoming infected with a minor parasitic disease, which exhibits itself in the form of small yellow pustules *(sporophores)*, that ultimately turn black as they mature and dry.

Fungous diseases of various kinds are exceedingly common on the conifers throughout Jaunsar-Bawar, and, of course, more especially on the southern exposures where the conditions as to insolation, food-supplies, and water of transpiration are very much more unfavourable than on the cooler and moister northern aspects.

On the vast majority of the Himalayan spruce (*Picea Smithiana*), which occurs so abundantly throughout the whole of the Jaunsar Division, in association chiefly with the Himalayan silver fir (*Abies Webbiana*), a fungous disease attacks the terminal shoots of the lower branches, transforming those into bright orange tassels (Plate *a*) which, after bursting and scattering their spores, become blackened and shrivelled up as if they had been scorched and withered by fire (Plate *b*). This fungus, identified some years ago by Dr. Cooke as *Æcidium Thompsoni*, seems to bear a very close relationship to the *Æcidium coruscans*, or rust-fungus common on the spruce of Sweden and Finland, which also attacks the young shoot and affects the whole of the leaves. These become occupied by a peridium, which ruptures either partially or along the whole length of the needle and shows the golden yellow æcidia beneath. The fleshy cone-like transformations of the shoot are eaten in Sweden; but the attention of the Himalayan peasants does not yet appear to have been drawn to the large possibilities before them in this respect every April and May. Sometimes the spruce are almost completely covered with these bright orange tassels, excepting the leading-shoot, which happily appears exempt from infection; and there cannot be the slightest doubt that if spruce were now a marketable tree, the great prevalence of the disease would be sufficient to draw practical attention to the advisability of trying to prevent the spread of the disease by lopping and burning all shoots within convenient reach. The teleutospore-form in which this *Æcidium* has its change of generation is not yet known. Leaf rusts are not confined to, or by any means so frequent on, Deodar foliage as on the needles of spruce and pines throughout Jaunsar. That on the Himalayan spruce (Plate *c*) was identified by Cooke as *Peridermium acicolum* (now better known as *Peridermium pini acicola* or *P. oblongisporium*), which is the æcidial form of the *Coleosporium*, that attacks the foliage of herbaceous plants like *Senecio*, *Euphrasia* and *Tussilago*. But the most striking and the most abundant leaf-rust is that on the foliage of the Kail pine (*P. excelsa*), designated *Peridermium orientale* by Cooke, which has been described in the *Indian Forester* (Vol III, page 88), and is now shown in the plate. During the months of April and May the *æcidia* are noticeable on the one-

year-old foliage of seedlings and saplings chiefly, though occasionally of older poles. The spermogonia are found among the yellow, pale orange or salmon coloured pustules which break through the cuticle of the leaf; and when those become dry and brown with age, they look like small black blotches. The mycelium develops inside the leaf, where it hibernates; and in the following spring it may again produce *æcidia* without killing the leaf. As the foliage does not die at once, or at least to any great extent, this fungoid disease is not of any very important character.

A more destructive disease is that occasioned by *Hysterium pinastri*, which was first noticed by Professor Heinrich Mayr (then Assistant to Hartig, but deputed by the Bavarian Government to visit the forests of North America, Japan, and the Himalayas) in 1886, when he found it on the Chir pine (*P. longifolia*) of the Lurli plantation. This disease, which has become the scourge of nurseries and young plantations throughout Germany in the last thirty years, appears first as yellow spots that spread out and turn the whole needle red, and often kills off the young plants when about one year old. This parasite is all the more dangerous, as it is saprophytic as well as parasitic, and can therefore reproduce itself upon the dead foliage lying on the ground.

Another form of fungoid disease occurring in Jaunsar is the *Peridermium pini corticola*, occasionally to be found on the stems of young pines, both Chir and Kail. Infection probably takes place at some point where an injury has been sustained (from an insect, hail, &c.,) and the mycelium spreads first of all within the cortex and then attacks the adjoining tissues, the rate of progress being usually somewhat more rapid longitudinally than horizontally. For the most part the *æcidia* are formed only where the cortex has become diseased during the preceding year; and there they protrude as large, bright, yellow or orange pustules of various shapes in May and June, which soon burst and scatter abroad their countless reddish-yellow spores. Like the majority of the other conifers of Jaunsar, the Leori (*Cupressus torulosa*) does not entirely escape fungoid disease, but is often largely attacked—more especially on hot southern slopes, of course—by a *Nostoc* (see Plate) or mucilaginous mass of brown teleutospore-layers which appear spirally round the stem. When this mucilage-like mass drops off, or becomes washed away by rain, small scars remain either exposing the woody tissue of the twig, or else forming excrescences on the bark. This *Nostoc* or cypress fungus is due to *Gymnosporangium Cunninghamianum*, whose teleutospores are each autumn developed under the outer cortical layers, and in spring they break through the cortex, appearing, often very profusely, in their mucilaginous masses. These fructifications consist of long filamentous basidia whose outer wall has become transformed into this gelatinous-like mass, and of the two-celled resting-spores borne at their apex. Within this mucilaginous mass, which

is soluble in rain water, the formation of the promycelium and sporidia takes place. On being liberated, the sporidia are conveyed by the wind to the foliage of various pomaceous trees, most probably to *Sorbus* in the case of the Cypress *Nostoc*, where they produce the *Æcidium Cunninghamianum*.

The common rust which attacks wheat and other grasses is frequently to be met with in Jaunsar as the Barberry fungus (*Æcidium Berberidis*) on the leaves of the Himalayan Barberry (*Berberis aristata*—see Plate). When infected, the leaves become thick, fleshy, and yellow, whilst the sporophores occur as bright orange-yellow pustules thickly scattered over the lower surface of the foliage, although a few also break through the cuticle of the upper surface. Infection probably takes place at the time of the opening of the buds, so that the development of the leaves speedily becomes arrested. The leaves infected—which not infrequently includes all the leaves of the short shoot in question—consequently become thickened, and remain more or less abortive. The sporophores ripen quickly, and shed the spores towards the end of April when they are scattered far and wide by the wind to produce the rust on wheat (*Uredo linearis*) and mildew on various kinds of grasses (*Puccinia graminis*).

But one of the most beautiful of all the diseases of the Himalayan trees is that caused by a species of *Exoascus* on the cinnamon tree (*Cinnamomum Tamala*). This disease, ultimately causing a cluster-like deformity of twigs and foliage similar to the so-called 'witches-broom' of the birch in Europe (also caused by an *Exoascus*), takes the form of a dense mass of bell shaped or crinkled excrescences of a beautiful pearly grey colour, which in form much resemble the malformations produced on a less luxuriant scale by *Exoascus alnitorquus* and *E. epiphyllus* in the fruits and the foliage of the common alder.

This branch of vegetable pathology has previously been introduced to the notice of the readers of the *Indian Forester* on more than one occasion, as may be seen on reference to Vol. II page 380, Vol. III pages 24 and 89, and Vol. XVIII page 21; and it has also been referred to on page 38 of Mr. Hearle's *Working Plan of the Deodar Range*, Jaunsar Forest Division, N-W.P., 1889. But to those who may wish to cultivate a closer acquaintance with the Diseases of Trees, Hartig's text-book can be warmly recommended. His companion work, *Anatomy and Physiology of Plants, with special reference to those of Sylvicultural Importance*, will also be issued in an English form during the autumn by Mr. David Douglas, the well-known Edinburgh publisher.

DEHRA DUN, N-W. P.
24th February 1895.

J. NISBET.

System of Tapping the Caryota Urens for Toddy in Travancore.

Although the *Caryota urens*, under the local names of Olathi, Choonda and Kali-pana, is met with in most of the cool shaded valleys and lower hill-slopes of the cultivated parts of Travancore, it is, as a rule, tapped in only a few of the districts in the inner North-Western part of the country. Its great ashy-green fronds of leaves which often serve to decorate some gay pandál; the stiff, dark fibres of its leaf-stalks locally used as fishing-tackle; its huge trunk which, when dead and hollowed out, is made into gutters and troughs; its soft, inner pith that sometimes takes the place of Sago,—are, in their way, useful, and among the many products it is capable of yielding: but, from its almost general utility in the localities in which the Caryota is tapped, its toddy is by far the most important product. Toddy is not, as some understand it to mean, the harsh alcoholic liquor obtained by distillation from the fermented sap of the palm; but it is the delicious, milk-and-water like, sugary sap itself as, cool and refreshing, it flows out at the cut-end of the flowering-spathe. The cocoanut, the palmyra and the Caryota has each its own distinctive method of tapping, but, perhaps, the most laborious, yet interesting, system, is that followed in the extraction of the toddy from the gigantic flower-branches of the last.

In North Travancore, where, more than in most other parts of the country, a perennial humidity pervades the air, the cocoanut, the Areca, the Talipat, the palmyra and the Caryota, glorying in the gay sun-shine of their tropical day, bathed in the copious showers of the monsoon rains, bedewed by the translucent condensations of the night-air and fanned by the perpetual breezes from the sea, bear up their imposing tufts of foliage high into the sky. Of this remarkable brotherhood, the Caryota, though one of the biggest, is yet the shortest lived; for, attaining its greatest dimensions in about twelve or fifteen years after sowing, the tree gives out its huge clusters of flowers for another two or three years at most, and then declines and dies long before its more fortunate associates will have arrived at even middle-age. Within the short period of its existence, however, it proves, in its own way, a useful and valuable tree; for, from the time it attains its greatest height down to a late day in its life, its grateful, nourishing sap administers to the sustenance and comfort of many hundreds of the lowest agricultural classes of the country. The noon-day meal of the Poolaya generally consists of nothing more than a long-drawn draught of sour toddy which, in his short hour of respite, he cheerfully drinks to the accompaniment of much rural gossip and prattle, with the companions of his toil sipping with him.

"Tapping," as applied to the several species of palm from which toddy is extracted in Travancore, consists of two distinct operations—"training the spathe" and "tapping-proper." In the case of the cocoanut and the palmyra, the training or preliminary, stimulative manipulation of the unexpanded flowering-spathe as an incentive to the flow of sap is always antecedent to the tapping proper, which consists in the methodical paring and slicing of the lower, free end of the spathe, at certain fixed hours of the day, to let out and, so gather, the pent-up toddy that collects in its spikes through their training. In the case of the Caryota, however, its giant clusters of flower-buds are too stiff and stubborn to yield their juice by a single process of training, and that operation is therefore made to alternate with the tapping-proper in a regular series or succession in which they are each repeated several times.

On the Caryota attaining its fullest dimensions—usually, a height of from 40 to 60 feet and a basal girth of about 3 or 4 feet—it gives out its first flowering-spathe which, appearing at the summit, stays the tree's further growth in height. A healthy, vigorous tree generally has from fifteen to twenty fronds of leaves, and once flowering begins, a spathe is let out at the axil of each frond. As they travel downward, the spathes increase in size until the middle of the crown, where the largest is given off, is come to: thereafter, they not only grow smaller but emerge at longer intervals, and, in a year or two after the last and smallest cluster matures, the tree itself speedily declines and dies. Wherever it is untapped, the Caryota, stamping a peculiar melancholy feature on the physiognomy of the vegetation around it, lives on for several years; but in localities where tapped, its vital energies come to be so incessantly and powerfully taxed, that, in the re-action which sets in, the tree dies at a comparatively early age. The first spathe let out is generally small and ill-formed and, as it would not pay being tapped, it is let alone. But when, a month or two later, the second spathe appears, the tapping of the tree is taken in hand. A couple or more stout bamboos with portions of the arms retained on each side to serve for steps, are tied on to the stem of the tree, one above the other, until they form a ladder long enough to reach the spathe; and at the top, directly below the spathe, a rude platform of little sticks is constructed for the tapper's use. This individual, usually a man of the Chöga, or "Tapper caste," now ascends the tree and, perched on his platform, proceeds to cut away that portion of the tough sheath which encloses the long, tender, flower-spikes of the spathe: the remaining part of it protecting the peduncle of the spathe itself is, however, allowed to remain to shield the latter from the direct heat of the sun or any other external influence likely to injuriously affect it. The spathe, at the time the sheath is thus removed, will have just completed its elongation, but will not yet have burst open. On removing the sheath, the delicate spikes of unex-

panded flowers are all unravelled and stretched ; but they are, soon after, wrapped up in a few strips of Talipat leaf and tied round with a little coir rope. Early the next morning the spathe is untied and the spikes of embryonic flowers are taken, one at a time, between the fore-finger and thumb of each hand in succession and gently, yet firmly, pressed. This operation, the first step in the training of the spathe, begins at the attachment of the spikes with the peduncle and, proceeding with an even, rythmical regularity along their entire lengths, is continued down to their free ends. It is repeated several times over each and every one of the three or four hundred spikes in the spathe—an extremely tedious operation, but conducted most patiently and carefully. Every morning, six days following the unravelling of the spikes, this monotonous pressing goes on, the spathe being, during the intervals, carefully wrapped up in its shroud of Talipat leaf. On the sixth day, after the training for the day gives over, about six or eight inches of the sheath left covering the arched end of the peduncle is carefully cut and removed ; the dense, rusty tomentum on it is scraped together and ground, with a little sour toddy, into a stiff paste ; the exposed part of the peduncle is gently bruised with a smooth stone and the paste applied over the bruise. This bruising of the peduncle is said to arrest the further development of the fibrous tissue in the spikes ; it, at any rate, makes them limp and pliant : the paste is applied to exclude the air from the injured part and, so, to prevent decay. The spikes are usually from five to seven feet long, and the next step consists in the cutting away of their lower, free ends for about six or eight inches of their length, care being taken that every spike is clean-cut and to the same length. To ensure this, the spikes are, before being cut, bound together into a compact bundle. For the next ten days the spikes are taken, one by one, between the fore-finger and thumb of each hand, as before, and twisted by a dexterous, tilting action, proceeding at first from left to right and then reverse ways, and continued like the pressings from the insertion to the free end of each spike. For the next two or three days the spikes, placed between the palms of both hands, are gently rolled about backwards and forwards for several minutes each. By the time this operation ceases, the young toddy begins to flow. No attempt is, however, made to collect this astringent, sub-acid juice, but, under the name of " Kaippan mara-vellam " (bitter tree-water), it is allowed to drip to the ground for a couple of days. On the third day, the pot, usually an earthen vessel, is tied on to the cut end of the spathe and a piece of the lower petioloid expansion of the leaf-stalk of the areca palm is tied all round the rim to prevent the rats, squirrels, bats, pole-cats and flying-foxes from prying into its contents. The monkey is, however, the only animal that cannot be kept away when he decides upon taking " a drink " ; but the penalty of his indulgence too often overtakes him in the midst of his Bac-

chanalian enjoyment, and he is found most disgracefully "tight," either tottering on the tree-top or sprawling about, with many an amusing antic, near the foot of the tree. However, with the tying of the pot the tapping-proper begins and, for a couple of days thereafter, every morning and evening, the tapper, on emptying the toddy-pot into a curious bucket which is carried strung to his waist, trims the ends of the spikes with a sharp, broad-bladed, little chopper, with which, on each occasion, he carefully slices off about an eighth or a quarter of an inch of their length. After this, the spikes are untied and rolled about between the palms for three, four or even five days. They are then tied together again and tapping goes on, without interruption, for five days. By this time, the yield of toddy would be about four quarts per day. The spikes are now untied, rolled for three days and bound together again. The tree is then tapped for eight consecutive days when, a yield of six quarts per day being attained, the rolling of the spikes again goes on for three days. Another twelve days of tapping, enhancing the yield to eight quarts, ensues, and the spikes are then pressed for three days. This pressing is a repetition of the first operation only, when undertaken at this stage, it is done more thoroughly. The tree is then tapped again for twenty days, at the end of which time the yeld will have run up to twelve quarts. But when, a few days later, it shows symptoms of decline, the spikes are once more, and for the last time, vigorously squeezed, twisted and rolled about for three days. This sustains the yield of toddy some time longer and, in strong, healthy individuals even increases it to eighteen or twenty quarts per day. But the course of the spathe is run. Through the frequent slicing of its lower end it will, by this time, have been reduced to less than half its original length ; and when, after a month or a month-and-a-half more of tapping, the yield of toddy steadily declines until it at last ceases, all that will remain of the once beautiful cluster of graceful, light-green spikes would be but a few inches of their dry and shrivelled-up stumps.

When tapping is going on in any particular spathe, the others do not so readily emerge, but, varying from a fortnight to a couple months after it gives over, one or more of them appear. Sometimes several come out in quick succession but, then, they are tapped, each in its own proper season : in this way, three or even four spathes may be all seen tapped on the same tree, at one and the same time. When such prolixity is evinced, however, the last spathes are slow in appearing, but, again, when they do emerge, they are generally more vigorous than the ones gone before. In any case, the last spathe is the smallest and it, like the first, is usually let alone. Again, owing to the extremely vigorous condition of certain individuals, it sometimes happens that the flow of toddy is so copious that the pot has to be watched and emptied several times during the day. It is also interesting to note that some

spathes, in spite of the most careful and exciting training, will not yield any toddy whatever.

An average-sized spathe is tapped in about four months, and it usually takes about two years for all the spathes of a tree to be tapped.

As the toddy is taken down fresh from the trees, it is sweet, and fairly large quantities of it may be drunk without fear of inebriation. It is not only mild, but is considered both wholesome and nourishing—hundreds of poor little Poolaya and Choga babies being kept upon it throughout the day while their mothers are working in the fields far away. Unlike the cocoanut's, the toddy of the Caryota is thin, *i. e.*, more watery; but once fermentation sets in, it soon turns into a foaming, beer-like liquid, acid to the taste and intoxicating readily. It is this strong, sour toddy, however, which diluted with water, is usually drunk by the lower classes, especially the Poolaya who would refuse to take any other, even the sweetest: but give him the sourest, and he would, calling it "Nalla poolicha Kallu" (good sour toddy), drink as much as four or five quarts at a single sitting in one of his thirsty noon-day palavers.

Tapping for "Jaggery" is conducted on the same principles as tapping for toddy, only the pot used for "Jaggery-toddy" is thickly coated inside with well-slaked lime which stays fermentation for several hours. On being collected this toddy, which is very sweet, is poured into large copper vessels and boiled down for several hours, until it grows into a thick, dark brown, syrupy, granular mass, when it is ladled out into little brass or earthenware dishes and, solidifying on cooling, constitutes the coarse native sugar familiarly known as "Chakkaray" or "Jaggery".

KOOTHATOOKOLAM
28th January, 1895.

A. M. SAWYER.

The Sandalwood Tree in Mysore.

Sandal-wood *(Santalum album)* belongs to the Santalaceæ family. It is a tree with fragrant wood, opposite entire smooth leaves, of a roundish oval shape and of a dark green colour. It propagates itself in Mysore amongst bushes, woods and rocks. The tree is a middle-sized one, and has a good crown. It is almost peculiar to Mysore and Coorg, and though it grows to some extent in some of the adjoining districts of Madras, it is comparatively less in quantity and inferior in quality. Though the tree is found all over Mysore it grows very unequally in different parts

of the country. It is not met with in the heavy, evergreen forests, and is conspicuously absent to the west of Hemavati towards South Canara. It attains its greatest bulk and weight in places with a moderately heavy rainfall, say 30 in., but the perfume of the wood grown in such localities is not so strong as that of trees grown in more arid spots. The girth of a mature tree varies according to soil and circumstances, and in exceptional cases there are trees with 4 to 5 feet in girth, with a stem of 16 ft. long to the first fork. It attains maturity at between 20 and 40 years of age according to soil and climate. The older the tree the nearer the heartwood comes to the surface.

The tree is found in three varieties, red, pale and yellow, but they exhibit no indications externally, and there are two other sorts of sandal, called Navul Kannu (pea-fowl's eye) and Naga Kannu (cobra's eye), so-called on account of some spots on the heartwood, which can be distinguished by a careful observer by the external condition of the bark. The heartwood is hard and heavy, highly scented and rich in oil, the bark and sapwood have no smell. The best parts are used for carving boxes and other works of ornament This is probably the most valuable of woods in the world, for the market value of a cubic foot of it varies from Rs. 10 to Rs. 20. The roots, which are the richest in oil, and the chips, go to the still. It forms the basis of many scents, and is also used in medicine. By far the greater portion of the wood sold yearly in Mysore is taken to Bombay, the annual revenue to the Mysore State from Sandalwood varying from 10 to 14 lacs of rupees. The Mysore Government have long established Kothis at different centres of the Province, for the storage of Sandalwood collected from the forests and other lands, where it is prepared and exposed annually for sale. Dead and dying trees, and fully mature trees are removed bodily, and the bark and sapwood are taken off in the forests. The wood is then carted to the nearest Kothi. In the Kothi, the root of the tree having been first separated from the stem by a saw, the log is cut into billets of 3 feet in length, any white wood that might have been 6 feet on it is removed by a small adze and then chipped, The billets going into the first five classes are then planed either with a carpenter's plane, or shaved with a double-headed bill hook, to give the billets a smooth surface. The wood is classified by the weight of the 3 feet billet and its external appearance. The wood is generally assorted into 12 classes, the first 5 classes, then the roots, *Jujpokul* (or hollow wood) *Bagar Adeidor* small pieces, *Hutri*, *Iyu* and *Milwa Chiltas* and the saw powder. The rules for the classification of wood framed by the late Dewan Purnaiya are almost fully still in force.

Although Mr. Petrie Hayes has been bringing about improved machinery for the extraction of Sandalwood oil, the primitive mode of obtaining this oil by distillation is still in vogue, and largely

followed by people in South Canara. It may be interesting to many of the readers of the *Forester* to know the details of the primitive method of distilling Sandal oil. To say briefly, Sandal oil is procured by distillation, the roots yielding the largest and the finest quality of the oil. The body of the still is a large globular claypot, with a circular mouth. The mouth of the still, when filled, is closed with a claylid, having a small hole in the centre, through which a bent copper tube is passed for the escape of the vapour. The lower end of the tube is conveyed inside a copper receiver placed in a large vessel containing cold water. When preparing Sandal for distillation the white or sapwood is rejected and the heartwood is cut into small chips, of which about 2 maunds or 56 lbs. are put into the still. As much water is then added as will just cover the chips, and distillation is slowly carried on for 10 days and nights, by which time the whole of the oil is extracted. As the water from time to time gets low in the still, supplies are added. The quantity of oil yielded by wood of good quality is about 10 oz. per maund. The oil is transparent, and of a pale yellow colour.

Propagation.—It is understood that the formation of Sandal plantations in Mysore was first mooted at the beginning of the present century by Colonel Wilks, then acting British Resident in Mysore. At that time the universal opinion that existed appears to have been that Sandal trees would not thrive in artificial plantations. Nurseries of Sandal plants were made and the plants transplanted into pits, but this was attended with failure. Mr. Ricketts, the Inspector-General of Forests in Mysore, in his circular regarding Sandal growth, says that artificial planting in the open, even on the most favoured soils, is generally attended with failure for want of shade to the seedlings in the hot season, but that the chances of failure of artificial sowing in ploughed lands have proved to be few and limited. All that is required to be done is to select a good sized block of waste land favourably situated, if possible, as regards moisture, though if the soil be poor it does not much matter. This block of land should be thoroughly ploughed at the first rains or the usual ploughing season. Sandal seed should be sown at the ordinary sowing season mixed with seeds of quick growing indigenous fuel trees or any naturally quick growing trees. Experience has shown that this method of planting Sandal is a success, and a plantation worked on it in the Gundekutte Kavul, close by Hassan, has a hundred thousand young Sandal trees. Doubts are expressed as to whether artificially sown Sandal trees would produce Sandalwood, equal in scent to that grown spontaneously, but the plantations are young as yet, so that it will take time to remove the doubt.

N. NARAYAN RAO,

Forest Ranger, Hassan.

The Management of Forests containing teak.

The review of the Annual Forest Administration Report for Mysore for 1891-92, which appeared in the February issue of the *Forester*, shows that in Mysore as on the Anaimalai Hills, the same difficulties are experienced with regard to the reproduction of teak, and of the few valuable species which the mixed forests contain. Immediately the leaf canopy is broken, a rank undergrowth springs up, and the teak seedlings stand no chance. It would be interesting to know whether the same conditions obtain in Wynaad, Travancore and Cochin. Personally I feel convinced that the selection method of treatment, and fire protection, unaccompanied by cultural operations, is not sufficient in the mixed forests of Southern India, which still contain teak, and that if the present system continues, teak, rosewood and vengay, *(Pterocarpus Marsupium)* and other valuable species will become extinct. I drew attention to this fact last year in the *Forester*, and suggested certain remedies ; the subject is, however, of such vital importance, that I again refer to it, in the hope that other foresters may give us the benefit of their experience and advice. The Nilambur plantations (Malabar district) have, I believe, always been looked on as a source from which, in the future, considerable supplies of teak will be available. The growth of teak in these plantations is doubtless very rapid, but it yet remains to be proved whether teak, grown on these alluvial deposits, is of the same quality as teak grown on the Anaimalais and other hills between 1,000 and 3,000 feet above sea level. Soft, spongy teak is of less value than good, sound jungle-wood of inferior species. I have had no experience of the Nilambur plantation teak timber, but as I found that the Anaimalais teak required, on an average, 120 years, to attain a diameter of 2 feet, I am inclined to be suspicious as to the qualities of the Nilambur teak, with its rapid growth. However, I am doubtless prejudiced on the subject, and Mr. P. Lushington, who is now engaged in preparing working plans for the Nilambur plantations, would be able to enlighten us on the subject. I visited the Nilambur plantations in 1887, and was much struck with their appearance; on the whole I was disappointed, many of them had not been sufficiently thinned, and the consequence was that the trees in some of the older plantations had poor crowns, and resembled telegraph posts ; thinning was urgently required, but it was doubtful whether it could be undertaken without serious risk at the time : in any case it was an operation which required extreme care, as the trees could have had but little root, and if the wind once got in they would have gone down like nine-pins. What has been done since then in the plantations I have never heard, and it seems a pity that there is no annual record of how our forests are worked in each district, and what are the results of cultural operations, &c., &c. Had there

been any system of collecting such information as is the case in other countries, an Indian sylviculture might have appeared, accompanied by a treatise on working plans for different kinds of forests long ere this. True, we have the Code Forms and Returns, but they are useless for the purpose. For 40 years at least the Anaimalai hills have been under the management of the Forest Department, during which period a large quantity of timber has been worked out, but as the problem of teak reproduction has not yet been solved, the forests must have become poorer every year, and this is doubtless the case elsewhere; far too much importance is attached to financial results. As natural forests of pure teak do not occur at any rate in Southern India, it is more than doubtful whether plantations of pure teak on alluvial deposits are likely to produce first class timber. At the time (up to 1887) there was a good demand for teak poles from Nilambur, these were, I believe, sent up the Persian Gulf; if this demand still continues, and if it be found that the timber is inferior, there is every reason why the Nilambur plantations should be worked solely to meet this demand. If, on the other hand, the timber is of good quality, the plantations should be worked as timber forests, as the thinnings will probably meet the demand for poles.

It is unfortunate that the conditions at Nilambur are peculiar, and obtain nowhere else in Southern India so far as teak is concerned, as the data now being obtained, interesting as they doubtless are to show how rapid is the growth of teak in the Nilambur plantations, will not be of the slightest use in constructing tables for the preparation of working plans for any other forests. In such regular plantations the possibility might be fixed at so many trees a year, without attempting to determine the annual volume to be felled.

TRICHINOPOLY,
5th March, 1895. } H. J. PORTER.

II—CORRESPONDENCE.

The Forest Policy of the Government of India.

SIR,

Mr. Editor, as you rightly surmised, the publication of the full text of the recent Resolution on the Forest Policy of the Government of India in the *Forester* was awaited with interest by your subscribers at Home. Those of us who do not see

Indian newspapers could only form an idea of the nature and scope of the Resolution by the comments on it which appeared in the *Times*. The papers on "Indian affairs" in the *Times* are generally supposed to be written by some person of standing, and an authority on India and Indian affairs, and are therefore usually accepted as authoritative, and perused with interest by all who have ever been concerned in our Indian administration. Viewed in this light, the paper I refer to has caused no little anxiety amongst the pioneers and veterans of the Indian Forest Department in Europe, who were at a loss to understand what had rendered such a Resolution necessary, and fearful lest some new departure might be contemplated likely to undo much of the good work accomplished and in progress.

A careful study of the Resolution itself will, I think, somewhat allay this feeling, and lead to the conclusion that the usually well-informed and moderate *Times* writer has, in this instance, depicted the state of affairs which presumably led to its issue in too vivid and suggestive colours, for the Resolution itself contains no reference to "grave grounds of dissatisfaction in the forest administration" or "undue infringement upon (query "*of*"?) the rights of individual classes;" and, read literally, is merely a repetition of what has been already laid down and accepted as the basis of our forest administration in India, one's first impression after its perusal being merely one of astonishment at its promulgation. It is, however, rather in what the Resolution leaves unsaid, and in the various and conflicting interpretations to which its somewhat indefinite wording may lend themselves, that its chief danger appears to lie. The first question which naturally presents itself is, what has rendered such a Resolution necessary, and was it expedient to reopen such a wide field for discussion and possible misconstruction by publishing it broad-cast? So far as I and other retired forest officers are aware, there was no necessity for a reiteration of the forest policy of the Government of India, for if any local Government or Administration had appeared inclined to go too far, and to render the forest laws oppressive, it would surely have been more expedient to warn it or them through the ordinary official channels, rather than by a Resolution addressed publicly to all, and communicated to the Press. To proclaim on the house-tops that "the sole object with which State forests are administered is the public benefit," is to state a truism which applies equally to the administration of every Department and to the Government of India itself. To reiterate it is to suggest a feeling of "*qui s'excuse, s'accuse*"!

The difficult questions to solve have frequently been, and doubtless still are, "who are the public"? and "what are its real interests"? and what some of the ablest and broadest-minded forest officers have deprecated is the sacrifice of the welfare of a whole district or province to the privileges or abuses of a comparatively small but clamorous section of its inhabitants whose

villages happen to adjoin the forests, or who have made it their custom to devastate the hills and woodlands by grazing and browsing large herds of cattle and goats in them free of all restraint or contribution to the revenues.

The only effectual solution of such difficulties has been found in all countries to be full enquiry, registration of claims, and their definition under a legal, but at the same time liberal and sympathetic, settlement, such as is provided for under all the Indian Forest Acts, or is in the competence of Local Governments. The Resolution does not appear to me likely to further such definition and final settlement; on the contrary, by its vague generalities and ambiguous suggestions, it is much more likely to unsettle matters and open up anew a whole crop of questions and indefinite claims, which it was hoped had been happily settled once for all and most frequently by some sort of compromise. The petty timber dealer who is frequently the village headman, the needy Vakil, the unscrupulous agitator, and even subordinate officials of other departments inimical to the Forest, may all twist the wording of the Resolution to their own advantage, and appeal to it in support of agitation and obstruction, active or passive, against every restriction or curtailment of what some are pleased to designate "the immemorial rights, privileges and customs of the People" (with a very big P), ignoring the fact that the people had virtually no rights till the British rule, with its law and order, evolved them; and that all privileges and customs are subject to curtailment and modification under a different state of affairs, and in the interests of the community, or what Americans term the Commonwealth or weal. The Resolution opens by a reference to Dr. Völcker's report in the improvement of Indian agriculture, to which reference is again made in para. 11 with regard to the formation of fuel and fodder reserves. I have the greatest respect for Dr. Völcker's opinions on agricultural matters, and am fully in accord with his views that any rational forest policy in India, as elsewhere, should conduce to, and even subserve, the welfare and improvement of agriculture. But Dr. Völcker had admittedly a very limited and cursory acquaintance with India and its people, and it has always appeared to me and other forest officers that throughout his able Reports he was inclined to overlook, in the interests of the agricultural classes as represented to him by themselves, several important factors in what I may designate as the agri-forest probbem. Notably, that the sustained yield of a forest is limited, and that, especially if it has been injuriously trenched upon for years, complete protection and remedial measures, involving a curtailment, or possibly entire cessation of the supply for a more or less extended period, are necessary to ensure its permanence and still more its enhancement. That is the case with most of our Indian forests, and still more so with the fuel and fodder reserves which have been subjected to excessive and unregulated felling, lopping and over-grazing for many years, and would ere this have probably disappeared entirely

had not forest conservancy in some shape or other intervened. Dr. Völcker doubtless grasped with an expert's eye that leaf manure, fodder for cattle, and an adequate supply of material for agricultural buildings, implements and fuel were *desiderata* towards the improvement of Indian agriculture, and he doubtless heard a good deal of the restrictions of the Forest Department on such supply. What he does not appear to have adequately realised is the fact that the total area classed as forest is limited, and for the most part greatly impoverished, and that considerable periods of efficient conservancy are necessary to render its production anything like sufficient to meet the demands not merely of adjacent villages but of the country at large.

Dr. Völcker advocated a supply of cheap firewood mainly on the ground that it would put a stop to the practice of burning cow-dung "bratties" as fuel. Without doubt an adequate supply of cheap fuel would be an advantage to the people, and it will come in most provinces if systematic forest conservancy is persevered in, but that will not prevent the native of India using "bratties" to cook with, for they are regarded, doubtless rightly, as more or less a necessity for a slow fire. This flaw in his argument was brought to Dr. Völcker's notice in my hearing by a forest officer in London, and reference was made to the case of Bombay city, where, with large supplies of comparatively cheap firewood, and a well-to-do and enlightened community, acres of land at Byculla are devoted to the manufacture of cow-dung "bratties," which is a regular industry. So far as I can recollect, he admitted that his attention had not been drawn to this view of the question, and had certainly not seen its practical application in Bombay ; and expressed regret that he had not seen more forest officers and heard their views whilst in India. I have referred to this episode not to detract from Dr. Völcker's able report and suggestions, but merely to show that even such an open-minded and enquiring expert may, from erroneous impressions, and from lack of sufficient opportunities and experience, overlook some aspects of a very wide question.

The Resolution deals with the forests of India, which it appears to assume to be all State property (which is by no means the case) under four broad classes, and passing over the first, *viz*, "Forests, essential on climatic or physical grounds," in which the only consideration suggested is "a reasonable hope of the restriction being effectual"; prescribes regard for customs of user either free or at non-competitive rates without regard to the forest income, and the supply of small timber suitable for the requirements of the agricultural and general population from the second class, *viz.*, "forests which afford a supply of valuable timbers for commercial purposes." *Rights* of user are defined and provided for at the Forest Settlement, and even *customs* have, so far as my experience goes, been considered, and, wherever possible, tracts were excluded from reservation for their exercise. Such areas, have, as a rule,

very speedily been denuded; and too frequently, notably in the Bombay Presidency, the villagers having eaten their cake, have demanded more. This can, however, generally be met from the adjoining Revenue forests, *provided* it is taken under supervision and when and where the forest officer prescribes. The use of the words "every reasonable facility" and "full and easy satisfaction" is ambiguous and apt to cause trouble, being open to widely different constructions on the part of the villagers on the one side and the forest officers on the other. Whether the produce is given free or on payment does not, or ought not to, really affect the forest officer, whose duty it is to grow it, but differential rates are objectionable; and, as a rule, it has been found preferable either to make free grants for special reasons or to sell in the open market. As regards the production of small, in preference to large, timber, the forest officer will naturally prefer the former, if there is a better market for it, but the fact that only the State or very wealthy proprietors, can afford to grow "high forest," *i.e.*, timber, owing to the length of time the capital is locked up, should not be lost sight of. In this connection nothing has been so frequently impressed by the present Inspector General upon forest officers charged with the preparation of working plans, than that a very important factor is "*the will of the owner*," *i. e.*, that they are not to provide for the growth of *timber* if the owner—in this case the Government—wishes *poles* or *vice versâ*.

Little or no exception can be taken to the doctrine that "*subject to certain conditions* the claims of cultivation are stronger than the claims of forest preservation," but the fourth condition attached, *viz.*, that cultivation must not be allowed to encroach upon the minimum area of forest necessary to meet the present and future requirements of the country, renders the prescription unnecessary, for of no Province of India, excluding Burma, can it be maintained that the area of reserved forests *in their present condition* is sufficient for, still less in excess of, its requirements. What it may become under efficient protection and management is another question, which it will take at least a generation to solve. Sir Dietrich Brandis, then Inspector General, cherished dreams of smiling villages and fields nestling in the forests and supplying necessary labour in return to a certain extent for exceptional privileges, but we are a long way off that Utopia, which a wavering and indefinite policy with regard to the Reserves or State forests, such as the Resolution may be taken to indicate, may, I fear, postpone *sine die*.

The third class of forests referred to in the Resolution, styled, briefly, "minor forests," embraces by far the larger area in the provinces with which I am acquainted, and, I believe, throughout India: the normal or ideal forest, well-stocked with trees, capable of yielding *timber* of commercial value being the exception. But there is abundant evidence that much of this class formerly

contained valuable and well grown trees, which it is the task of the forester to reproduce ; in fact, to convert into forest what has degenerated into scrub or jungle. I leave it to any intelligent person, at all conversant with the subject, to consider how much this task, by no means an easy one at the best, under the climate and conditions of India, may be rendered harder, if not altogether impracticable, if the policy of the Resolution, with regard to local supply of fuel, grazing etc., is really given effect to. And if all considerations of revenue are to be subordinated to such a policy, where is the money for adequate protection and improvement to come from ? If the Government of India is prepared to provide for and guarantee, not merely for a year but for all time, ample funds for adequate forest establishments, irrespective of forest revenue, well and good, but such a supposition is negatived by the hard logic of facts—the financial straits of the Government, and the fate of the famine fund ! The Resolution itself contains abundant evidence of how illusory it would be for any forest officer to adopt such an idea; for, whilst proclaiming in grandiloquent terms the necessity for liberality in the provision of forest produce to the People (big P), without any consideration of revenue, and referring to the paucity and low pay of forest subordinates, it proceeds, in the most ingenuous manner, to suggest that their numbers and presumably their expense may be found capable of reduction ! Let any local Government, Conservator or Divisional Forest Officer, be led away by the liberality (?) of the Resolution in framing forest budgets, and I have little doubt what the result will be.—sweeping reduction in the provision for establishments and working charges, involving a cessation of protective and remedial measures, and *ultimately* far greater loss to the People and country at large than under a less sentimental, more commercial, but not necessarily an unsympathetic or illiberal policy. The mistake which has been made of late years is not the raising too much forest revenue, which is a mere bagatelle, compared with what it may legitimately become when the forests are well stocked, and able to supply the demand which is now largely dependent on imports; but, as pointed out by Mr. Hill when acting Inspector General, too large a proportion goes into the public treasury, and too little is expended on the protection and permanent improvement of the forests. Let the Government of India prescribe that at least two-thirds of the nett surplus in any Province shall be expended on the reserved forests till the end of the century, and they will then have a supply of forest produce and forest revenue to be proud of, and can afford to be liberal not only in the forest but in other departments. This paper has run to such length that I must only refer very briefly to the fourth class of "forests" styled "pasture lands" in the Resolution. I think it would have been more in accordance with fact to group those with the "Fuel and Fodder reserves," excluding the latter from the third category. The control of such scattered areas, with the object of securing and

increasing the supply of firewood and fodder, is really outside the scope of the Forest Department, but was entrusted to it for want of a better agency, experience having shown that if left to the people themselves or the Revenue Department they would certainly deteriorate and disappear. They might probably with advantage be constituted "village forests," and managed by village heads under simple but definite schemes prepared in the Forest and Agricultural Departments. Some restrictions and payments would be necessary, but care should be taken that they do not become the nucleus of a third department competing on a small scale with the "Forest," as was the case with what was styled "Jungle Conservancy" in Madras.

The question of pasturage is far too wide to be dealt with at the close of this paper. Suffice it, that the practice which obtains in most villages adjoining forest areas, of keeping large herds of cattle, sheep and goats, and driving them into the forests daily, is universally condemned by those who have studied the subject. For only do they do great damage to the forests, but their manure is, for the most part lost, and the beasts themselves are half starved. It is notorious that the finest and best fed cattle are found not in forest villages, but in the open plains where no such practice is possible, and only the numbers actually required for ploughing and draught and the supply of milk are kept. Of course, these remarks do not apply to extensive grazing and breeding grounds, such as exist in some upland districts of most provinces, and are a necessity to the welfare of the country. In such the growth of trees must be subordinated to that of grass, but regulation is none the less necessary to prevent over-grazing, fire, and damage to the trees and shrubs required for shade, and the supply of leaves; and the graziers may well be required to contribute to the revenues for the exercise of what is a very lucrative calling, the amount being credited to whichever department exercises the supervision and control.

I have always been under the impression that one of the chief objects and advantages of "forest settlements" was to set at rest once for all most of the questions raised by the Resolution. The forest officers were to be restricted to the management and improvement of clearly defined areas, subject only to such rights as were established and privileges conceded at the settlement, and of course to the "will of the owner" as regards treatment and class of produce to be grown. This was certainly Sir Dietrich Brandis' aim, and it has been the goal of most Conservators' and Divisional Forest Officers' ambition for many years. If the result of the Resolution is to unsettle all this, the Divisional Forest Officer anxious to show what he can do professionally even on a comparatively limited scale if let alone, may well lose heart and abandon all hope of making his forests what they should be. I do earnestly trust that if any further concessions are really to be made and produce granted free or at nominal rates from reserved forests, the forest

officers may have the credit of granting it, and be allowed to do so in their own way, and that we may not have the spectacle repeated which presented itself to Sir Dietrich Brandis in Madras, of the forest officers doing their best to protect and improve the forests, whilst subordinate revenue officers were authorized to grant permits for the produce wholesale nominally free, but too frequently for a substantial consideration. I had intended to refer at some length to the manner in which such concessions as the collection of dead wood, leaves for manure, free grazing for a limited number of cattle, etc., are capable of abuse, and indicate the measures to prevent it as far as possible, combining "improvement fellings" and the employment and training of forest labour under proper supervision with such free grants, but I cannot trespass any further on your space at present.

To summarize my opinion on the Resolution, I, and I think I may say other veteran forest officers, consider it can do no good, and may do much harm through misrepresentation to the people, not one in a million of whom will ever see it, or would understand it, if they did. It is doubtless well intended, but I venture to think, with all respect, would never have been promulgated had Lord Elgin been at the close instead of the commencement of his Viceregal career.

VETERAN FOREST OFFICER.

Germination of Kharshu.

DEAR SIR,

With respect to Mr. Leete's enquiries in the December, 1894 number of the *Indian Forester* as to the cause of the failure of Kharshu seed to germinate after the profuse seeding which occurred in July last, it appears to me that the failure reported is, to some extent at least, only apparent, not real, and that a careful inspection of the ground in the vicinity of trees which seeded last year as well as of the nurseries which Mr. Leete started on the "Cheena Peak" may result in the discovery of a number of seedlings which might at first have escaped his notice altogether. Mr. Leete, perhaps, expected to find the Kharshu seedlings normally developed, just as the seedlings of other forest trees look soon after the process of germination is completed, and it is quite probable that in his search for such plants he might have either overlooked the delicate, leafless shoots of Kharshu, or mistaken them for something else. Seedlings of Kharshu, as a rule, do not develop true leaves till they are nearly a year old, remaining all this time dormant, and looking more like stunted blades of grass than real plants. The peculiarities which the acorns of this oak show in their mode of germination will be found fully described in my

"Note on the germination of the Kharshu acorn," in Volume XVII of the *Indian Forester*, but it will not, perhaps, be out of place to quote the following passage from it, in order to enable the reader to form an idea of what the Kharshu seedlings look like for a long time after the seed has germinated :—

"When the plumule first makes its appearance, it is a very 'small thing, consisting merely of the terminal bud. It, however, 'begins soon to elongate itself, and when it is about an inch long, 'it is covered with a number of scale-leaves, each bearing a bud in 'its axil. The stem continues to grow on till it is 2 to 3 inches in 'length, when the ensuing drought and frost bring it to a state of 'repose ; but during, at least, the first year of its life it does not 'develop the true leaves, and is a slender, delicate-looking, leafless 'shoot. The taproot, on the contrary, grows both in length and 'thickness in a marked manner ; and while the stem is only a 'delicate, leafless organ, it is not unfrequent to find the root in-'creased to more than 6 inches in length and a quarter of an inch 'in diameter. At the commencement of the following spring the 'seedlings begin again to push up, but it is not till the rains have 'set in, *i. e.*, till they are nearly a year old, that they develop their 'first leaves. A few exceptional cases, however, occur in which the 'first true leaves are formed during the same year in which the 'seedlings germinate."

The small size of the seedlings coupled with the absence of true leaves make it difficult to trace their existence amidst the mass of dead leaves which partly hides them from view, but in some cases their presence can be detected by means of the exhausted, shrivelled-up remains of the cotyledons, enclosed within the pericarp, which are often found lying under Kharshu trees long after the acorns have germinated, and remain attached to the base of the seedlings by the dead tissue of what once formed two elongated (united) petioles of the cotyledonary masses. I have often been able to find out small seedlings in this way, which would have otherwise escaped observation altogether.

The failure of sowings on the "Cheena Peak" may, in part, be attributed to the way in which the acorns might have been dibbled in or covered up with earth in nurseries. As explained in my note referred to in the beginning of this letter the taproot-like process which bursts forth from an acorn soon after it is shed is not, properly speaking, a taproot, but consists of (1) the elongated and united petioles of the cotyledons which remain enclosed within the pericarp, (2) the plumule which is situated at the base of the united petioles, and (3) the radicle or taproot proper. As a result of this formation the germ-plant after the taproot-like process has sufficiently elongated, is carried away from the acorn, but has still to depend for nourishment on the food-gorged cotyledons which though thus left behind are still connected with it by the united petioles. If, at the time of sowing, the entire acorn

is covered with a thick layer of earth, the cotyledons cannot get a sufficient amount of heat and air to elaborate the material stored up in them and begin to decay; and the germ-plant, being thus deprived of the only source of food supply, perishes also. But if the seed be merely placed on the ground and covered with a thin layer of some porous and hygroscopic substance, such as pure vegetable mould or moss, the cotyledons get all they require of warmth and air, and are then able to feed the germ-plant till this last establishes itself in the soil. Where pure vegetable mould or moss are not available, a thin covering of soil will also do, but burying the acorns deep in the soil is sure to end in failure.

It will be very interesting if Mr. Leete will again examine his sowings on the "Cheena Peak," and make known the result of his second inspection through the pages of the *Indian Forester*.

LUCKNOW:
13th March, 1895.

KESHAVANAND.

Bamboo-Seeding and Fever.

SIR,

Perhaps some of your readers may be good enough to record any personal experiences they may have gained relative to the matter treated of in the following extract from the *Forest Administration Report of the Southern Division, Bombay Presidency, for* 1874-75 :—

"92. The Conservator has noticed during the last ten years 'in Kanara that wherever the bamboos flower and seed, fever 'during the season, as an invariable rule, prevails. In 1866, im- 'mediately below the ghats, and in 1867 and 1868 towards the 'eastern part of the district, it was so ; and now around Yellapur, 'where the bamboos flowered and seeded prior to the rains, 'fever is general, few escaping it. The type of fever that at 'first prevails is not unlike hay fever at home ; but this is when 'the flowering of the bamboos first sets in and it changes into great- 'er severity as the seeds begin to fall and ferment."

If subsequent experience has shown that this really is the case, then it would plainly be the duty of Conservators and Divisional officers to ensure ample quantities of quinine being supplied as a prophylactic for the use of Rangers, Foresters, and Forest guards, in all districts where it is known that the bamboo is about to flower and seed.

DEHRA DUN, N-W.P.
16th March, 1895.

J. NISBET,
Deputy Conservator of Forests,
On Special duty.

Forests and Forestry in Japan.

SIR,

The following cutting from the *Athenæum* of 5th January, 1895, regarding the forests and forestry of Japan, may be of more than passing interest to Indian forest officers; and more especially as direct reference is made to our Department by the critic :—

"*A travers le Japon*:—*Forêts domaniales et particulières*, '*Essences*, *&c.* Par L. Ussèle, Garde Général des Forêts. '(Paris, Rothschild.)—This is an interesting and well-illustrat-'ed summary of the present state of forestry in Japan. Of the '38,000,000 hectares composing the area of the so-called empire, 'nearly 13,000,000 are covered by forests, of which almost exactly 'one moiety is in the hands of private owners. The commonest 'trees are the well known *Cryptomeria* and several kinds of *Pinus*; 'the most valuable are the *kéaki*, a species of elm, and the *hinoki*, 'a member of the coniferous order. The pines sometime attain an 'enormous size, by horizontal as well as by vertical growth. At 'Karasaki, on the borders of Lake Biwa, still stands a famous tree, 'said to be 1,200 years old, nearly 100 ft. high, and throwing its 'ample shade over a diameter of much more than 100 ft. Its wide-'flung branchage is now supported by 380 props. The *Cryptomeria*, 'a handsome, but not a very picturesque tree, sometimes attains a 'height of 130 ft. This tree and the *Pinus Thunbergii* form the most 'prominent features of the Japanese landscape: the great avenue 'of Nikko, some sixty miles in length, is composed mainly of secular '*Cryptomerias* (the offering of a Daimio who was too poor to add 'his quota of stone lanterns to the mausoleum—as the Nikko 'temples may be termed— of Iyeyasu) arranged in four parallel 'lines, two on either side. Why M. Ussèle calls the *Cryptomeria* '"segni" is not obvious; its Japanese name is *sugi*, which may be 'connected with the verb *sugu*, to overtop. As timber the '*Cryptomeria* has little to recommend it save its quantity and 'cheapness. The most important of the conifers is the *hinoki* '(*Chamæcyparis obtusa*), a very beautifully grained wood, much 'used for interior work. But the finest timber is undoubtedly that 'of the *kéaki* (*Planera japonica*), a close-grained resisting wood of 'agreeable ruddy colour (M. Ussèle says grey, but this must be a 'mistake). The tree has a fairly rapid growth, and might well be 'introduced into India. There are many varieties of oak—in 'Hachijo the houses are all built of this wood—and species of birch, 'alder, ash, beech, chestunt, and walnut are common, but are of no 'great value as timber-trees. The camphor laurel is one of the 'most picturesque of Japanese trees; of isolated examples the gnarled 'and rugged trunks often have a diameter of several yards. The 'varnish tree (*Rhus vernicifera*), like the *kéaki*, is well worthy of 'the attention of Indian Forestry Department. It is odd that M.

'Ussèle should not even mention the *kiri* (*Paulownia imperialis*), 'the curiously light and moisture-repellent wood which is so extensively used for minor purposes in Japan. One of the great 'difficulties foresters have to contend with in Japan is that of 'transport. Timber carts are unknown, and, indeed, would be useless in the mountain districts. The great trunks have to be borne 'on men's shoulders down to the nearest river bank. One may 'sometimes see as many as thirty coolies engaged in carrying a 'single trunk, generally with the aid of an ingenious combination 'of longitudinal and transverse beams that not seldom must add 'considerably to the total weight of their burden. A capital sketch 'of such a system is given on p. 132 of this volume, the paper of 'which, it should be added, is of fine Japanese manufacture, not to 'be torn by any but malicious force. On the cover is a *tori-i*, far 'too high in proportion to its breadth, flanked by a couple of ill-'drawn *toro* or stone lanterns; but the numerous illustrations in the 'text are much less open to criticism. The moral of this careful, 'though far from exhaustive monograph is that Indian and colonial 'governments might, with great advantage to their forestry 'services, send an expert to study the timber trees of Japan, even 'more fully than M. Ussèle was able to do."

DEHRA DUN, N-W. P.
19*th March*, 1895.

J. NISBET,
Deputy Conservator of Forests,
On Special duty.

III.—OFFICIAL PAPERS & INTELLIGENCE

Notes on Girdling.

(We print these two Notes in continuation of those given in March number).

MR. MURRAY works with six parties: each consisting of one selecting gaung, one hammer-man, and four to six coolies. The selecting gaung makes a rough blaze on the tree and writes his name on it and the current number of the tree; the tree is then girdled; the girdlers make two blazes—one above and one below the girdle. The girdlers wait by the tree, shouting at intervals for the man with the hammer, who examines the tree and, if it is thoroughly girdled, marks it and enters it in his book. He also has to see that the tree bears the selector's name and the number of the tree, which he enters in his note-book with the names of the coolies. The dimensions of the tree and the number are also entered in the selector's note-book, and the two are compared on return to camp.

I think that when not working against time four parties of six men each are fully as much as one gazetted officer can supervise.

The most difficult point is the selection of the trees in forests for which no working plans have been prepared.

The rules laid down in Upper Burma were that—

(1) in forests that consist of mature and over-mature trees which had not previously been girdled over and in which trees of the 2nd, 3rd, and 4th classes are practically wanting not more than one in every three sound marketable trees was to be girdled;

(ii) in forests where the younger classes were well represented as many as half the sound 1st class trees were allowed to be girdled;

(iii) in forests in which girdling had already been carried out in recent years the proportion of trees to be killed was not to exceed ¼th of the marketable trees, and the proportion was to be reduced at the girdling officer's discretion.

I have lately examined the returns of girdling in the Mu forest in the light of the valuation surveys made at the time of girdling and have come to the conclusion that we have been girdling too heavily, and that the proportion should be reduced to a *maximum* of ¼th, ⅓rd, and ⅛th of the marketable trees respectively in each of the above three cases. It must be borne in mind that the outturn of the forest must be based on the average state of the whole area that will eventually form our working circle and not on the possibility of small patches taken separately. The girdlings undertaken in Upper Burma, it should be noted, are intended to represent the possible yield of 12 years, the duration of the corporation leases. In calculating the possibility the existing stock of girdled trees must be taken into account as well as trees worked out during the portion of 12 years that have already elapsed.

Special coolies for cutting creepers and freeing suppressed teak should always accompany the girdling parties, as this work in Upper Burma cannot at present be done in advance.

J. W. OLIVER,
Conservator of Forests,
Eastern Circle.

The 7th July, 1893.

Both in the Uyu and the Nankamu I always girdled every Nyaungbat I could find, that is to say, if there was any teak of any size near it. The European Assistant of the Bombay Burma Trading Corporation, Limited, in the Uyu informed me that the Nyaungbats "made no difference at all" as the tree in falling when felled, generally tore the ficus off. If this did not happen,

the tree was logged and thrown into the stream with the ficus on it; the knocking about it then got soon pulled the ficus off. I also took the opinion of two Burman contractors, and they both said the Nyaungbat did not affect the timber as a general rule.

* * * * *

In my opinion it would pay to have one party for Nyaungbats only, no matter on what species they grew, as their being cut out would be a great improvement to the forest; we should find that we gained in regeneration as well as in getting clean timber. Of course they would get introduced again, but never to such an extent as before.

As regards inspection in unreserved forests not likely to be cultivated, if the girdling (? revising) officer had nothing else to do except inspect the girdling of his subordinate girdling officers, I think he should certainly see from 35 to 45 per cent. of the trees. Unfortunately in Upper Burma the girdling officer is expected to map the country with a view to reserve proposals as well. He cannot therefore see more than 15 per cent. if he has only three parties and 10 per cent. if he has four.

* * * * *

I think very few forests will stand girdling at 1 in 3 marketable trees; 2 in 7 should be the most girdled.

C. W. A. BRUCE,
Forest Divl. Officer, Lower Chindwin District.

Resolution on the Report of the Imperial Forest School for 1893-94.

During the twelve months ending 30th June, 1894, the School continued to be under the direction of Mr. J. S Gamble, M. A. The appointment of Deputy Director was filled by Mr. A. Smythies, until the 1st April, 1894, when he was relieved by Mr. J. Nisbet, Dr. œc. pub. No other alterations took place in the permanent staff, which was assisted as usual by the Director of the Botanical Department in Northern India, by the Deputy Superintendent of the Indian Museum, and by Officers of the School Forest Circle, North-Western Provinces.

2. The total number of students who attended the School and who were present on the 31st March 1894 was 106. Of these, 68 were in Government service, or were afforded assistance by Government, 5 were the moninees of the Durbars of Native States, and 33 followed the courses as private students. During the last four years, the proportion of private students attending the School has steadily increased from 17 per cent. in 1890-91 to 31 per cent. in the year under consideration. This increase is satisfactory and

will, it is hoped, continue. At the final examination held in March 1894, on the conclusion of the course of instruction, 39 students obtained the Ranger's certificate and 13 the certificate of the lower or Forester class.

3. The open examination for admission to the Rangers' class in the year under notice was held in the various provinces in March 1893. The total number of candidates was 116, of whom 44, or 38 per cent., successfully passed the test, and 35 were admitted. It is observed, however, that, during 1893-94, of three stipendiary students selected by Local Governments, one died from consumption, one was remanded on account of physical unfitness, and one because his knowledge of English was insufficient. Laxity in the admission tests, whether physical or educational, is to be deprecated; and greater care should be exercised in the selection of candidates, especially of those who are judged worthy of pecuniary assistance while following the School courses.

4. The Government of India are glad to observe that increased facilities for instruction have been secured by the erection of adequate school buildings and by the more efficient arrangement and equipment of the library and museum. The Government of India recognise the advisability of completing, as soon as possible, certain subsidiary buildings in connection with the School.

5. The School was satisfactorily administered during the year. The Inspector-General of Forests has reported that the education secured and the thoroughly practical knowledge displayed by the officials who have obtained the certificate of Ranger in recent years, have been specially brought to his notice during his tours of inspection in various provinces.

VI.—REVIEWS.

The Ceylon Forest Administration Report for 1893.

Last year, in our April number, we reviewed the Report of 1892, and remarked on the indications it gave of a want of smoothness in the carrying out of the Colonial forest policy. The Report before us has less to say on this subject, so we may hope that matters have improved.

The question of whether Forest Settlement Officers are to be permitted to give away rights, even when they have not recognized them as legal easements, has come up in Ceylon as it has in India, and with possibly worse results than here. The following extract gives the Conservator's remarks on the subject:—

"I have above alluded to the settlement of the Pedrutalagala 'forest. The reasons for my objections to this report were that 'the Forest Settlement Officer did not appear to have dealt with 'claims to rights on the part of villagers like an impartial judge, 'but rather because he thought that the grant of these rights was 'necessary for the existence of these villagers. This, I submit, is 'not part of the duty of the Forest Settlement Officer. If the 'Government Agent discovers that the grant of rights and privi-'leges is necessary for the well-being of a community, it is his duty 'to represent to Government that such grant should be made, but 'not that of the Forest Settlement Officer, who has merely to 'judge the legal claims. In this case the villagers said that if they 'did not obtain the right they would steal, and that it they did 'not steal, they would die. The Forest Settlement Officer's 'argument was that the villagers used to obtain their produce 'from forests close at hand, which were subsequently sold by 'Government without a sufficient inquiry into their rights, and 'that, therefore, the villagers had a right to forests further away 'which were still Crown property. Another defect in this settle-'ment as well as in others made by another Forest Settlement 'Officer is that the quantity allowed was not stated. The Forest 'Settlement Officer had ample opportunity to find out how much 'timber was required by each villager for his household and agri-'cultural wants. Yet he allowed unlimited rights to certain kinds 'of produce over the greater part of the forest. Such settlements 'are worse than none, as they legalize the spoliation of the forest."

The area of reserved forest in Ceylon amounts now to 81½ square miles, but there are 236 square miles of proposed Reserve, and 3,060½ square miles of other Crown forests besides.

The following extract shows what is being done in the matter of working plans, and what are the difficulties in the way of an improved system of forest conservancy:—

"Mr. Hansard completed the working plan of the Conical 'Hill forests above the Railway near Nanu-oya, and the working 'plan has been sanctioned by Government. It will, however, be, 'I believe, necessary to slightly alter the order of fellings, and to 'make one or two alterations to make the working somewhat 'easier. Felling was commenced in compartment I in accordance 'with the working plan. Eight strips were felled, covering an area 'of 38¼ acres, from which 4,512 cubic yards of fuel, or over 120 'yards per acre, besides timber, amounting to 50 trees, 906 jungle 'posts, 1,391 rough rafters, and 29,500 shingles. Four of the 'strips were cleared and planted with *Eucalyptus robusta* and '*Acacia decurrens*. This is the first working plan which has been 'completed in the Island, and it is of the highest importance that 'simple plans of operations be made for all our forests as soon as 'possible. The Ceylon forests are generally most difficult to work. 'The valuable species form a comparatively small percentage of

'the stock, and large areas have consequently to be gone over to 'obtain moderate supplies of timber. This necessitates greater 'care in the selection and marking of trees, increased efforts to 'foster more abundant natural reproduction and to encourage 'existing growth, and heavier outlay on transport, as timber has to 'be brought together from distant points. Unfortunately, next 'to nothing has as yet been done. The officers of the Department 'have most of their time taken up by reports on lands for sale 'and chenas, &c; and, as regards forest work proper, the limited 'time which is left at their disposal has to be confined to supply-'ing in the best way they can (*i.e.*, by taking the timber wher-'ever it may be found) the demands of the Public Works 'Department and other purchasers."

As usual, there are some interesting records from the measurement of sample plots, especially of 8 teak trees in the North Central Province which had an average girth in 1890 of 7·87 in; in 1893 of 19·37 in., and in 1894 of 21·75, giving thus a mean annual girth increment for 4 years of 3·47 inches which seems to us a very fine growth. We should like to have more information about the 'wire shoots' in use in the Ceylon forests, and would be greatly indebted to any Ceylon forest officer who would send us a good account of their construction and working with drawings to illustrate the methods of laying down and carriage.

The following remarks, which show that Public Works officers are in Ceylon sometimes as unreasonable as those in India in expecting sudden and immediate compliance with indents for seasoned timber, regardless of working plan or Budget prescriptions and rules, will be read with interest:—

"There has been the usual amount of friction between this 'Department and that of the Public Works. I supposed that it is 'hardly to be avoided when officers are trying each on his side to 'work to the best advantage of his own Department. The chief 'cause of dissension has been over-delay in handing over timber, 'and no doubt, in some cases, Forest Officers are to blame; but in 'others officers of the Public Works Department suddenly send 'in orders for timber of unusual dimensions and expect to be 'served at once, forgetting that it is not equally easy at all seasons 'of the year to bring timber from the forest. The principal works 'for which timber has been supplied were the passenger jetties at 'Galle, Kalkuda, and Trincomalee, markets at Kalmunai in the 'Eastern Province and Trincomalee, and the Deduru-oya bridge in 'the North-Western Provinces."

On the subject of 'free-grants,' Bombay officers and others may, perhaps, read the following with some sympathy. To free-grants being allowed even in considerable amounts to poor and deserving people, who are working hard in agricultural or industrial work, no forest officer is likely to object, provided that the annual yield of his forests is not interfered with; but it is surely bad

political economy, as Mr. Broun points out, to grant them too indiscriminately, and in such a way as to encourage idleness and lessen the area of agricultural land under proper cultivation :—

"In my humble opinion the free grants of timber to villagers 'require much restriction. I have noted that free grants were 'made to people who had no claim to be called *bonâ fide* villagers. 'If free grants are made to such people, there is no reason why 'members of the European and Burgher communities should not 'have their personal requirements in timber satisfied without pay-'ment. There is a belief among certain Revenue Officers that 'all the demands which "poor starving villagers" are making 'should be promptly complied with, but to me this compliance 'seems to be a direct encouragement of the slothfulness and want of 'enterprise which characterize the rural population in the wooded 'parts of the Island. These people, as they are supplied by a pater-'nal Government with as much as is required for their personal 'requirements, have no ambition to better themselves. They cul-'tivate just enough to keep themselves and their families alive, 'and try to do no more. To such people the abolition of the 'paddy tax has been no boon. They merely cultivate less. Forest 'produce costs them nothing, therefore they have nothing to 'produce for its payment. Had they to pay for timber, fence 'sticks, &c., they would take much greater care of them than now 'when they are granted with such ease. The villagers of Ceylon 'are much better off in the way of taxes than their neighbours 'of India. They are treated with the greatest liberality, but yet 'they have not taken advantage of these benefits. This country is 'extremely backward in its cultivation: the little paddy that 'there is is cultivated in a manner, which the Indian cultivator 'would laugh at, and that is because they can get what they 'require without any effort."

The financial results of the year again show a considerable deficit. It amounted to Rs. 38,998.

VII.—EXTRACTS, NOTES, AND QUERIES.

The Imperial Forest School.

PRIZE DAY AT DEHRA DUN.

The annual distribution of certificates and prizes of the Imperial Forest School took place yesterday at the Forest School itself, where two large tents were pitched in the school grounds to

accommodate the invited guests, the students and their friends. The time fixed for the distribution of the prizes and certificates was 4 p. m., and by that hour the tent was crowded with students, and well-wishers of the school. Mr. Hill, Officiating Inspector-General of Forests, presided, and was supported by Mr. J. S. Gamble, M. A., Director of the School, and Mr. A. Smythies, B. A., Deputy Director ; the members of the Board of Control, Mr. C. Bagshawe, Conservator of Forests, Berar, and Mr. C. F. Elliott, Officiating Conservator of Forests, Punjab; Mr. J. F. Duthie, Director of Botany, Northern India, one of the visiting members of the School staff; Mr. W. H. Reynolds, Superintendent of Forest Surveys, the remaining members of the regular teaching staff, Messrs. Gradon and Rogers, together with Dr. Nisbet, who occupied the post of Deputy Director for nearly the whole year and is now going to Burma to officiate as Conservator; Mr. McArthur Moir, Deputy Conservator of Forests, Jaunsar Forest Division; Mr. Grenfell, Assistant Conservator of Forests, Dehra Dun Division, were seated on the dais at the end of the tent. All the principal residents of the station, among whom may be mentioned Colonel Straham, R. E., Colonel Newall of the 1st Battalion, 2nd (P. W. O.) Gurkhas, Major Gore, R. E., and Mrs. Gore, Mrs. and Miss Begbie, Mrs. Lace, Mr. and Mrs. Eccles, Dr. and Mrs. Leather, Captain Macintyre, Mr. and Mrs. Vincent Mackinnon, Mr. Hodges, Mr. and Mrs. Home, and Mr. Leslie Rogers and others were present, and in so doing showed the interest they all take in the local Institution.

Mr. Hill opened the proceedings by calling upon the Director, Mr. Gamble, who, he said, needed no introduction from him, to read his report upon the School work for the past year. Mr. Gamble commenced by reminding his audience that the first regular distribution of certificates and prizes had been inaugurated by him in 1891, and it had now come to be looked upon as an annual institution. He expressed great pleasure in seeing so many friends gathered around him to hear his annual report on the work of the School, and to witness the distribution of certificates and prizes. The chief event of the year, he continued, was the completion of the new students' quarters, which now allowed of 80 students being received in residence, and he acknowledged his indebtedness to the Government and the Inspector-General for them, adding that the new students' quarters would always be associated with the names of Sir Philip Hutchins, former Member of Council, Sir Edward Buck, Secretary to the Government of India, and Mr. B. Ribbentrop, Inspector-General of Forests, who was now enjoying the furlough he had so well earned. He then expressed his regret that, fitted as the School was in its staff, its buildings and its general arrangements for the accommodation of a sufficient number of students to supply the vacancies in the Provincial Forest Staff of India, sanction is still withheld to the

scheme which is to place the prospects of the passed students of the School on a more advantageous footing (applause), and expressed a hope that the required sanction would not be much longer delayed. Mr. Gamble then gave a short history of the class which is about to leave the School which, together with five students who were permitted to stay at the School a third year, numbered 50, and of these 42 had succeeded in getting certificates, 35 by the higher and 7 by the lower standard. No honour certificates had been gained this year, as was the case last year, but the Director pointed out that in order to get an honour certificate a student must not only obtain honour marks on the whole examination, but also in each of the principal subjects, in what is severe examination, and he felt sure that such of his hearers who had had experience in examinations would agree with him that this was by no means an easy thing to do, and that there may often be a year in which nos tudent gets an honour certificate. The School medals which he explained were Government prizes, were awarded to the best students in the different subjects, as the Board of Control might decide, and to obtain a medal a student must obtain honour marks. This year no medals were awarded for Sylviculture, Forest Engineering, Natural Science or Forest Mathematics, but two have been given for Utilization and Working Plans, and one each for Surveying and Drawing, Botany, Forest Law, Zoology, the best Herbarium, and for general proficiency, to the best student in the lower class. The medal for the best herbarium was won by a lower class student, Bhikan-Lal, the herbaria of Hukam Chand and W. H. Craddock being specially commended for their general excellence, while with one or two exceptions the herbaria of all the students were very well and carefully made. The prizes which are presented by Forest Officers interested in the School have been awarded as follows this year :—The chief prize, that for an essay on a sylvicultural subject, presented by the officiating Inspector-General of Forests, Mr. H. C. Hill, has been won by R. R. O'Hara, the subject being "the Deodar," that sent in by W. H. Craddock being next best. The entomology prize, presented by the Director for the best collection of insects, harmful or useful to forest growth, was won by J. A. Wallinger, and owing to the kindness of Mr. Nisbet a second prize has been awarded to Hukam Chand, whose collection was also very good. The prize for the best note-book kept of the various tours and excursions made during the two years' course has this year been divided between P. E. Plunket and Raman Menon, whose note-books were adjudged by the Board of Control to be of equal merit, the illustration of Engineering works seen on tour being unusually good. The prize presented annually by Mr. McArthur Moir for the best student in practical Forestry has been awarded to R. C. Farrell. The Campbell-Walker prize for the best Madras student in Forestry has been won by Srinivasa Aiyengar. Mr. C. G. Rogers' prize for the best drawing

has been awarded to R. C. A. Pinder, and a second prize presented by Mr. Bagshawe, a member of the Board of Control and Mr. Gamble's immediate predecessor in office, was given to W. H. Craddock. The Deputy Director's prize for the best student in practical Forestry in the lower class has been awarded to Prabh Dyal; and a second prize presented by Mr. Gamble for the 2nd best herbarium to Hukam Chand. The Director then briefly described the course of studies and practical work which made up the School curriculum, stated that the general health of the school had been good, and acknowledged the help received from Dr. Ruttledge, Civil Surgeon, and the Hospital Assistant, Ganga Sahai, for the care they have devoted to such students as had been ill. Referring to the drill of the native students he thanked Colonel Begbie, commanding the 2-2nd P. W. O. Gurkhas, for sending havildars to instruct the students in drill, and Major Leslie Rogers and officers of the D. D. M. R., as well as Sergeant-Instructor Allen, for their co-operation and help in connection with the drill of European students, who were all members of the local Volunteer corps. The noticeable event in the School athletic sports was P. E. Plunkett's throw of the cricket ball to a distance of 116 yards. He then referred to the help he had received from the School staff, which was at present the same as it was this time last year, as Dr. Nisbet who had filled the post of Deputy Director nearly the whole year, had been recently transferred to Burma as Conservator of Forests, Tenasserim Circle (applause), and Mr. Smythies had returned to his old post of Deputy Director. He then proceeded to thank the divisional forest officers for the help they had accorded to him during the year, as well as the various gentlemen, especially Mr. Duthie, who had helped in the instruction of the classes, and Mr. Reynolds who had rendered such valuable assistance in connection with the correction of the final Survey Maps and in the oral examination in Surveying. Concluding, he referred to the epidemic of influenza, which had attacked nearly all the members of the Board of Control in 1894, and trusted that the present Board would greatly benefit by their visit to the healthy climate and beautiful scenery of the Dun.

Mr. Hill then rose to address the students preparatory to the distribution of the certificates and prizes. He said that it was his duty, as Mr. Ribbentrop's *locum tenens*, to say a few words, even if he could not work up his (Mr. Ribbentrop's) enthusiasm, or entertain them with his predecessor's humorous remarks. He then proceeded to thank the assembled company for mustering in such force and thus showing so much interest in the School in attending a function which was only directly entertaining to those who were to receive prizes, and looked at from an outsider's point of view must be a very monotonous affair. Mr. Hill continued by reminding his hearers that five years had passed since the School underwent the re-organisation by which its control was placed

under a board, who regularly assemble every year at this season, and that as Mr. Gamble, who succeeded to the Directorship at the same time, had reminded them, this was fifth anniversary of the prize day first instituted by him, which, he added, need not necessarily fall on the 1st April, as it had chanced to do this year.

Since the reorganisation, 194 students had passed out the School, while only in 1891 and 1894 honour certificates had been recently gained. Years with honour certificates come but rarely, but when they do come several men obtained them, for in 1891 four men and in 1894 three men received honour certificates. The old saying about rain and its pouring seemed to apply to honours, and this was a *dry* year. (Laughter) Honours, as Mr. Gamble has explained, are not earned by kindness or leniency on the part of the examiners, but by a hard and fast standard which has to be maintained in all subjects. Last year Mr. Ribbentrop said that if a long tail of 6 or 7 students had failed, that was more than counterbalanced by 3 obtaining honours at the head of the list. This year Mr. Hill added he was sorry to say there was a long tail of 8 failures without the counterpoise of a head. Still he might safely assert that of the 42 passed students, the majority appear to be up to the average of previous years, (applause), while W. H. Craddock and Srinivasa Iyengar, who headed the list, had done most creditably, though missing honour 'certificates. "You, ladies and gentlemen," Mr. Hill added, "have 'seen the School grow up and develop, (some of you from the 'beginning) and you are the best judges of the progress made—and 'I trust I may count on your agreeing with me that Mr. Gamble 'and his staff may justly claim credit for the extended utility of 'the School, its greatly enlarged accommodation, its more complete 'equipment, its improved natural history collections, the beauty of 'its grounds, and the orderliness which characterises both its ap-'pearance and the arrangements connected with it. The staff has 'undergone but little change since the School was re-organised; 'last year we said good-bye to Mr. Smythies, our Deputy Director, 'this year we can say how glad we are to see him back again 'sooner than we expected." Mr. Hill then addressed some remarks to the students, especially those who were about to leave. He wished them one and all a healthful and successful career, and proffered them some good advice, telling them that they must not think that the School professors had taught them all that they needed to know, and reminding them that they must go on learning by observation, experience and sound judgment all through their service, if they aspired to rise in their profession. Mr. Gamble and his officers had put them in the way of attaining knowledge, and they should be very thankful to them. He then continued by informing them how surprised he had once been when, while a student at Nancy, a distinguished professor at the French School of Forestry had exclaimed in class with much emphasis "Gentlemen, I have been studying my subject for 30

'years, and I know absolutely nothing about it," and went on to say that his (Mr. Hill's) first idea was that the learned professor was incompetent as a teacher (laughter) if he were so absolutely ignorant of his subject, but that was not the case, and there was much more truth in his assertion than appeared on the surface. "You," Mr. Hill added, "who have studied for a few years 'know less than the professor who confessed to knowing 'nothing. What the school curriculum has or ought to have 'done for you, is to direct your observation, your studies, and your 'conclusions into safe and proper channels, you have still, if you 'wish to succeed in life, to learn for yourselves, and according as 'you gain your knowledge and put it to good use, so will each one 'of you take his place in the world, where the struggle for existence '(about which you have heard so much with regard to crops) goes 'on unceasingly. Let it be the ambition of everyone of you to stand 'out as dominant, healthy subject of the future, who though he may 'go through periods of hard struggle, never becomes suppressed." Mr. Hill then made suitable allusions to the physical drill of the native students and his indebtedness to the officers of the Dehra Dun Mounted Rifles for their co-operation and help in connection with the drill of the European students.

He then asked Mrs. Smythies to distribute, on his behalf, the certificates and prizes to the various successful students, which she proceeded to do, addressing a few suitable words to each student as he came up to receive his certificate or prize. This brought the ceremony to a conclusion, and after cheers were given for Mr. Hill, the Board of Control, Mr. Gamble, Mr. Smythies and the ladies, the company proceeded to walk about the grounds, which are at their best just now, and were capable of testifying how great is the personal interest which Mr. Gamble takes in their beauty, and how ably he is seconded in his endeavours by Forest Ranger Birbal, who is in direct charge of the School compound and gardens. The School Museum, including the collections of insects, minerals, fossils and stones, all came in for their share of admiration, and one and all testify how well they have been developed and arranged since the re-organisation of the School five years ago.—(*Pioneer.*)

Obituary, Dr. J. M. Slym.

We regret to have to record the death, at Moulmein, on the 5th of March, at the ripe age of 71, of Dr. M. J. Slym, who retired on the 16th December, 1883, after twenty-three years' service in the Department. Dr. Slym, a native of Holland, came out to Burma as Surgeon on board a Dutch vessel more than 40 years ago, and during that period, we believe, never left the country. He

practised for some time in his medical profession in Bassein, and joined the forest service in December 1860. He first served in the Thanawaddy Divison for a few years, and in 1864 took charge of the well-known timber station at Kado, with the working of which he continued to be closely associated for the remaining nineteen years of his service.

The admirable way in which Dr. Slym managed the enormous timber business at Kado has been commented upon on many occasions by different officers. His tact and temper in dealing with disputes, and in suppressing timber thefts, as well as his thorough knowledge of the trade in all its bearings were consistently recognised by Government, and his services were retained till he reached the age of 60.

In 1877, he published a book on the treatment of elephants in health and disease, which was at the time pronounced to be very useful.

On his retirement he continued to reside in Moulmein, where he had many friends, to whom he was known as "old schlapps" (from his Dutch way of pronouncing slabs.) He never tired of entertaining in his quaint way with amusing anecdotes, and he will be missed by many a Moulmein resident who never let a week pass without paying him a visit in the evening when he was always at home. We sympathise with his widow and large family in the loss they have sustained, and regret his death as removing one more of the oldest toilers in forest work in Burma.

VII.-TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

March 5th, 1895.

EAST INDIAN TEAK.—The February deliveries have only been 334 loads against 2,109 loads in the same month last year. For January and February together they are 1,177 loads this year, against 2,534 loads in 1894. Considerable quantities are, however, awaiting delivery as soon as barges can be moved, so these figures may probably rectify themselves in another month or two. Business has been quiet for floating cargoes, the available supplies being pretty well disposed of.

ROSEWOOD,—Small parcels of large, good logs would sell well.

SATINWOOD,—Finely figured wood is asked for.

EBONY,—Good wood, sound, and of fair sizes, would sell well.

PRICE CURRENT.

East Indian Teak	per load	£10.	to	£16
Rosewood	„ ton	£5	to	£8.
Satinwood	„ Sup. foot	6d	to	12d.
Ebony	„ ton	£6	to	£8

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, March 1st, 1895.

Cardamoms	per lb.	2s.	to	2s. 6d.
Croton seeds	per cwt.	20s.	to	27s. 6d.
Cutch	„	20s.	to	32s.
Gum Arabic, Madras	„	15s.	to	30s.
Gum Kino	„	£25	to	£30.
India Rubber, Assam,	per lb.	1s. 7d.	to	2s.
„ Burma	„	1s. 7d.	to	2s.
Myrabolams, Bombay,	per cwt.	7s. 9d.		
„ Jubbulpore	„	6s.	to	7s.
„ Godavari	„	5s. 6d.	to	6s. 6d.
Nux Vomica, good	„	6s.	to	10s.
Oil, Lemon Grass	per lb.	1⅛d.		
Orchella, Ceylon	per ton	15s.	to	22s.
Redwood	per ton	£3. 10s.	to	£4
Sandalwood, logs	„	£35	to	£55
„ chips	„	£9	to	£30
Seed lac	„	30s.	to	90s.
Tamarind	„	8s.	to	15s.

INDIAN FORESTER.

Vol. XXI.] **May, 1895.** **[No. 5.**

Note on the Cultivation of the Robinia Pseudo-Acacia in the Simla Hills.

For some time past more or less extensive experiments with the Robinia have been carried on in the neighbourhood of Simla, and the following notes on the treatment successfully adopted may be of interest to some of the readers of the *Forester* :—

Direct sowings have been tried again and again on various aspects, at different elevations, and during different seasons, but have failed completely in all cases, and so it appears certain that the plants must be raised in nurseries.

It has been found that sowings made in the beginning of the rains were not very successful, as the amount of moisture that they then experienced was apt to kill off the seedlings : the best time then for the necessary sowings, which should be light, is from the middle of September to the middle of March, according to the altitude, and this is equivalent to saying that the seed can be sown as soon as there is no further danger to be apprehended from frost. Drainage is the main point to be seen to in the construction of the nurseries, for an excess of water, but more particularly anything in the shape of stagnant water, is fatal to the young seedlings ; the nurseries should therefore be made with small raised seed beds surrounded by small trenches, and the amount of water given during the hot weather should be regulated by the appearance of the plants, care being taken to avoid any flooding of the nurseries, and to see that no water remains standing in the beds. The seedlings commence germinating some three weeks after the sowings, and grow quickly, many of them attaining a height of over two feet by the break of the rains and of over five feet by the end of the growing season, while exceptionally quick-growing specimens have been found to attain a height of eight feet six inches during this period : seedlings germinating late will naturally become more or less suppressed, but, nevertheless, it is inadvisable to attempt any rebedding during the rains, for this stops the growth of the larger and kills many of the smaller plants that are moved. Similarly to the sowings, the results of transplanting from the

nurseries during the rains are not very satisfactory, and it is better to do this work during January and February, timing it so as to give the plants the benefit of the latter portion of the winter rains after they have been placed in their final situation. At first, plants of all sizes were put out into the plantations, but it was noticed that the smaller ones made very little progress during the first and sometimes also during the second year following their removal, while the large plants grew on without any such break: now, therefore, no trees under three feet six inches in height are used for transplanting, and all under these dimensions are rebedded into nurseries during January and February, and left there for another year.

This transplanting and rebedding cannot be done without inflicting some injury on the roots, but, with the Robinia, this really does not matter; indeed, it is found that, while the transplants themselves do not suffer, the bits of the roots inadvertently left in the ground give rise to a crop of flourishing root suckers during the following year, and these attain larger dimensions than the seedling plants.

The formation of regular plantations has only just been commenced, so that it is not possible to give statistics for the growth of the species when cultivated in this manner; but an individual tree has been known to attain a height of over 20 feet and a girth of one foot four inches below the first branch, in three years from the sowing of the seed; again, in a small plot at Jutogh, stocked in the winter of 1892-93 with one year old plants of all sizes, put about ten feet apart, the trees, many of which are now from 10 to 13 feet in height and 6 to 13 inches in girth, bore seed last year, and have commenced to throw up root suckers. It is believed that six feet by ten feet is a good espacement to adopt for the trees in plantations. Nothing very definite can yet be said on the subject of suitable altitudes and aspects, beyond that the experiments made up to the present appear to show that the species will grow almost anywhere between 4,000 and 8,000 feet, and that it will possibly do equally well at lower elevations; also that it has no particular objection to hot aspects, and seems to like loose friable soils. As regards the cost it may be noted that in Simla, where the work has been longest established, the total expense is just about two rupees for every hundred plants put into the plantations, and this, at the six feet by ten feet espacement, means an expenditure of under fifteen rupees for an acre of plantation, which is not very much when it is remembered that there is little or no further cost to be met for repairs, as, once through the first season in the nurseries, the species is wonderfully hardy, and gives no trouble. Many thousands of *Robinia* have now been put out at various elevations and on various aspects in Simla, Jutogh, Dagshai and Sabathu, and where the large plants only were used, the failures met with have been very few indeed.

G. S. HART.

Forest Demarcation in South Arcot.

Forest demarcation as now conducted in the Madras Presidency may be divided into 2 classes, *viz.*, I.—Preliminary and II—Final.

I.—Preliminary Demarcation.

Definition:—This, as its name indicates, simply means defining on the ground by means of temporary marks the outer limits of forest blocks that are newly selected for the purpose of reservation. According to the recent orders of the Madras Government, every forest block must be *preliminarily demarcated* before it is notified for reservation under Section 4 of the Madras Forest Act.

Method adopted :—The method adopted in South Arcot District consists in cutting a line 6 feet wide along the boundaries intended to be notified under Sec. 4, and constructing stone-cairns or earth-mounds at all turns or bends in the line.

In order to carry out the preliminary demarcation of a forest block accurately, the officer conducting the work provides himself with a sketch-map of the block, on which are indicated not only the topographical features of the land and its surroundings, but also the Revenue Survey stones of the various fields, forest Khandams, and other areas that may be comprised in the block. Of course the boundaries of the block are also indicated on the sketch-map. With this sketch in hand the demarcating officer starts his work generally from the north-west corner of the block where he plants a flag. From thence proceeding eastwards he goes on fixing a flag at every angle in the boundary lines until he comes back to the starting-point. To minimize chances of mistakes by workmen, in case of any flags being removed by wayfarers or cowherds, he generally marks in tar R. F. and the serial number of the flag on Survey stones, trees, or any permanent object that may be found near the flag.

Construction of Stone-cairns or earth mounds :—Soon after progress is made in fixing the points by flags, a guard follows the demarcating officer, with a gang of coolies, and constructs a stone-cairn or a mound of earth, which is usually 3 feet high and 3 feet in radius, at every flag-point.

Line-clearing:—As soon as all the points on the boundary line are defined by cairns, or, in fact, simultaneously with that work, the cutting and clearing of the boundary line is commenced. The line is cut perfectly straight between any two adjacent cairns to a width of 6 feet. The outer edge of the cut line will be along the line of Revenue Survey stones should the line follow such stones, but in cases where it does not follow such stones, along the outer edge of the consecutive cairns.

Cost of preliminary demarcation:—From experience gained in some ranges of the District, it is ascertained that the average cost per mile does not exceed, Rs. 2-8-0 both for line-clearing and

construction of cairns. It is found that where stones are available near at hand, a cairn costs about one anna, and a mound of earth about nine-pies. Of course, the cost is dependent upon the density and description of growth to be cut, prevailing rates of wages, proximity of the requisite materials, and so on. But it should always be borne in mind that preliminary demarcation is, after all, temporary, and that it should therefore be conducted with all possible economy, utilizing the materials nearest to hand in order to secure marks that last sufficiently long to ensure identification of the boundaries until the final demarcation of the block is taken in hand.

II.—Final Demarcation.

Definition:—The term "Final Demarcation of a forest" means the defining of the boundaries finally determined upon after Forest Settlement and Notification under Sec. 16 of the Madras Forest Act, by the use of permanent marks such as stone slabs, masonry pillars or substantially constructed cairns; and by cutting a line all round. It also includes permanent demarcation of all admitted private or public rights within the forest by similar means.

An accurate map necessary:—Before commencing this work, the officer conducting it provides himself with a sketch-map on which the outer boundaries of the block as well as all admitted rights of way, water courses, burial grounds, puttah lands, &c., are correctly indicated. The accuracy of the map is previously verified by a careful comparison with the description of the boundaries and the various admitted rights published in the final Notification under Section 16 by Government. The best course to pursue is to obtain the original sketch map submitted to, and approved by, Government when the block was notified under Section 16, and in case it is not available, to secure an exact copy of it. With this map in hand, the Ranger himself, or an experienced Forester who has the requisite local knowledge of the block, proceeds with its final demarcation.

The final demarcation of a forest block includes the following items of work:—

1. Demarcation of the outer boundaries,
2. Demarcation of admitted puttah land,
3. Demarcation of admitted paths, and
4. Demarcation of other admitted rights, such as temples, burial grounds and so on.

For the sake of convenience and clearness, I propose dealing with each of these items separately:—

1. *Demarcation of the outer boundaries.*

This comprises the following—(*a*) Blocks preliminarily demarcated; and (*b*) blocks not preliminarily demarcated.

(*A*)—In the case of preliminarily demarcated blocks, their final demarcation is necessarily an easy task. Here again, it may comprise (*i*) blocks, the original boundaries of which re-

mained unaltered at Forest Settlement; and (*ii*) blocks the preliminary boundaries of which were altered at Settlement.

(*i*) Taking the first case, if no alteration was made at forest settlement in the preliminarily demarcated boundaries of a block, then all that is required to be done to finally demarcate it is simply to replace the temporary cairns by permanent stone slabs or substantial cairns of stones with posts inserted in their centre as described lower down; to add as many intermediate stone slabs as cairns with posts as may be required to render them distinctly visible from those on either side; to widen the already cut 6 feet line into 12 or 18 feet as the case may be; and to eradicate all stumps and roots on the line as described below.

(*ii*) Taking the second case, the originally erected temporary cairns on the unaltered lines are replaced by permanent stone slabs or cairns with posts; and the same process is followed in respect to altered lines, care having been previously taken to indicate the points on the line selected to ensure continuity of vision from one slab to the other.

(*B*)—In the case of blocks not preliminarily demarcated much difficulty is experienced in practice in *finally demarcating* them, there being nothing on the ground to guide the demarcating officer in identifying the correct boundary lines, espicially so in the case of blocks the boundaries of which are notified in vague, and indefinite terms, as instanced in the case of a few Reserves settled prior to the year 1890, in which, owing to the vagueness of the descriptions of their boundaries, much difficulty was experienced in identifying them on the ground, and therefore much attention and discretion is called for on the part of the demarcator. Thus we have here, too, two cases to deal with—(1) that in which the boundary descriptions notified are clear and lucid and (2) that in which the descriptions are vague and indefinite.

(*i*) In the first case the demarcating officer proceeds to the fields with a sketch map of the block on which the boundaries are previously marked, as notified under Section 16 of the Forest Act, and starts his work at the north-west corner of the block. He plants a flag at the starting point and numbers the Survey field stone, a tree, or any permanent object near that point with No. 1 in tar, and proceeds planting flags at visible distances apart on the line and marking the consecutive number of each flag on any permanent object close by, care being taken that the line followed is strictly in accordance with the notification. Should any difficulty or doubt arise, the village officials of villages in which the forest lies are taken to the spot, and all doubts cleared before proceeding further. As above stated, the distance between any two consecutive flags is so regulated as to admit of their being distinctly seen from each other, and of course, at every turn in the line

a flag is planted. In this manner flags are planted all round the block, and their exact positions marked on the sketch.

(ii). In the second case where boundaries are described in such vague terms as "along the foot of Alampundi Hill" or "cultivated fields of Kristnapuram village," the demarcating officer has to be more careful than in the above case. A sketch-map of the block is prepared by taking a tracing from the Revenue Survey plans of villages concerned, and with this map in hand the demarcator goes round the block indicating the boundaries on the map as he finds them on the ground. As far as possible he takes straight lines for boundaries wherever he can do so without excluding forest land and without including private pattah holdings. To do this efficiently and correctly he may have to go over the boundaries more than once, the work thus entailing much patience and attention. After indicating the boundaries on the map, it is submitted to the District Forest Officer with a detailed explanatory note of any areas excluded or included in order to straighten the boundaries consistent with the terms of the boundary description notified. After receiving the District Forest Officer's orders thereon, the demarcator proceeds to fix flags at all necessary points on the approved boundary lines as described in the first case. The information required for the demarcation of admitted rights, such as puttah lands, paths, &c., is ascertained by inspection and marked on the sketch map.

Submission of Estimates for Final demarcation

As soon as flags are fixed all round the block and information collected for demarcation of admitted rights, the demarcator who is then in a position to know the number of stone slabs or cairns and posts required for the outer boundaries and admitted private and public enclosures, &c., in the block, prepares an estimate. The estimate provides for the cutting and clearing of the boundary lines to a given width, say 12 feet, and for putting up stone slabs, or cairns and posts, as the case may be, on the outer boundaries, and at the corners of admitted rights. The estimate is submitted to the District Forest Officer with a sketch map, on which are marked the boundaries and the points selected thereon for planting stone slabs or cairns and posts, and also the various admitted rights. The estimate is also accompained by a record of the points selected for planting stone slabs, &c. After intimation of sanction of the estimate is received the work is put in hand.

As elsewhere remarked, the final demarcation of the outer boundaries consists of two distinct items of work:—(1) Line clearing and (2) planting stone slabs or cairns with posts at all the flag points.

(*i*) *Line clearing.*—This work is commenced by the Range officer, or by an experienced Forester with the forest guard

in charge of the block. At the required width apart from the first flag another flag is planted inwards, similarly a separate flag near the next flag at the same width apart is planted. These flags enable the workmen to cut the line straight between any two points and to a uniform width. A gang of coolies is set to cut and clear the line ; as the work progresses, the flags are shifted forwards. All trees, shrubs and herbs on the line which is generally 12 feet wide in South Arcot are cut and removed, and all roots and stumps grubbed up and eradicated thoroughly to ensure freedom from re-growth on the line. After conducting the operations in this manner for a day or two and instructing the guard in the nature of the work to be done, the Range officer or Forester will leave the guard solely in charge of the work. The guard continues and completes the same within a given time.

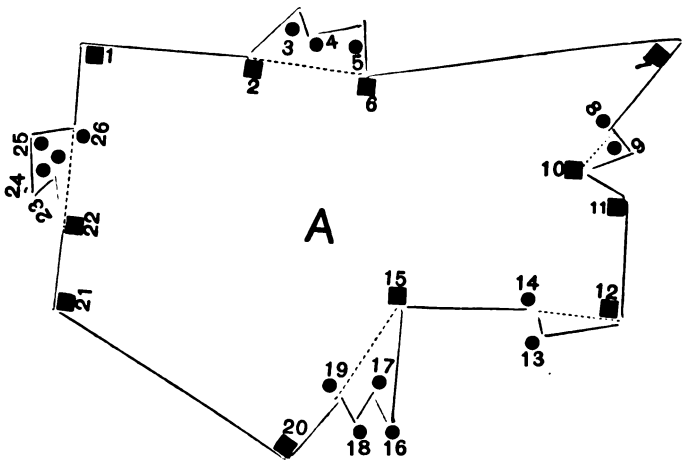
(2). *Planting stone slabs, or constructing cairns with posts.*—Immediately after the boundary lines are cut and cleaned, or simultaneously with the progress of that work, the planting of stone slabs, if available, or the construction of cairns with posts inserted in their centre at all the flag posts is proceeded with.

Stone pillars.—On account of their durability, freedom from frequent damage, necessity for repair, or renewal, stone slabs are preferable to other materials as boundary marks.

Dimensions of Stone slabs.—The following are the sizes in general use in this District—8 ft. or 6 ft. high by 1 ft. broad by 4 to 6 in. thick and 5ft. or 4 ft. by 1 ft. by 4 to 6 in., the former being, for convenience of description, called *large slabs*, and the latter *small slabs.* The height of the stone slabs required for the demarcation of any block depends very much upon the configuration of the ground, and the distance of the Reserve from the quarry, as it naturally follows that the bigger the stone slabs the higher the cost of carriage. But for all main points on the line, slabs of 8 ft. or 6 ft. are utilized.

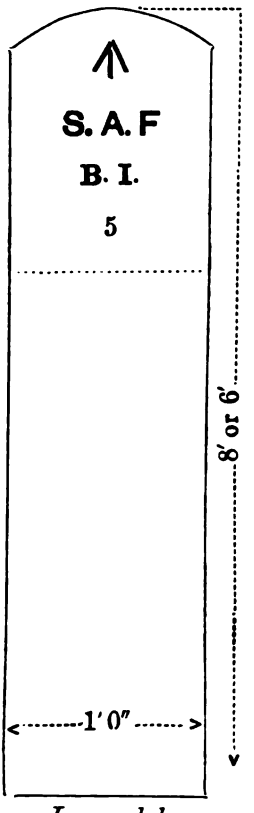
Disposition of stone slabs on the Boundaries.—At each point on the line at which a flag had been fixed, as already described, a stone slab is planted. Large stone slabs are planted at all conspicuous points and turns in the boundaries and the small ones at all minor bends and angles. The object of this distinction is simply this, that when it is sought to cut straight lines at the time of regularly working the Forest, these large stones may be seen at the ends of the straight end lines, the limits of the small areas excluded in consequence of straightening the lines being defined by

the small slabs. The diagram given below illustrates what is meant by the above;—

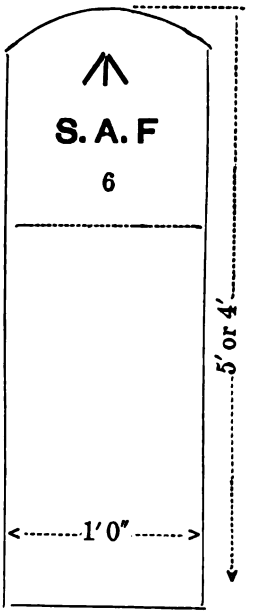


Let the above diagram A represent a forest block with an irregular boundary. The mark ■ represents a large stone slab and ● a small one. The dotted lines indicate the straight lines adopted in order to simplify and straighten the boundaries for convenience in working the forest. Between stone slabs 2 and 6 the line is irregular, resulting in several small angles. If a straight line is cut from 2 to 6 a small area enclosed by 2, 3, 4, 5, 6 and 2 is included, although it forms a part of the notified Reserve. Therefore in order to indicate that it forms a part of the block, small slabs are planted at the minor angles 2, 3, 4 and 5. Of course large slabs may be planted at these minor angles as well ; but it is only the question of cost that suggested the adoption of small stones.

Inscription on stone slabs—The large stone slabs bear the following inscriptions:—Government arrow mark ⩚, the District Forest initials S.A.F. (South Arcot Forests), the number of the block, and the serial number of the stone slabs. The small ones bear all the above inscriptions except the number of the block. The tops of the slabs are rounded, and the figures and letters cut out in them after smoothening the surface. The diagrams below show the manner in which the inscriptions are written.



Large slab

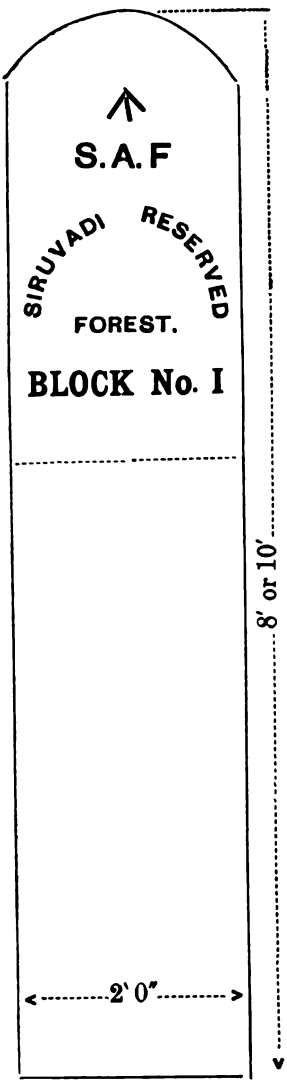


Small slab

The initial letters of the District Forest are adopted only in the Tindivanam Range ; in other ranges the letters R. F. are used instead. The stone slabs are numbered serially irrespective of their sizes, a separate serial order being adopted for each block.

Planting the Stone-slabs:—In planting the stone slabs they are always so arranged as to have their numbered sides facing outwards, that is, away from the Reserve. Large slabs are planted

generally 2 feet deep in the ground, and small ones 1½ feet deep. They are firmly fixed, with earth and small pieces of stone well rammed in.



Planting the slabs:—The numbered top portions of the slabs are painted white. It is found advisable to paint the tops all round to a length of 2 or 3 ft. so as to enable the stone to be easily seen. The chiselled letter and figures are picked out in black.

Sign posts indicating names of Reserves, &c:—The Board of Revenue has ordered that a board indicating the name, number, &c., of each block should be put up at some conspicuous point on its boundary. In lieu of a wooden plank fixed on to a post which requires frequent repairs, a large and broad slab bearing the necessary particulars is used wherever such slabs are procurable. In Tindivanam range slabs 10ft. or 8ft. × 2ft. × ½ft. bearing the ⩚ mark, S. A. F., name of Reserve and its number are used. The figure given below represents a slab of this description.

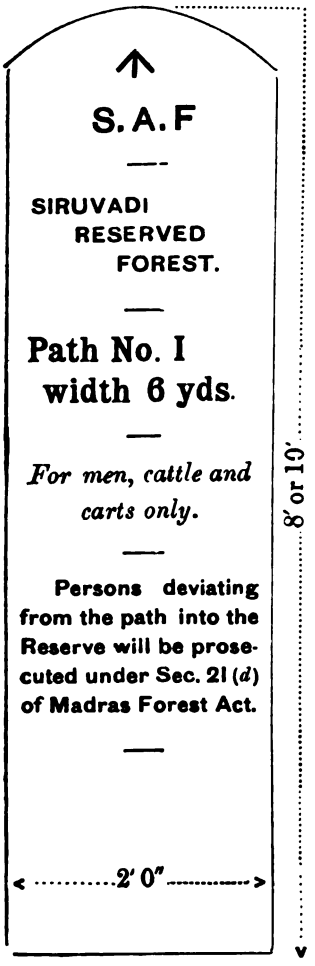
2. *Demarcation of admitted puttah lands.*

This is simple, a line 3 to 6 ft. wide is cut round the limits of the admitted fields, and small stone slabs (5 ft. or 4 ft. × 1 ft. × ⅓ ft. to ½ft., are planted at all the corners of each field. The slabs bear the ⩚ mark S. A. F., with or without the letter P, which is used to denote puttah land. In case of fields which are cultivated over their whole extent, cutting a line is dispensed with as the verge of cultivation itself and the stone slabs planted at the corners are sufficient to define the limits of such admitted private enclosures.

3. *Demarcation of admitted Rights of Way.*

All admitted footpaths and bandy-tracks have also to be demarcated or defined in order to enable the public to know the

admitted rights of way within the Reserve. For this purpose two stone slabs at the entrance of an admitted path into the Reserve and 2 at its exit are put up at the admitted width apart, one of the two slabs is 2 feet broad, while the other is 1 ft., and both are 10 or 8 ft. high. The broader slab bears the name of the Reserve, the number and width of the path, the purpose for which it is admitted, and the penalty for deviation from it; and the other slab simply bears the ⩚ mark and S. A. F. The inscription is written in Tamil, and is cut out in the stone. Where broad slabs are not procurable, narrow ones are used indicating the number and width of the path.



4. *Demarcation of other admitted Rights.*

The limits of other admitted public or private rights within the Reserve are defined in the same manner as those dealt with in the preceding cases with such alteration and modifications as the peculiarities of each case may necessitate.

Cost of Final demarcation:—It will not be out of place to give where details of cost actually incurred in demarcating some ofthe forest blocks in South Arcot. As I am best acquainted with the work done in Tindivanam Range, I shall confine myself to the figures recorded in that Range. The following statement shows the details

of cost of finally demarcating the forest blocks in Tindivanam Forest Range.

Statement of cost of final demarcation of 10 Reserved Forest blocks in Tindivanam Taluq of South Arcot District by cutting and clearing boundary lines and planting stone slabs.

No.	No. and Name of Forest Block.	Total length of boundaries.	Total cost of line clearing and grubbing out roots and stumps.	Average cost per mile of line clearing.	Details of stone slabs put up. For outer boundaries.	Details of stone slabs put up. For admitted pattah lands.	Details of stone slabs put up. For admitted paths.	Details of stone slabs put up. S. slabs brg. manes, &c.	Details of stone slabs put up. Total No. of slabs.	Total cost of putting up stone slabs, including carriage, numbering planting, &c.	Average cost per mile of stone slabs calculated on the outer boundaries.	Total of the cost of line clearing and stone slabs.	Average cost per mile of demarcation (line clearing and slabs).	Remarks.
		Miles.												
1	Struvadi ...	15½	175 12	11	169	93	3	2	267	157 4	10	333	21	Some additional stones have since been planted at minor turns.
2	Muttakadu ...	10½	96 6	9 9	80	14	0	2	96	64 4	6	160 10	15	
3	Karai ...	8¾	69 2	7 14	94	29	...	1	123	78 5	8 15	147	13 8	Produce cut on the line was given away in lieu of wages, D
21	Kumalampattu ...	8¼	Nil ...	Nil ...	101	16	17	...	134	88 6	6 5	88	6 5	
22	Kil Sevur ...	6⅛	Nil ...	Nil ...	84	17	4	...	105	57 5	9	57	9 5	Do.
25	Peradikuppam	6¼	44 0	7 0	64	0	4	1	69	64 14	10	108	17 6	
26	Akkur ...	8¼	68 9	8 5	74	0	8	1	83	64 1	7	132	11 3	
28	Saram ...	4½	28 4	6 4	48	60	11	1	121	82 9	18	110	13 3	
19	Kurumbaram 1st Bit ...	7½	22 13	3 3	168	58	8	0	234	152 12	21	175	9 7	Cost of line cutting was partly met by giving produce on line in lieu of wages.
24	Venmaniyatur ...	5¾	36 ...	6 4	99	34	11	2	146	93 3	7	129	3 9	
	Total ...	81¼	541 1	6 6	...	...	...	...	1378	903 2	7	1444	4 1	

It will be noticed from the foregoing statement that the cost of clearing boundary lines and of procuring the stone slabs varies largely in different blocks. This is due to several circumstances, the chief among which are (1) variation in the density and description of forest growth, (2) difference in local rates of wages, (3) distance of stone quarries from forests demarcated, (4) availability of stone masons, (5) straightness or tortuousness of boundaries, (6) the number, extent, and the shape of the periphery, of admitted enclosures and so on. On the whole considering the permanent and substantial nature of the work Rs. 17-12-5 per mile of final demarcation on this method is certainly most reasonable.

As I have far exceeded the limits which I originally proposed to myself in writing this article I shall put off giving a brief description of the *post and cairn method* of final demarcation to a future date.

M. R.

TINDIVANAM,
14th January, 1894.

II.—CORRESPONDENCE.

Pynkado Railway Sleepers

SIR,

I shall be much obliged if any of your readers in Burma or elsewhere will give me information regarding the employment of the wood of *Xylia dolabriformis* for railway sleepers. It is, I believe, in use on several Railways in various provinces, and quite recently we have been asked to supply sleepers to the Southern Mahratta Railway.

I want more particularly to know the methods employed and the time allowed for the seasoning of the wood. Is the wood liable to split when drying or dry? What prices are obtained by the Forest Department for the wood, whether in bulk or converted into sleepers? If possible also I should like to know the prices at which these sleepers are exported from different Indian ports.

HUGH MURRAY.

Divisional Forest Officer, Belgaum.

Privileges and Rights.

SIR,

As my number of the *Indian Forester* for November, 1894, did not contain (it may have fallen out when I opened the cover) the paper by Mr. Hight, I am unable to refer to the context with reference to which B. H. B.-P. calls attention in the 4th para of his letter in the February, 1895, number of the *Forester*. As far as I understand the matter, Mr. Hight says: "What we in India call privileges, the author calls by their proper name rights."

Now B. H. B.-P. lays down that a privilege is a mere tolerance. It implies no legal right. It is a matter of pure favor or concession which might at any time be withdrawn.

If this view is correct—under our older settlements in Burma, are there no rights? On turning to the Settlement reports for the State Reserves in my divsion I find everywhere privileges allowed when the reserves were notified, never rights until some notified in 1894-95 where the statements are of rights and privileges.

Let me take an example. In 1881, extensive reserves were sanctioned, certain privileges being granted, *viz.*, to several Karen communities, the collection of certain produce for home consumption and the cutting of taungyas within certain areas, also certain rights of way to travellers. They are distinctly called privileges, *vide* Revenue Department No. 78 Forests, of 15th September 1881. The Conservator had drawn up and submitted a draft notification in which the tables notified on 15th September 1881 as "Statement of privileges" were headed "Statement of rights"

The Karens had always been in the habit of cutting their yas and making use of the produce for home consumption. Am I to understand that owing to the wording "statement of privileges" the Karens have no legal rights. It should be again noticed that the above are customary uses which have been admitted, and should therefore be full legal rights.

In conclusion I might call attention to the fact that at the end of the Burma Forest Act, pages 92 to 104, are published "Instructions to Forest Settlement officers, Lower Burma." Whether these have escaped the notice of the Hon. Editor, or whether they are not of the same kind as those published in Madras, I do not know, as I am unacquainted with the Madras Rules for the guidance of forest settlement officers.

N'A-MA-LE.

NOTE.—We regret that, being in camp, we have no copy of the Burma Forest Act to refer to. As soon as we can get hold of it, we shall study the instructions to which our correspondent draws attention.—HON. EDITOR.]

III—OFFICIAL PAPERS & INTELLIGENCE.

The Resolution on the pensions of trained Forest Officers.

READ,

Despatch to the Secretary of State for India, No. 169, dated 6th June 1893.

Despatch from the Secretary of State for India, No. 188 (Financial), dated 21st September, 1893.

No. 1303 *dated the* 18*th March*, 1895. *Resolution.*—The Governor-General in Council is pleased to announce that Her Majesty's Secretary of State has sanctioned the extension of the scale of pensions laid down in Article 712 of the Civil Service Regulations to officers of the Forest Department who have been, or may hereafter be, appointed from England to that Department.

2. The provisions of that Article are accordingly extended to the officers in question; but inasmuch as the existing rules (Articles 518 to 520 of the Civil Service Rugulations) now applicable to officers of the Forest Department are in certain contingencies more advantageous than the scale laid down in Article 712 of the Regulations, His Excellency in Council is pleased to allow every officer of the Forest Department appointed from England, now in the service, the option of choosing between the two scales of pension, and to direct that the new scale shall not be extended to any officer who prefers to remain under the existing rules of his service.

3. All officers appointed from England to the Forest Department in India, who are now in the service, are accordingly required to state, within a period of six months from the date of this Resolution, whether they prefer to remain under the existing rules which govern their pension, or elect the scale in Article 712 of the Civil Service Regulations. In the event of an officer electing to remain under the existing rules, the privilege of retiring under those rules will be reserved for him so far as he is concerned, and the new scale will not apply to him. In all other cases the old scale of pensions will cease to apply.

4. The decision arrived at by each officer in India as to the scale of pensions he prefers to abide by should be communicated by the Local Government or Administration concerned to the Government of India in the Revenue and Agricultural Department.

5. The question of granting to the members of the Forest Department special additional pensions of the kind mentioned in Article 714 of the Civil Service Regulations is now under the consideration of the Government of India, and any such pension

which may be admitted hereafter will apply to officers under the new scale of pensions and to those who may elect to remain under the existing scale. Article 503 of the Civil Service Regulations will also for the present apply, whichever scale of pension may be elected; and should any change hereafter be made in respect of the superannuation of Forest officers, no difference will be made between officers on the different scales of pension.

Note on the Extraction of Timber by Government Agency, in Burma.

When teak trees have been girdled full three years the Forest Officer has to arrange for their extraction, and in forests where no trees have been girdled, or the girdled trees have been extracted, there is always a quantity of dead and fallen timber, and it is the duty of the Forest Officer to bring this timber also to market as quickly and with as little loss as possible.

2. The distribution of this work among the different contractors is in some divisions the most important work of the year and the one which calls for the greatest exercise of judgement and a thorough acquaintance with his forests on the part of the Divisional Officer. In this paper it will be impossible to give the Forest Officer a complete set of instructions to guide him, but it is hoped that it will contain so much advice and so many hints that he may not make any great mistakes even when he finds himself in a new division where the forests and contractors are both strange to him.

3 Contracts are usually given out annually, and in November, when it is known how many logs the old contractors have left lying in the forests or neaped in the streams. Before distributing the work the Forest Officer should be master of full information on the following points:

(*a*) The number and locality of girdled trees which were girdled more than three years ago, but have not yet been felled.

(*b*) The number and locality of trees girdled three years ago and which are now ready for extraction in the ordinary course of events.

(*c*) The number and size of the elephants belonging to each contractor.

(*d*) The balance of logs left by each contractor and how many of them are lying in the forest and how many are neaped in the streams.

4. Experience has taught us that the best work is done by contractors who have at least three elephants, for this number enables a contractor to divide his forces during the rains and to take advantage of every rise in the streams. In the case of the man with

one elephant the animal is usually employed in launching logs in the floating streams or pushing down the smaller streams at a time when all logs previously launched are stuck in an obstruction miles down the stream, and the result of this often is that all or a large proportion of the logs felled by such petty contractors are neaped and left for next floating season. Of men with three or more elephants the best contractors are those with the most powerful elephants; in the case of old contractors the Forest Officer can easily discover who are the best workmen by a study of the number and size of the logs delivered in previous years; the contractor whose logs have been Yathits with an average contents of 20 to 30 cubic feet demands no consideration and, if employed at all, should be given a forest where there is known to be little or no large size girdled or dead trees, whereas the contractor who has delivered over 100 logs for each elephant with an average cubic contents per log of 60 cubic feet is a man to be encouraged and treated with consideration.

5. We know from long experience that as a rule an elephant cannot do more than drag the logs which are furnished by 100 girdled trees, and in giving out contracts this should never be forgotten, and when there is no large quantity of neaped logs to be taken into consideration an area may be allotted to a contractor containing approximately girdled trees in the proportion of 100 trees to each elephant the contractor possesses, and this area must be clearly defined in the contract. If this is not done and the contractor is allowed to work in a forest containing a large number of girdled trees, he naturally takes all the trees which are standing close to the banks of the streams and perhaps obtains 200 or 300 logs per elephant, but in the following year neither he nor any other contractor is willing to work the same forest except at enhanced rates. Another mistake the Forest Officer is liable to make is to allot a forest to a contractor and enter in the contract that the contractor is allowed to fell 100 trees only without defining the area; this limits the contractor's outturn, but does not prevent him from taking only the trees which are easy to extract and leaving the difficult work to another contractor or demanding enhanced rates for it. Even in the case of a forest, containing dead and fallen trees only, a very large area should not be allotted to a contractor; there is a case on record in which a contractor working with only one elephant obtained 300 logs in one season, but, needless to say, he wanted extra rates for the next season's work.

6. If the contractor has a large balance of logs left either lying in the forest or neaped in the streams, an area containing a smaller number of girdled trees should be allotted to him, or, if he is working dead and fallen timber, he should only be allowed to fell as many trees as he can work out in addition to his arrears of the previous season. No fresh trees would be allotted to a man who had 100 logs per elephant not launched or 200 logs per elephant neaped, and in the case of a lesser number the number of

new trees to be felled would be reduced in proportion. Areas containing large trees should not be allotted to a contractor with small elephants who is unable to put two elephants on to one log to drag it, or the result will be either that the trees are cut into small logs to the prejudice of Government interests, or that all the large trees are left standing and, as they will be scattered over the area, the contractor who works them out will want extra rates.

7. Having obtained his contract the contractor should set to work at once so as to utilize to its full extent the working season, which generally ends with February, as in March owing to scarcity of water in the forest, and the heat rendering it inadvisable to work elephants hard, they are generally turned out to graze.

8. The first step towards extraction is to fell the trees and cut them into logs. The contractor sometimes employs coolies to do this, but very often the elephant drivers do this in addition to their other work. The felling and logging should cost about Re. 1 per ton. The forester in charge of the beat should keep himself informed as to the number of the trees felled and the number of logs obtained from them, and should send in reports from time to time, giving this information separately for girdled trees and for, dead and fallen trees. The Divisional Officer should record this information in a book, and at the close of the year the total number of trees felled in each forest will be entered in Form 2A, but the number of logs obtained will appear in Form 4 and the monthly total in Form 6 for Forest depôts.

[NOTE.—In the Toungoo division, the rates for felling teak timber usually are—

For 100 logs 5¼ feet (3½ cubits) and above in girth ... Rs. 80
For 100 logs 4½ to 5¼ feet ... ... „ 50
For 100 logs under 4½ feet (3 cubits) ... ... „ 25

the average coming to about 12 annas per log or 10 annas per ton.

For felling and logging dead trees or for logging fallen trees in forests where no girdled trees are available the rate is Re. 1 per log or 13 annas per ton, the enhanced rate being paid to compensate the wood-cutter for the time he spends in searching for these dead and fallen trees.—C. J.]

9. The logs are dragged to the nearest stream which is large enough to float them away when in flood, but when the distance to a large stream is great the logs are often dragged to a smaller stream, and then it is necessary to employ elephants in the rains to push the logs along; this operation is known by the name of "aunging." There are in Lower Burma very few teak forests which are not intersected by numerous streams, and the average distance that logs have to be dragged does not exceed 2 miles, and the cost of dragging should not be much more than Rs. 2-8-0 per ton. If the logs have not already been marked with the forest hammer, this should now be done by the forester, who should never be allowed to mark logs after they leave the forest, and the use of

marking-hammers on a floating stream or rafting river either by the forester or the contractor should never be permitted.

10. As soon as floods occur the logs already launched float down the stream and others follow as they are launched, but the contractor has to employ one or more elephants in "aunging" logs down the small feeders and in setting logs adrift which get caught in the bends of the streams and by fallen trees, &c., and there are often places where it is necessary to have elephants stationed as long as the floating continues; such places include "thegawas," where owing to insufficient fall the stream is not confined to a narrow deep channel, but spreads over the land on either side and forms a shallow lagoon without ufficient current to move the log along even if the water is deep enough to keep the log afloat. "Aunging," &c., in most streams costs 8 annas per ton.

[NOTE.—It is difficult to express the cost of "aunging" in exact figures. If the elephants can do dragging work in the same localities where the "aunging" is done, the latter may be said to cause no additional expense.

If the elephants are kept to watch "thegaws" or other obstructions or form part of linked stations on the banks of a long floating stream, "aunging" is expensive and especially if the expected floods are delayed. In streams, the sources of which do not reach the main Yoma range, floods are very uncertain, and a case has occurred in which a batch of 1,200 logs had to be "aunged" for four rainy seasons before the timber reached the rafting river.

Again in narrow and tortuous streams two elephants can move 100 logs from ½ to 2 miles in one flood; in wider and straighter streams one trained and powerful tusker can work 600 logs or more over a distance of 4 miles or longer. Floods in feeder streams are of shorter duration than in main streams and almost invariably occur at nightful lasting until mid-night or thereabouts. "Aunging" at night is of course more difficult and less effective than similar work in the daytime.—C. J.]

11. At the mouth of the floating stream the logs are either caught by men employed by the contractors or by the neighbouring villagers or by a "boom" consisting either of a large rope of twisted canes or of logs tied or chained together, and which is stretched across the stream.

12. When sufficient logs have been collected they are tied together in rafts and taken to the sale depôt, most of the logs in Lower Burma being sent to Rangoon. The rafts on the Sittang, which have to be passed through the canal, usually consist of 45 logs only, but elsewhere a raft often consists of 100 to 120 logs. Rafting to Rangoon costs Rs. 3 per ton from places on the Irrawaddy, Rs. 2 per ton from places on the Hlaing and Pegu rivers, and Rs. 3-12-0 per ton from places on the Sittang.

13. As a rule the felling, dragging, floating, and rafting are all done by one contractor, who undertakes to fell the trees and

deliver the timber to Rangoon ; and for this work a form of contract has been drawn up, which may be found in the guard-book. It will be noted that there are two schedules of rates—the lower rates are in force in the Tharrawaddy and Rangoon divisions, where the rafting to Rangoon is least expensive, and the higher rates are in force in the other divisions, where the distance logs have to be rafted to Rangoon is greater. Contracts in any other form, such as giving the contractor so much per ton, whether the logs be heavy or small, or giving him a percentage of the proceeds arising from the sale of the timber, have been abandoned, and they should in future only be entered into in exceptional cases and with the previous sanction of the Conservator. The schedule of rates in the Tharrawaddy contract has been well considered with a view of giving the contractor a fair rate and at the same time of giving him a larger rate per ton for heavy logs than for small ones. Under this schedule the contractor receives (with a few exceptions in the case of short logs) for logs with an average contents of—

	Per ton Rs.
Under 20 cubic feet	6
From 20 to 30 cubic feet	7
From 30 to 40 cubic feet	8
From 40 to 50 cubic feet	9
From 50 to 60 cubic feet	10
From 60 to 80 cubic feet	11
From 80 to 100 cubic feet	13
From 100 to 120 cubic feet	15
From 120 to 150 cubic feet	16
Over 150 cubic feet	17

There is one fault about this schedule of rates, which arises from the limits of the girth classes being so large as 18 inches (the Burmese taung) ; for example a log 30 feet long and from 6 feet to 7 feet 5 inches girth costs Government Rs. 22 for extraction. For an average log of this class 6 feet 9 inches in girth the contractor receives Rs. 13 per ton ; if the log is only 6 feet in girth he get Rs. 16 per ton, and if 7 feet 5 inches in girth only Rs. 11 per ton. With a large number of logs of one class the contractor probably receives the average rate which it was intended he should obtain, but when only a few logs of a particular class are delivered the contractor is liable to receive a rate either much greater or much less than it was intended he should receive. This anomaly might be removed by a contraction of the limits of the girth classes, but a narrower limit than the foot would give much trouble and extra work, and the Burman is used to his cubit and has a grea' distrust of any tampering with rates that he has been accustomed to. Instances have occurred in which contractors have refused to work under a revised schedule of rates, even though the new rates were more favourable to them than the old ones.

This schedule of rates has been found sufficient for the average forest in the Tharrawaddy division and in most forests where trees are fairly plentiful, but in some forests where the logs have to be dragged long distances the rates are inadequate, and in such cases a clause is added to the contract that the contractor shall receive an addition of 10, 20, or 30 per cent., to the amount which he would receive under the schedule; this has been found much more simple and satisfactory than giving him an extra rate of Re. 1 or Rs. 2 per log. These extra rates should not be granted without a full enquiry as to the difficulties in the way of extraction and never without the sanction of the Conservator.

[Note.—In considering to what degree the dragging in a certain forest is difficult the nature of the ground has to be taken into account as well as the distances. In a fairly level forest, average sized elephants can drag logs of 60 to 65 cubic feet each, or two or more elephants can be made to drag one big log; buffalo-dragging can be resorted to with great advantage, and in the dry season elephant and buffalo carts can be used.

In hilly forests where the timber has to be dragged several times up more or less steep inclines, and to be rolled down in places which are too steep from dragging, the work is very trying even for the strongest elephants. In fact in such places small elephants can do little work, as it is impracticable to make several elephants drag one log up a steep and narrow dragging path as they seldom pull together, and the strongest of them does all the work. Only tuskers can work logs down steep hillsides, and it is very tedious work; the logs when rolled or pushed down are caught on the way by bamboos or trees, and the tusker has to follow them and start them again, finding a footing with difficulty. When dragging heavy logs in hilly forests elephants are very liable to hurt their feet; the cuts and sores fester badly and often incapacitate the animal from work for months.

Another feature of working in hill forests is the want of grass-fodder; bamboo leaves will not keep an elephant in condition over heavy dragging-work, besides the animal wastes a good deal of the time allowed him to feed and rest in walking long distances in an unsuccessful search for grass.

In some forests the compensation which the contractor has to pay for damage done by his cattle to paddy-fields, taungyas, or fruit gardens forms an item that needs consideration.

When timber has to be dragged or "aunged" through miles of the paddy plains between the hills and the river the compensation runs up into big amounts, and in addition causes friction between the contractor and cultivators, and sometimes even litigation —the most expensive complication, as it takes the contractor away from his work for an indefinite time.—C. J.]

14. The contractor generally requires money before he has completed his work by the delivery of his logs in Rangoon. Although we call payments made in such cases "advances," they

are not really "advances," but "part payments;" and Divisional Officers are responsible that these "advances" should be fully covered by work done; any payment not covered by work done, and which really partakes of the nature of an advance or loan to the contractor, should only be made under proper authority, and Government should be secured against loss by the mortgage of the contractor's elephants or other property.

15. Another matter connected with the extraction of timber is the clearing of floating streams of fallen trees, stranded logs, and other obstructions. The best time to carry out this work is March and April, when there is little water in the streams, and fire can be used to remove some of the obstructions. Native contractors, especially when more than one man is at work on a stream, will neglect this work unless they are looked after.

16. With regard to the cost of dragging it will be of interest to investigate the expenditure involved in the purchase and maintenance of elephants. If the average dragging elephant in Burma costs Rs. 1,800 and the life of an elephant at timber work averages 15 years, then the capital involved (allowing interest at 5 per cent.) to purchase an elephant and to replace it every 15 years is $\frac{1,800+1\cdot05^{15}}{1\cdot05^{15}-1}$.= Rs. 3,468 and the yearly cost is Rs. 173. Attendants cost Rs. 26 per month or Rs. 312 per annum; the cost of medicines, repairs to gear, and other incidental expenses may be put down at Rs. 25 per annum; the annual work of an elephant costs therefore Rs. 510. An elephant can drag and "aung" 140 tons in a year in a fairly difficult forest, and the cost of dragging and "aunging" in such a forest is Rs. 3-10-0 per ton. For dragging alone the cost is probably less than Re. 1 per ton per mile. The outturns given above are the actuals of the Swa forests on an average of four years. A Burman or Karen would not pay his men so highly, but on the other hand his outturn would be smaller, and the cost per ton would probably be about the same. The cost of "aunging" cannot be determined very well separately. In the Pyinmana forests, in former times, the rate paid for logs delivered on the banks of a floating stream was about Rs. 4 per ton, while for logs delivered in the rafting river Rs. 6 to Rs. 8 per ton were paid, and the difference Rs. 2 to Rs. 4 was not considered too great by contractors, as the man who worked for bank rates was paid for every log he dragged out, whereas the contractors who were paid for logs delivered in the river lost a great percentage of the timber they had launched; the Rs. 2 to Rs. 4 cannot therefore be regarded as the cost of "aunging."

17. The following information with regard to the construction of rafts has been collected from various sources,—"Timber floated down the Sittang and arriving at Toungoo from above is formed into rafts consisting of 42 to 60 logs; as the average log is about 63 cubic feet a raft may be said to contain 57 tons of timber. A raft has five sections, into which the logs are sorted

according to their length, some sections consisting of Luzars only, others of Dugyis and Yathits, with perhaps two short pieces placed in one line between long logs. To this sorting of the logs the long time raftsmen spend over their work at Toungoo is partly due. The size of a raft is limited by its width ; a section of Luzars contains therefore fewer logs than one of Dugyis or Yathits. If a section consists of nine logs, seven are fixed together by their end, being strapped on to two cross-poles (bo-dôns) and canes passed through the drag-holes (napa-thi-Kyeins); the strapping is done with split canes of the "Kyein ban" and "Kyein bok" description. The other two logs are attached loosely, one to each side of the section, and are called "Ban thits." The sections are connected by two strong lashings of canes called "Ka-sets." Strappings and lashings are effected in such a way that they can readily be untied in case the raft grounds and has to be shoved off ; if a raft grounds in a falling river, the raftsmen often have to shove off the logs singly. When floating the raft is guided by four oars—two at the prow and two at the stern ; a raft frequently slews round in the river and then the position is reversed. Rafts are not voluntarily moved at night, but made fast to the bank every evening ; for this purpose they have two mooring canes, to which is attached a pointed stake (Kwèdaing). On the quality, length, and strength of the mooring canes and on the skilfulness and judgment of the man who handles them the safety of the raft mostly depends. Good long mooring canes (120 to 150 cubits long) are eagerly bought by raftsmen at Rs. 3 to Rs. 5 each. The "Kwè-thama" is the best paid man of the crew, which consists of three men in all. The rowlocks, to which the 18 feet long oars are attached, are called "Kat-Kundaings." The centre section has a hut for the crew to sleep and cook in ; it is very carefully built of bamboos and thatch, and unfortunately is often converted into a gambling saloon, most of the Sittang raftsmen being inveterate gamblers. Rafts go down stream in batches of 12 to 20, seldom 25, which are in charge of a headman. The voyage from Toungoo to Rangoon can be performed in three weeks, but usually takes much longer, the average duration being little short of six weeks. The delays are due to some of the rafts breaking up on the way, such mishaps being sometimes caused by the snapping of both mooring canes when the rafts may come into collision with fallen trees, snags, or sandbanks. Frequently the raftsmen bolt, abandoning their raft or even selling it to a drift timber collector. In either case the headman has to collect the logs again and to engage a fresh crew. Owing to the difficulty of his task especially if the crews and head raftsman are not carefully selected, the headman is very highly paid. Each raft has a canoe, in which the "Kwè-thama" paddles to the bank when it is necessary to moor the raft. Above Toungoo rafts are made up with less care ; those starting from below Myohla have usually no "napathi" canes and

the logs are strapped to the cross-poles with creepers which the raftsmen cut themselves in the forests. Rafts from Myohla and above have "napathis" and "Katkundaings." These upper rafts have usually four sections and contain from 25 to 45 logs, and are managed by a crew of two men only. During the height of the rains rafts starting from Swa arrive the same day at Toungoo. Myohla and Yeni rafts are one night on the way, rafts from Yonbin and Sinthe two nights.

18. "The cost of rafting on the Sittang is as follows :—

	Rs.	A.	P.	
Raft hire from Swa	1	1	0	or an average of Rs. 1-4-0 per log.
Including from Myohla or Yeni	1	4	0	
Bank salvage from Yonbin	1	8	0	

For Upper Burma timber these rates have lately been raised by four annas or more per log. The cost of a raft of 45 logs or 57 tons is—

	Rs.	A.	P.
Expense above Toungoo as above	56	4	0
Contract rate from Toungoo to Pazundaung ...	110	0	0
Bonus for correct delivery { To headman	5	0	0
Bonus for correct delivery { To chief raftsman ...	10	0	0
The canoe costs Rs. 10, is brought back from Rangoon twice at an expense of Rs. 5 for each trip and eventually sold for Rs. 2	6	0	0
Four ores costing 8 annas each and used twice ...	1	0	0
Two stakes costing 4 annas each	0	8	0
Seven Yamata canes at Rs. 1-4-0 each	8	12	0
Canal dues at 4 annas	11	4	0
Raft hire from Pazundaung to Alôn—45 logs at Rs. 35 per 100	15	12	0
Contract stamp and sundries	0	8	0
Total ...	225	0	0

or Rs. 5 per log = Rs. 3 = 15-2 per ton. Rs. 49 per raft are paid in advance on the raft leaving Toungoo ; Kabaung contractors contract with raftsmen usually at Rs. 4-8-0 per log delivered at Alôn depôt, bank salvage and all expenses included ; Pyu and Kun contractors at Rs. 4 to Rs. 4-8-0 per log, the contractor making an advance of about Rs. 25 per raft on starting and a further advance of Rs. 5 at Shwegyin. The above rates hold good if the rafts are correctly delivered, but, if the men lose revenue-paid logs on the way and they are not eventually recovered, the owner loses the value of his timber as the raftsmen are only liable to a fine of Rs. 10 per log lost.

19. "Rafts of In timber consists of 25 logs ratted in five sections ; 1,200 bamboos are used for the floats of one raft, but including huts and breakage 6,000 bamboos are generally provided for 100 In logs. An In raft has a crew of two men ; the raft hire from Myohla to Kyaikpadaing is Rs. 110 if the crew provide themselves with food, or Rs. 95 if food is provided by the owner of the timber. The bamboo floats are about 2 feet square, tied together as close as possible with cane withies. The floats carry the two cross-poles, which are stronger than those for teak rafts,

and the logs are strapped on to the cross-poles by means of 'napathi' canes passed through the drag-holes. In rafts cannot be moved before November when the river has fallen and the current is less strong than in the height of the monsoon ; the journey takes a long time. In logs worked on streams like Hmon, Kyaukgyi, Shwegyin, &c., are floated down these streams with boats or boat hulls, two or four logs being lashed alongside the boat according to the size of the boat. The floating hire is about Re. 1 per log.

20. "Rafts made up at Prome vary in the number of logs which they contain—from 75 to 100 logs per raft, but the usual number is 80. The smaller rafts of 75 logs consist generally of five sets, each set containing 15 logs, but this is only done with small logs. The usual custom is to have six sets of logs which vary from 12 large logs to 15 small logs in a set. In making up the raft the longest logs are placed on the outside and in the middle with the shorter ones between them. The logs in the front of each set have a split bamboo passed through the drag-holes and on the top poles are laid, to which the bamboos are tied with small canes ; at the back end of each set poles are likewise laid on the top and the logs are fastened to them with small canes ; at the back end more poles are necessary as the logs of course are not all of one length and the split bamboo is not used. To fasten the sets together five or six logs in the first set are attached with split bamboos, which are passed through the drag-holes to five or six logs in the second set, the ends of the bamboos being tied with small canes to the poles, and so on with each set. Near the front of the first set and near the back of the last set a log is placed at right-angles to the logs forming the raft and fastened firmly to them by passing small canes through the drag-holes to each end and through extra holes made in the under logs. Long ropes measuring about 200 feet in length and 3 inches in girth are attached to these cross-logs, and when it is necessary to tie up for the night the ropes are conveyed to the bank and the other ends are fastened to stout stakes which are driven firmly into the ground. To steer the raft five oars are fastened in front and five behind. The crew consists of a head raftsman and three under-raftsmen ; two men work in front and two behind, the headman being in front ; the extra oars are to replace any that may get broken. The huts are built of a framework of bamboo and roofed and walled with thatch ; each raft is provided with one canoe, 20 spare poles, 50 spare small canes, and three small ropes. The best season for floating is the end of November and the beginning of December, and it takes about 20 days for a raft to get from Prome to Rangoon if no halts are made. The men are usually paid as follows for the trip : Each head raftsman Rs. 30 and each under-raftsman Rs. 20. Contractors' timber from the Nawin stream is, if possible, all sent down to Rangoon at one time with one head raftsman in charge of the whole, who gets about Rs. 40 for each raft."

21. The rafting of pyinkado on the Ngawun river is conducted as follows :—"The method of forming rafts of pyinkado logs north and south of Bassein varies slightly. North of Bassein the logs are dragged to the foot of the hills and lashed on to boats (as in Shwegyin) ; on arrival at the Ngawun river each log has bamboos fastened to the sides with canes or creepers. Usually ten of these logs with the bamboos are placed side by side and a pole put across the ends of the log and fastened with canes to the drag-holes ; sometimes a pole is also fastened across the centre of the raft. Five of these small rafts are made and fastened together with ropes and form one large raft. South of Bassein the logs are floated down small streams with bamboos fastened only on one side of the log ; on arrival at the rafting stream 10 logs are put together and a pole placed across and fastened to the bamboos at the ends and the centre. The quantity of bamboos required for making a raft of 50 logs varies with the size of the bamboos. Formerly Kyathaung of good size was used and 500 bamboos were sufficient for a raft, but for the past two years Kyathaung has not been procurable, and Tinwa and Kayin are mostly used ; it requires 1,000 bamboos of the former or 2,000 of the latter to make up a raft."

22. The following is an account of the rafting of bamboos on the Ngawun river :—"The bamboos have small pieces cut out similar to drag-holes, 20 bamboos are placed side by side, and a piece of bamboo passed through the holes ; then five such lots of 20 bamboos are placed on the top of one another and fastened round with strips of bamboo ('hni') and form what the Burmans call a 'Kadon,' each 'Kadon' consisting therefore of 100 bamboos. Five 'Kadons' are made and placed side by side and fastened to two poles, one of the poles being near the drag-holes and the other across the centre of the 'Kadons.' Five more 'Kadons' are then made and fastened to the centre pole on the top of the other 'Kadons,' but leaving about 6 feet of the lower 'Kadons' uncovered ; five more 'Kadons' are then made and similarly treated until the raft is completed. A raft generally consists of 20 rows of 'Kadons,' containing therefore 100 'Kadons' or 10,000 bamboos."

23. On the Pegu river the process differs somewhat. "The bamboos are first cut into lengths varying from 20 to 30 feet according to the kind of bamboo ; a small hole is then cut through the small end of each bamboo, and they are then strung together in fives by passing a split bamboo ('thidan') through these holes. Four of these lots of five bamboos are placed one on the top of the other (the thin ends pointing the same way) and are bound together, forming a bundle of 20 bamboos. Fifteen to 17 of these bundles are placed side by side (the small ends all pointing to the front of the raft), and secured together by two cross-poles, to which each bundle is fastened. The manner in which each bundle is lashed to the pole ('Po') is ingenious, a short split bamboo ('Kyet') being

inserted under the pole, the lashing passing under the 'Kyet' and over the pole and forming a very secure fastening; the outside bundle on each side of each section of the raft contains a few bamboos 2 or 3 feet longer than the rest; these are called 'Sweyanwa' and keep the succeeding sections in the same direction as those that precede them. A top layer of 12 or 15 bundles is then laid on the raft, each bundle made up in the same way as those forming the lower layer, but not secured to each other by a cross-pole. Each section of the raft, therefore, contains from 27 to 32 bundles or 540 to 640 bamboos. To facilitate steering in deep water there is an arrangement called a 'Kakron' in the first and last section of each raft; this is formed by a thick upright bamboo post planted on one of the cross-poles; through a hole at the top of this post is run a bamboo yard, which is tied down firmly, and this keeps the post upright; to the top of the post is fastened a rowlock for a long oar."

24. The following notes will furnish information regarding the catching of logs when they emerge into a rafting river from a floating stream down which the logs have been allowed to float singly. "Salving in the Sittang above Toungoo is done very vigorously and effectively. In places like the villages below the mouth of the Swa, where there are a large number of logs to collect and where a cloudy sky in the proper direction or heavy rain warns and prepares the villagers, the logs may float out during the night, it is very paying work; and a number of villagers engage in no other occupation during the rains. Three villagers of Swabauk lately salved 125 logs during one night and the next morning. Some years ago it was difficult to get men to collect the logs salved by the villagers and to raft them to Toungoo promptly, particularly to make the collectors pay full salvage rates. This led to encouraging the bank-salvers to raft the logs themselves to Toungoo. In the beginning the men had to learn how to raft quickly and how to manage the raft on the way and on arrival, and many mishaps took place. However, they saw they were paid well and promptly, and now have taken so well to the work that for years no obnoxious middleman has been employed to collect logs floating out of the Swa. The salvers work now without money advances, and the only assistance they get is a supply of good mooring canes at cost price.

25 "The Swa is too wide at its mouth to have a boom (Kyodan or Thittaga); the men go into the stream in canoes, or station themselves on the bank at places where the current brings the logs close in shore, swim for them, and haul them in with ropes. Although very few logs from the Swa pass Toungoo without being salved, the salvage of 2,000 logs coming out in one flood gives work to all the villagers on the river-bank down to Toungoo, and, if a much larger number of logs did float out at the same time, the whole of them would not be salved above Toungoo; this is, however, a very rare occurrence."

26. "Below Toungoo salving is done also by villagers living on the river-bank, but as the supply of logs is smaller and less regular and comes without warning, fewer people take to the work as a regular occupation. The collecting of the logs is therefore done in the old style by drift collectors, who redeem the logs from bank salvers and raft them to the depôts at Inbalwè and Myitkyo.

27. "Booms (Thittagas or Kyodans) have been used at the mouth of creeks which are not too wide and have not too strong a current. They consist of canes or iron chains, to which logs are fastened to keep the logs afloat and stop any logs which may drift down the stream. The purpose was to prevent the logs from going adrift in the rafting river, which before the annexation of Upper Burma was of importance, and to save bank-salvage. The raftsmen would, after the flood which had brought the logs down had subsided, work the timber out of the 'Thittagas' and form it into rafts. The disadvantages of 'Thittagas' were that some time was lost over working the logs out as they would jam and form a 'taik' inside the boom, which soon silted up and would render the employment of powerful elephants necessary to get out the logs. Some logs would always become buried in the sand to such an extent that they could not be pulled out at once, and either were totally lost or had to be dug out in the following dry season. Some streams like the Yeni have so little fall that there is never a strong current at their mouths so long as the river is high. In the Yeni a plain 'Kyodan' of canes is strong enough to stop the logs, and they can usually be worked out by the raftsmen with the assistance of elephants."

P. J. CARTER,
Conservator of Forests, Pegu Circle.

IV.—REVIEWS.

Note on an inspection of certain forests in the Central Provinces by H. C. Hill, officiating Inspector-General of Forests.

This note was written by Mr. Hill after his tour in the early months of 1894, a tour which was undertaken chiefly with the object of considering the arrangement for working plans. We do not purpose to review, the Report regularly, but to give a few extracts on the points of chief importance in his Report. The following remarks explain the manner of classification employed in the Reserves and their management :—

"*Manner of Classification.*—The reserves at present stand 'classified as A and B Reserves, but no distinct line of separation 'has been drawn between the two classes. It is true that certain 'of the A forests, such as Ahiri and Moharli in the Chanda Dis-'trict, Bori in Hoshangabad and some of the sal forests of Mandla, 'have been strictly protected and no cultivation has been allowed 'in them: but equally some of the B forests have been similarly 'treated, while some A Reserves and the majority of the B 'Reserves have been open to cultivation.

'The aim now is to place all reserves, designated A Reserves, 'under strict conservancy and the entire control of the Forest 'Department, while the remainder will be open for the settlement 'and extension of cultivation.

"Pending the final marking off of these two classes, a con-'siderable area remains in the intermediary stage, awaiting the 'determination whether it shall be classed as A, or be available for 'cultivation. This is now known as B, while the areas which it 'has been decided are more suitable for cultivation than for 'reserves, are now styled B-1. When the entire area called B has 'been dealt with there will be two classes, A and B."

"*Management of the two Classes.*—If it is decided to classify 'an area as A, the villages and cultivation included, if not demar-'cated out as separate plots, should be treated as forest villages. 'The B-1 areas should, in accordance with the Chief Commissioner's 'orders, remain without change under forest management until the 'formation of village blocks and their settlement. It would seem 'that this latter procedure has not been always enforced, from the 'remarks in the introduction and in paragraphs 5 and 33 of the 'Report of the Conservator, Northern Circle, for the past year. I 'venture to think it is of importance that all reserved areas, 'whether classed in B or not, should, as ordered by Sir A. P. 'Macdonnell, remain under the management of the Forest Depart-'ment for disafforestation. Up to the time of settlement and 'disafforestation there seems to be no reason why the Settlement 'Department should realize grazing-fees or sell timber off areas 'available for cultivation. Such a system will only lead to the 'people having to pay double grazing fees, as animals graze dur-'ing the year over wide areas, and in other respects will result in 'a dual management over the same, or not clearly separated, areas, 'and thus cause confusion."

On the subject of working plans, Mr. Hill says:—

"*No Working-Plans and the urgency for framing them.*—'Up to date no regular Working-Plan has been sanctioned in 'either Circle. The urgency of the Working-Plans rests on the 'scheme of the late Chief Commissioner, Sir A. P. Macdonnell, who 'is understood to have had in view the two main objects—

'I.—To make timber and forest produce readily available to 'the people, and to agriculturists in particular, in replacement of 'the system, which has hitherto been in vogue, of admitting con-

'sumers on license to cut and remove timber and produce much 'as they pleased.

'II.—To bring the exploitation of the forests under systematic 'control, in view of proper sylvicultural treatment, efficient protec- 'tion from fire and regulation of grazing."

And he goes on to give his suggestions for their preparation in the future which we now quote *in extenso* :—

'*Reasons why regulated fellings cannot be introduced generally.* '—To give effect to the policy of the Local Administration, as 'initiated by the late Chief Commissioner, it is in the first place of 'the greatest importance that the fellings should be reasonably near 'to villages, but it will be readily admitted that there is a limit to 'the number of the fellings, and to the size, below which it is 'impossible to reduce them with due regard to the available estab- 'lishment and in view to proper supervision, effective fire protection 'and closing to grazing. For instance, it cannot be desirable to 'fell annually for the supply of one or two forest villages such as 'Dokli, the requirements of which are met by commutation in dry 'wood, with the result that not a stick is saleable, whether one 'acre or more is cut.

'In the same way it is questionable whether in such tracts as 'the Ghot—Arpilli Range, where the total demand is represented 'by R173 for timber +R192 for fuel and charcoal=R365 received 'in commutation fees, fellings can advantageously be made. The 'tract is extensive, though the forest is inferior and the few vil- 'lages are scattered at long distances apart. In these circumstances 'change is scarcely called for, since the demand on the forest is the 'merest fraction of the production. Wairagarh and Sironcha, also 'Ranges of the Chanda Division, are very similarly situated.

'In the whole of the Chhindwara District with a total of 707 'square miles of State forest the yearly demand upon them is only '4,000 tons of fuel and 1,000 tons of poles. It will be clear that '1,000 acres cut over a year would yield all requirements, and that 'having due regard to the size of the fellings their number must be 'limited. It may be found possible to arrange for fellings in parts 'only, where the demand is greatest, and to meet requirements in 'more remote parts by the unregulated fellings under licenses 'hitherto in force. The foregoing examples go to show that no 'hard-and-fast rule can be laid down for the working of the forests 'to meet local and agricultural requirements, and that commutation 'for these wants may still be a suitable arrangement for the people 'in some localities, while the admission of licensees under certain 'restrictions may be more or less a necessity in other parts, where 'the demand is insufficient to consume the produce of fellings over 'areas of convenient size.

'*Consideration of the demand and where it can be met by cop- 'pice fellings.*—The first consideration must be the demand which, 'however roughly, must be to some extent gauged. And to this 'end the tentative fellings, more particularly the numerous ones

'made in the Northern Circle, will be useful; for it is obviously no 'use continuing them where there is little or no demand; and 'further indications will probably lead to the working of the forests 'more in view of the demand which centres on main roads and from 'which produce is easily distributed.

'The demand may be for local purposes, or to meet more 'distant markets such as Nagpur or those supplied by means of 'the Railway lines or the Godavari river. The sources of supply 'may be the same or different, but so long as a demand exists it is 'the duty of the Forest Department to meet that demand up to the 'possibility of the Forest. Where the demand is local and for the 'agriculturist, and the forests carry a crop of varying density, from 'open to complete, of poles and small timber standing on high 'stools, often badly shaped and hidebound with spreading old 'mohwa and other trees such as are found in the plains portions of 'Bhandara and Nagpur, it can be accepted that a cutting over 'sparingly in the open and more heavily in the more complete 'parts, will meet requirements, and, provided the areas felled over 'are *strictly* protected from fire and closed for ten years against 'grazing, be beneficial to the forest growth. The treatment will be 'coppice with standards in the denser and a mere improvement 'felling (*viz.*, the cutting back sparingly of the worst stems) in the 'more open parts. The rotation of 30 years already proposed may 'be accepted.

'The areas to be so treated may vary within wide limits, but broadly speaking it will be found convenient to have them of not 'less than 5 or more than 30 square miles; these would give felling 'areas of 107 and 640 acres, respectively.

'Such is the Working-Plan drawn up for the East Pench forests 'of the Nagpur District with a total estimated area of 155 square 'miles, and divided into four Working circles; and similar plans 'are being made for the forests of the different ranges of the 'Bhandara District. That for the Pauni Range embraces 40 'square miles of forest lying within a compact area; it is proposed 'to have four Working Circles, and I am confident that the four 'fellings over areas, which may extend to 200 acres each on an 'average, will meet requirements both as to quantity and quality 'of produce as well as in the matter of easy accessibility. I recom- 'mend the arrangements which will be the outcome of the Work- 'ing-Plans now being framed for the East Pench, Lakni, and 'Pauni Ranges to the Chief Commissioner for general adoption in 'this class of forests.

Choice of areas to be coppiced.—Complete blocks or 'groups of forests may be treated, or these with the exclusion of:—

1. "Areas where bamboos predominate, and where a cutting 'out of the tree growth with the reservation of standards would re- 'sult in the gradual establishment of a bamboo forest pure and 'simple (this result is seen whenever shifting cultivation is practised 'in this class of forest).

2. "Areas where, from the want of soil, or from the unsuitability of the soil, the forest is only open grass land with scattered tree vegetation in isolated trees or bushes or in groups. (Such areas can be more profitably kept open to grazing.)

3. "Areas where from the rocky and steep or precipitous character of the hills, the soil is almost unproductive, and to remove the present protective covering of such growth, as has been able to establish itself during a term of successful fire protective measures, would be to undo the work of years and reduce the area to the condition of sterility from which it has within recent years made some improvement. The areas of this class, which can be turned to no better purpose, can only be rendered productive of forest produce at all by protection over a long series of years, during which the forests may be expected to reconstitute themselves with more or less completeness. Under the favouring influence of more complete growth the production will be gradually increased, and tracts, which were valueless 30 years ago and have now no appreciable value, will come to be a source of supply of useful produce and to have a value.

4. 'Areas which in view of their meeting special demands in more valuable material such as teak wood, cart axles, mine props, etc., require a different treatment.

'*Forests where improvement fellings should be preferred.*—In other parts, the objects of the administration will, in my opinion, be met by "Improvement fellings," or by an operation which will differ from the one in the coppice with standard areas only in intensity. That is, instead of removing the greater part of the existing crop, say 6 tons or more, and reserving 20 or 30 standards to the acre, the fellings will be spread over larger areas and the greater part of the existing crop will be reserved and some 2 or 3 tons to the acre only cut out. Such a treatment is desirable in the Saonligarh and Bhowargarh forests and probably over all the hilly tracts of the Betul and Hoshangabad Districts. Such operations have been carried out in past years, but only teak was cut during the years 1874-83 in the Saonligarh Reserve, and in the old Satpura Reserve above Korai."

We can now conclude with the following interesting account of the future probable prospects of the forests concerned :—

'*General appearance and future prospects of the forests.*—When it is remembered that the forests in the Central Provinces consist in a large measure of old Dhya cultivation protected and allowed to spring up within the past 30 years, the vigorous growth of many species and the completeness of the stock, considering the climatic conditions of Central India, are strikingly remarkable. As instances, the fine teak of 1 ft. 6 in. and 2 ft. in girth and 80 feet in height in Bori, Ahiri, Dudhára, on the Tawa and in parts of Bhowargarh and Saonligarh may be noted, where, as far as can be seen, they promise as well as teak of similar age in many of the drier forests of Burma. Moreover, the vigorous natural

'reproduction of this species has introduced it naturally, where 20 'years ago there was question of resorting to artificial means. The 'dense thickets that have sprung up of *Terminalia*, *Pterocarpus*, '*Diospyros*, *Ougeinia*, *Lagerstræmia*, etc., wherever the beneficial 'influence of an old mohwa tree was felt, are the best proofs of the 'completeness which may be obtained once the soil is protected, and 'the conditions favourable to young growth are established.

'The preponderance of *Lebidieropsis* in the forests below ghat 'and of *Ougeinia* further north marks these species out as peculiarly 'adapted for completing the canopy, while the valuable *Chloroxylon* 'spreads over the most sterile soils and *Soymidar* gradually covers 'the most hopeless looking of blanks.

'There can be but little doubt now, whatever may have been 'thought 30 years ago, but that the considerable forest tracts, for the 'most part on soils which can be turned to no other purpose, will on 'coming to maturity, 50 to 100 years hence, yield a wealth of 'material not only for local consumption, the development of iron 'or other industries, but also for export to Bombay and elsewhere."

V.—SHIKAR AND TRAVEL.

Elephant-catching Operations.

DEAR SIR,

In Mr. Hadfield's letter which appears in your last issue he seems to have taken my account of elephant capturing operations on the Anaimalai Hills, which appeared in your January number, as a sort of challenge of his methods of capture. In this he is entirely wrong, as my letter was never intended for such, nor have I the slightest intention of pitting my short experience of these operations against the mature experience of Mr. Hadfield who is well known for his successes with elephants. All I endeavoured to do was to give a short description of elephant capturing operations on the Anaimalais as they have been carried out, together with their result. Mr. Hadfield states that I ignored the precaution of making the pits with sloping sides. Not so: I did nothing of the kind. I took the pits as I found them, but I certainly did not think it necessary to give up the pits and dig new ones simply because by mistake they had been dug with vertical sides, nor do I think now that it would be necessary

if only sufficient brushwood is put in. The sloping sides are, no doubt, the best, and in falling into these pits an elephant is less likely to be injured than in falling into a pit the sides of which are vertical. Again by a misprint, as I have already pointed out to you, Mr. Editor, I was represented to have written that no animal has been injured on the *face*, instead of in the *fall*. Mr. Hadfield accepts the misprint literally, and points out that I am not aware how injuries in the face are caused. In this point too he is quite wrong. The slight injuries to the face I have seen are not worthy of any notice at all. Further I would explain that in calling attention to the late captures, I merely intended to point to the utility of sufficient brushwood, for no animal was injured in the *fall*. Of course it is too early to judge the recent captures as successes, and I agree that it is advisable to let loose the big animals, although as a matter of fact I did not do so, but should invariably do so for the future. The two points of comparison at the close of Mr. Hadfield's letter call for no remark, for, of course, circumstances differ in different localities: but as regards estimating the size of the neck I must admit I was not aware of Mr. Hadfield's method, and have always estimated it with the eye. In conclusion, I would point out that the Anaimalai Hills on the Mount Stuart side are eminently suitable for the capture of elephants, as everything is conveniently close to the pits. There is no difficulty in *capturing* the animals, but the difficulty is to *train* them, as there are no suitable mahouts or attendants to be obtained. In this respect Malabar has a great advantage over Coimbatore.

PALAMCOTTAH, H. B. BRYANT.
29th March, 1895.

SIR,

I have read with much interest both Mr. Hadfield's and Mr. Bryant's notes on elephant-catching. I must say I agree with Mr. Bryant as to bedding (I do not see that he *substitutes* bedding for sloped sides, the Board's rules direct that brush wood and bundles of grass be laid at the bottom of the pit.) I would myself like to put in 6 ft. to 8 ft. of loose bedding, bundles of grass for choice. I do not believe any elephant of the size and age we wish to capture and retain could get out of a pit thus bedded. As an example, ten days ago, a small tusker, 4½ high, fell into an old abandoned pit, which was only 5 feet deep, and was taken out and safely enkraaled without a scratch being found on him. I cannot help thinking a depth of 8 ft. or 9 ft. would be ample, bedded for 4 or 5 ft. It would be most interesting if either Mr. Hadfield or Mr. Bryant could tell us if they know any case of an elephant having managed to get out of a pit by itself, giving also the pro-

bable size of the brute, depth of pit, &c., &c Every foot we can take off the depth of the pits with safety must tend to lessen injury to captures.

MANANTODDY, 30th March 1895. } J. G. F. M.

VI.—EXTRACTS, NOTES, AND QUERIES.

A Book required giving information about Babul

G. K. Mediwala writes from Baroda :—

"Would you or any of your readers oblige me by letting me 'know as to the best book or article about plantation treatment 'and regeneration of Babul (*Acacia arabica*)?"

[In our opinion the best work to consult would be Ribbentrop's "Arboriculture in the Punjab."—*Hon. Ed.*]

A Novel Logging Device.

There is a wood pile in Lead City S. D, widely known throughout the Black Hills mining region. It belongs to the Homestake Gold Mining Company, and is composed of timbers about the size of railroad ties, which are used in supporting the walls and roofs of the drifts and tunnels of the mines. A narrow gauge railroad brings the logs, which have been sawed flat on two sides, to a point on the mountain slope about 600 feet above the valley, and they are then thrown into a wooden chute about 4 feet wide and 2 feet deep. The inside surface is kept smooth and slippery by a small stream of water. If the logs were allowed to run directly to the ground, they would speedily excavate an enormous hole besides damaging themselves, so the lower end of the chute is curved upward, and the logs leave it at an angle of about 60 degrees with the horizontal, and rise from 150 to 200 feet in the air, turning over and over, and finally landing on the enormous pile already there. A useful fact in connection with this method is that the logs sort themselves in the pile according to their size: the heavier ones, having a greater momentum, are all found at the side farthest away from the chute.— (*Scientific American*).

Conditions of Forestry as a Business.

Writing in the *Engineering Magazine* of New York, Mr. J. Beale, M. S., Ph D., says:—

Forestry is a business, like agriculture—an industry which is concerned in the production of a soil crop. It is the art of managing a wood crop so that it will make the best harvest of timber in the shortest time at the greatest profit. Forestry differs from agriculture, however, in that it takes many years for the crop to mature, and the crop is then a complicated one. Forestry in the United States as a defined business is now in its earliest stages—chaotic and undeveloped. In its most perfect conditions, forestry is not a single science or art, but combines relations to several sciences and arts. On its scientific side it touches botany, chemistry, geology, meteorology, physics, geography and entomology; on the art side it touches horticulture, arboriculture, lumbering, and protection from fires.

In parts of Europe the growth of timber is already well systematised, but knowledge of the subject in all its details has been of slow growth. More than a hundred years ago a few alarmists in Europe prophesied an approaching dearth of timber. This agitation helped to induce economy in the use of timber, and to delay the evils predicted. Without giving the strictest attention to systematic arrangement, we may note some of the chief attainments by the leading countries of Europe in the management of forests, and the methods adopted to accomplish such results.

It would seem that Government ownership and control of much of the forests in the old countries gave a great advantage over our newer country, where "private enterprise" accomplishes almost everything. There, even the woodlands of corporations and of individuals are subject to the laws of the country, which specify how much may be cut in each year. These laws are enforced by officials well educated for the business. Forests are systematically inspected, and reports made concerning their condition and needs. The inspector acts as "a paternal adviser" to all owners of forests. In the words of a recent American consul to Austria-Hungary:—"The owner of forest land in Austria must exercise extraordinary care not to be guilty of trespass upon his own land." How different the feeling of owners of land in the United States. In the country above referred to the array of forest officials of various grades maintained numbers nearly 32,000 persons. In all of these particulars the fact must not be lost sight of that wages are much lower and interest on investments much less remunerative than in the United States.

The large number of officials who must pass rigid examination makes it possible and even necessary to maintain numerous schools to keep up a supply of skilled men. The encouragement of profitable employment induces pupils to patronise the schools, which give laboratory or practical work, often in the forests, as

well as lectures in the classroom. To some extent these subjects are taught in other schools than those for the special object of educating foresters. These officials usually serve for life, and are pensioned in old age or in case of disability.

By dint of great energy of a few persons in this country attention has been called to the greed and dishonesty of men who steal timber from the public lands, and to the evil effects of removing vegetation from mountain slopes. Many instances of the same kind have been enumerated in Europe, where the evil effects remain as a warning to newer countries. The cost of reclaiming some of these waste places has been great. In this reclamation seeds from the scattering trees cannot be relied on to furnish seedlings for the new growth, but nursery-grown stock must be well set, and afterwards properly cared for. Experience has led to the formation of many rules in relation to forest management. For example, on sandy soil and on steep mountain slopes, timber can only be cut in narrow strips, or thinned out. Grazing among timber is rarely permitted. Stringent rules in regard to igniting fires in or near forests are enforced.

Between 1860 and 1887 France reforested over 250,000 acres of mountain lands at a cost of 30,000,000 dols., the State paying one-half. In 1887 the total annual appropriation for the forestry department of France was 5,000,000 dols. Here the people of the United States may well take warning. How much more economical it would be to spend a little money now in preventing devastation than to suffer the consequences for a time, and then possibly spend enormous sums in restoring the forest to the mountain slopes.

In Germany about 25 per cent. of the entire area is devoted to forests. Of this amount about 32 per cent. is Government land, 15 per cent. belongs to the communities, 1·3 per cent. belongs to charitable and other institutions, 2 per cent. belongs to corporations, and 48 per cent. belongs to private parties. Without the supervision of State officials "a reckless devastation of forests would be the consequence," just the condition we are experiencing in most regions of our own free country. In the Eiffel district the mountain slopes were reforested and otherwise improved at the expense of the Government, though much of the land belonged to communities.

A chief director of forests in Germany, in writing to a United States consul, says:—"You are certainly quite right when you speak of the importance of forest culture for the United States, but allow me to express my belief that no earnest work in that direction will be accomplished there. The culture of the forests proceeds too slowly to suit your countrymen, and the profits are not forthcoming soon enough. In my opinion good results from forest culture can only be had in the United States when the Government shall have taken the matter into its own hands." Dr. Otto von Hagen says:—"The forest is a trust handed down to us

'from past ages, whose value consists not alone in the income deriv-
'ed from wood, but also in the importance which it exerts through
'its influence on climate and rainfall or land culture. Its import-
'ance is not merely a question of the present day or of the present
'ownership, but is also a matter which concerns the future welfare
'of the people." For these and other reasons it has been determin-
ed that it is a duty to interfere by legislation with the waste of timber.

Think of the time required to grow trees of certain species fit to cut for important purposes. In Germany the age for cutting oaks is 150 to 180 years; beech, 100 to 120 years; Scotch fir or birch, 30 to 100 years; though for some purposes, of course, trees are cut when much younger. One of our consuls to France in 1887 observed that "forests are much more easily destroyed than 'replaced, for in three years, from 1788 to 1791, almost as large an 'area in France was deforested as has been reforested in the last 'ninety years, although much attention has been paid to the subject 'during this time."

The older and more thickly-settled countries of Europe have all passed through the stage in which many of our States have but recently passed or are now passing. Their land in most instances was well covered with forests. They cut and fired and wasted as we are doing, and have long been aware of many of the evil effects of this practice. To what extent shall we learn and profit by their mistakes?

Under the circumstances, what can the people of the United States accomplish? In what ways can we best secure a reform in forest management? Legislation, whether state or federal, will accomplish little, until there are enough stalwart persons thoroughly interested to continue under adverse conditions to work for the success of a better management of lands in forests or lands which ought to be covered with forests. Something may be done by forest commissions, but too much is likely to be expected of them, and to save expense somebody will advocate their abolition—and somebody sooner or later will succeed. The value of forestry commissions consists chiefly in giving advice and in educating the people.

Tree-planting on a large expensive scale is not likely soon to be so skilfully conducted that satisfactory profits will be apparent. But, notwithstanding, trees of every kind should be planted in many places, and the sooner the better for us all. Probably not one in a thousand now knows enough about the subject to proceed intelligently to take the best care of his forest, or to reclothe land with timber in the most economical manner. Those who try the experiment should be able to wait.

Over a hundred years ago some persons in Europe were foolish (?) enough to plant a few white pines from North America. In the language of our time they would be known as "cranks," and yet who shall dare place a sufficiently high estimate on the

value of that simple experiment, for it has demonstrated that our white pine is one of the best of trees to grow for timber in that country? We need men in every country of every state who will have enthusiasm and foresight enough to plant a few trees in places where there may be a prospect for growth a long time without molestation. Before these experiments are completed there will be many anxiously waiting to profit by the results.

We live in a comparatively new country, where our fathers and grandfathers cut down and burned the finest of trees to make room for crops and pasture. We have been taught to destroy trees and not to save them—much less to replant. The arguments for preserving the virgin forests of a new country are by no means all on one side, and no one should expect the trees to be preserved. In most cases, the profits of holding are too small to pay for the investment.

Michigan once had about 150,000,000,000 feet (board measure) of standing pine, which was believed to be well-nigh inexhaustible. Those now living find remaining only comparatively small tracts in the back counties. Even with what might be considered good management in a thinly inhabited country, where lumber was cheap, it was soon found next to impossible to preserve this timber, however much the owners might desire to do so. In many seasons the fires destroyed as much pine as the woodman's axe. Dead pines must be cut to save them, and the *debris* was almost sure to burn and the fire to spread to the standing trees. To some extent the same condition of things prevails with regard to the "hardwood" trees, though in most cases these are not so likely to be destroyed by fire. In a business way there are men now spending much time and money in defending their remaining pine lands from fire. But more system is needed, and the care should be more general than it ever has been.

The study of European methods and results in forestry by competent men is not enough, says one writer. It is not even the most important thing for us. Nothing can be very useful to us which is not based upon careful study of conditions peculiar to this country. We must have in time a system of American forestry if we are to avoid serious disaster to our national interests and civilisation. The forestry of this country must be the product of growth which has as yet scarcely begun. It will be developed by continued and widespread observation, and by constant comparison of the results of practice. It is necessary to remind ourselves that no useful system of forest management can be originated or created by legislative enactment. There must be special knowledge and national good sense regarding the needs of this country behind forestry laws, or they will be useless and mischievous.

It is important to understand the value of great areas of growing trees on the surrounding cultivated land, and to know in what respect they check fierce winds, prevent rapid evaporation of moisture, or encourage late frosts in spring. But the possession

of this knowledge is not likely to induce men to save trees or to plant trees for the benefit of persons owning farms in the surrounding townships or in other counties. Here is one of the best of reasons why the state and nation should take an active part in the management of forests

It is difficult to induce most persons to understand fully the results of a timber famine. They have heard more or less of this talk for years, but they believe the day is yet far distant when our people will suffer much inconvenience from lack of timber. They argue that as timber becomes scarce and more expensive, less of it will be used. We shall burn coal for fuel, and use more iron and steel. Transportation will be cheaper, and timber can be transported for long distances. The use of the land to produce various grains, grasses, fruits, and vegetables will help to pay higher prices for timber.

In the moister portions of our country, when the original forests were cleared away, seedlings and sprouts in immense quantities sprang up to contend for every foot of available space. In cutting away the valuable timber there are usually large numbers of "young things" up to 6 in. or more in diameter which, if protected from fire and other destroyers, have already made a fair start toward renewing the forests. Too little care is usually observed in protecting this young growth, which is admitted to be of no value at the present time. Because there are no dollars in them now the proprietor is likely to let them go to waste. In very few instances in moist climates would it be necessary to plant trees started in the nursery.

The writer has often been asked by bright young men of no resources, except their active brains and hands, "What is there 'in this country to encourage a young man, who must earn his 'living as he goes along, to make a speciality of forestry? I like 'the subject, and if I saw a good living in the business I should run 'the risk and go ahead." I am free to say that so far work in this field seems to be done gratuitously.

A few persons in our agricultural colleges have done a little in this direction, mainly to call the attention of students to the magnitude and importance of a study of forestry. Before any one of us thought much about trees the course of study in these colleges were replete to suffocation with subjects of seeming importance. Elective courses are expensive. The writer has twice given a course of lectures daily for twelve weeks to members of the senior class of the University of Michigan, or to those who elected forestry. A course on parasitic fungi runs parallel with that on forestry, and only one of the two can be elected. No doubt there have been similar reasons in the other schools to prevent giving more attention to forestry. But if we are interested and make the effort we can all find some opportunities for this work.

Lectures at farmers' institutes in many states afford some opportunity. But here the indifference of the hearers tempts us to

select other subjects. Vividly does the writer call to mind one occasion at an institute in a new county in which he spoke of the importance of preventing forest fires. The first one to lead in the discussion was a farmer living in the neighbourhood, who won the applause of the audience when he said of these fires, "They are the 'best friends we have in clearing up the country."

The more students know about trees, the more they are likely to be interested in this subject. The things to be learned are the different species, their names, their anatomy and physiology, their rate of growth and geographical distribution, their special uses in the arts and in nature, how to raise trees from the seeds, how to plant and where to plant, and why, and especially how to take proper care of them after setting. He who fully understands the structure and functions of roots will never be seen carting living trees with roots exposed to dry wind and sun for miles along the highway. Students may be set to investigating the effects of pasturing a wood-lot by noting examples of those pastured and those left to themselves. They may estimate the amount and value of an acre of good, medium, or thin forest, and note the time required to produce it. The effect may be noted of trees as a shelter along the highway or near dwellings, barns, and sheds. Other questions are, why are certain trees found growing in swamps and others on dry land? Why are there no pines or cedars in some neighbourhoods, and no beeches or maples in others?

Besides the means suggested for aiding the cause there are others. If the programmes were judiciously prepared and well carried out, the celebration of Arbour Day by school children would have a tendency to awaken an enthusiasm among the people; but usually the exercises consist mainly of quotations from literary authors—scraps of poetry, history, and sentiments—rather than any substantial information pertaining to the needs of forestry. The establishment of an arboretum, even a small one, on some of the farms of enterprising people, and more especially at each agricultural college and experiment station, would help to educate and interest the people. We cannot soon expect to see an Arnold arboretum in every state, but the beneficent influence of that garden has already reached thousands of miles.

Associations for securing the protection of certain private natural scenery help to educate every one who sees the reserves. Botanic gardens containing shrubs and trees are likely to increase in numbers, each good one lending encouragement to others. So of herbaria, and especially of museums of plant products, which should contain no end of interesting specimens of timber, not only those which were well grown, but likewise all manner of monstrosities. The writer a few years ago collected and placed in position a unique collection of this kind, and considering the cost, it was more attractive than an ordinary museum of fossils, minerals, or stuffed animals. Who can tell the good results likely to occur to

forestry from the establishment and maintenance of the Jesup collection in Central Park, New York?

Several books have appeared that are worthy of notice, but none of them can be compared with "The Silva of North America," by Professor C. S. Sargent, the first four volumes of which have been published. In several States, reports have been issued by Forestry Commissions or Forestry Associations, or special bulletins on the subject have been published by experiment-stations. The United States Government has, through Mr. Fernow, the efficient head of the Forestry Division of the Department of Agriculture, for some years past been active in advocating measures of importance in relation to forestry. Bulletins and reports and gratuitous lectures and frequent conferences with Congressmen have all had their effect in awakening an interest in this subject. From the condition of things here outlined, it will be seen that the growth of an interest in forestry must be slow for some time yet, but I anticipate very great changes in the sentiment of our people and the formation of salutary laws by the close of this century.—*(Timber Trades Journal.)*

VII.—TIMBER & PRODUCE TRADE

Statement of average selling rates of timber and bamboos in Meerut, Cawnpore, Bareilly, Pilibhit and Moradabad for the quarter ending 31st March, 1895.

Description.	Timber Scantlings per score.		Bamboos per 100 scores.		Remarks.
	From	To	From	To	
MEERUT.	R. A. P.	R. A. P.	R. A. P.	R. A. P.	
Sal 10′ Tors (Poles) ...	10 0 0	20 0 0	...	...	
Sal and Sain, &c., Karis, 12′ × 5″ × 4″	25 0 0 40 0 0	40 0 0 65 0 0	...	...	
Sal bed posts, 7′ × 2½″ × 2½″ ...	12 8 0	15 0 0	...	...	
Bamboos 9′ to 10′, per 100 scores ...	..	...	35 0 0	100 0 0	
CAWNPORE.					
Sal 10′ Tors (Poles) ...	4 8 0	5 4 0	...	...	
Sal & Sain, &c., Karis, 12′ × 5″ × 4″ ..	20 0 0	60 0 0	...	..	
Sal bed posts 7′ × 2½″ × 2½″ ...	10 0 0	12 8 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	30 0 0	60 0 0	
BAREILLY.					
Sal 10′ Tors (Poles) ...	5 0 0	10 0 0	...	...	
Sal & Sain, &c., Karis, 12′ × 5″ × 4″	25 0 0 40 0 0	35 0 0 50 0 0 60 0 0	... ...	... ...	
Sal bed posts 7′ × 2½″ × 2½″ ...	10 0 0	25 0 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	50 0 0	137 0 0	
PILIBHIT.					
Sal 10′ Tors (Poles) ...	40 0 0	70 0 0	...	...	
Sal and Sain, &c., Karis, 12′ × 5″ × 4″ ...	30 0 0	40 0 0	..	...	
Sal bed posts, 7′ × 2½″ × 2½″ ..	5 0 0	6 4 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	...	...	
			60 0 0	100 0 0	
MORADABAD.					
Sal 10′ Tors (Poles) ..	20 0 0	25 0 0	...	...	
Sal & Sain, &c., Karis 12′ × 5″ × 4″ ...	30 0 0	55 0 0	..	...	
Sal bed posts 7′ × 2½″ × 2½″ ...	0 8 0	0 10 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	50 0 0	75 0 0	

Churchill and Sim's Circular.

April 3rd, 1895.

EAST INDIA TEAK.—The deliveries have again been disappointing in March, at 749 loads against 1,034 loads in March, 1894. For the first quarter they stand at 1,926 loads and 3,568 loads for the two years respectively. A fair business has been doing both in London and elsewhere, at certainly no reduction on previous rates, and this may tell favourably on the London deliveries later on.

ROSEWOOD.—Importers are without stock, and large good logs, in small parcels, would sell readily.

SATINWOOD.—There is not much enquiry for *boards*, but finely-figured *logs* sell well.

EBONY.—Small parcels, of really good logs, would sell well.

PRICE CURRENT.

Indian Teak	per load	£10	to £16.
Rosewood	„ ton	£5	to £8.
Satinwood	„ Sup. foot	6d	to 12d.
Ebony	„ ton	£6	to £8.

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, April, 1895.

Cardamoms	per lb.	2s.	to 2s. 6d.
Croton seeds	per cwt.	20s.	to 27s. 6d.
Cutch	„	20s.	to 32s.
Gum Arabic, Madras	„	20s.	to 30s.
Gum Kino	„	£25	to £30.
India Rubber, Assam,	per lb.	1s. 7d.	to 2s.
„ , Burma	„	1s. 7d.	to 2s.
Myrabolams, Bombay,	per cwt.	7s. 9d.	
„ , Jubbulpore	„	6s.	to 7s.
„ , Godavari	„	5s. 6d.	to 6s. 6d.
Nux Vomica, good	„	5s.	to 9s.
Oil, Lemon Grass	per lb.	¾d.	to ¾d.
Orchella, Ceylon	per ton	15s.	to 22s.
Redwood	per ton	£3. 10s.	to £4
„	„		
Sandalwood, logs	„	£35	to £55
„ , chips	„	£9	to £30
Seed lac	„	30s.	to 90s.
Tamarinds	„	8s.	to 15s.

INDIAN FORESTER.

Vol. XXI.] June, 1895. [No. 6.

A tour in the Landes and visit to the French Resin Works.

Introduction.—I arrived at Bordeaux on the 28th of November, and on the 29th I proceeded to visit M. Muel, the Conservator of Forests, who directed me to M. Grandjean, Garde Général in charge of the Forest of La Teste, but as that officer was absent on tour, I proceeded direct to Arcachon on the 30th in the hope of finding him there. I was fortunate enough to meet him on his return from tour on the 1st December, and he and the Brigadier accompanied me in an inspection of the forest blocks in the immediate vicinity, and were good enough to show me everything of interest.

On the 2nd December we made a long tour to the South in the direction of Simaphore, and visited on the way a considerable portion on the State forests as well as the private forest of M. Conseil, where we had ample opportunity of studying the resin-tapping operations as carried on in both classes of forests. The season was not, however, well suited for seeing the collecting work at its best, as the busy time lasts from April to October only, and during the winter little work is done. We also visited the great artificial dune constructed along the coast to check the movement of the drifting sand, and we also saw a place where the inroads of the sea had destroyed the artificial embankment. We also saw another place where a private proprietor had neglected the maintenance of the works, with the result that a considerable belt of forest got buried by the sand. In the same vicinity we saw the site of a most disastrous conflagration which burnt a large area of forest during May 1893, and which tended to impress me with the fact that the system of fire lines, as constructed in this part of France, is apparently not very effective.

On the 3rd December I visited the important resin factory of M. Lesca, near La Teste, where his agent showed me over the works and explained all important points with regard to the manufacture of colophony and turpentine, also regarding the sale of the same.

On the 4th I made further notes and observations, and started in the evening to join my steamer at Brindisi by the shortest route, *viz.*, Marseilles, Genoa, Rome and Naples, and arrived at the port of embarkation on the 9th.

Forest of La Teste.—The forest of La Teste is situated to the west of Arcachon in the Department of the Gironde and in the Conservatorship of Bordeaux. It consists of what may be called four patches, the principal one of which, situated on the Bay of Biscay, has a length of about eight miles, with an average breadth of about one and a quarter miles. The other three plots are situated on the Bay of Arcachon to the west of the town, and are much cut into by the compounds of villas, roads, &c. The area of the forest is about 6,000 acres, but the extent was at one time nearly four times its present area. The reduction took place mainly about 30 years ago, when after the Mexican war the State being in want of funds, large areas were sold to private individuals. The prices then obtained were, it is stated, very advantageous, owing to the high cost of resin and turpentine after the American war, when they fetched in the market more than double the rates that can be obtained now.

The soil of this forest of La Teste consists of almost pure sand thrown up by the sea, but underneath the sandy layer, traces of peat and of a ferruginous sandstone, called *alios*, are to be found, and this, probably, formed the surface of the ancient landes or beds of the old marshes. Judging from the stumps of large trees, which are occasionally found embedded in the peat, it is probable that up to about the year 1200, when the forests became gradually destroyed by the increasing population, the greater part of the dune area was thickly covered with pine forest down to the water's edge.

The annual rainfall of this district is stated to be about 30 inches, and is, as a rule, well distributed throughout the year, but droughts occur occasionally during the months of May and June when, as a matter of course, forest fires usually occur.

The neighbouring population was formerly strictly a pastoral one, but since the planting up of the dunes has commenced, the number of flocks has greatly decreased, and the people are now largely employed on the resin-tapping and timber operations in the forests.

The sand dunes extend for a distance of about 125 miles from the mouth of the Gironde as far as Bayonne, and some of them rise to an elevation of 230 feet. Those situated immediately along the coast are called the "dunes blanches," or white sand dunes.

The principal species of tree found in these forests is the cluster pine (*Pinus Pinaster* or *maritima*) with here and there a few oaks (*Quercus pedunculata*, *Toza* and *suber.*) The undergrowth consists of broom, gorse, brambles, ferns and heath. There is practically no grass in these forests; but in the older parts the ground is now fairly well covered with a layer of moss, pine-leaves

and mould. The absence of hard turf and matted grass is, of course, very favourable to natural reproduction which seems to be extremely easy. The cluster pine is probably indigenous in this part of France, and is eminently suited for the "reboisement" work of the dunes. It possesses a well developed taproot as well as a lateral root system, and this enables it to take firm hold of and fix the sandy soil, also to seek moisture from great depths.

The forest of La Teste being especially valuable commercially on account of its resin production, its treatment has been determined mainly with a view to that object. Owing to the difficulty of transport over the soft sandy roads and the facility with which foreign timber can be obtained by sea, the production of large timber is a matter of secondary consideration. The rotation of the forest of La Teste has, in consequence, been fixed at 60 years, which age is considered sufficient to enable the maximum amount of resin to be obtained, and the Working Plan has therefore been drawn up accordingly. The whole area has been divided up into 12 blocks or affectations, 5 years being allowed for the final working out of each. Each block is divided into 5 compartments of about equal size, in three or four of which thinning operations or final coupes are in progress. During the earlier stages of the forest growth, thinnings are made every 5 years, principally by daily labour, and this continues up to the age of 35 years when the regular thinnings on sale to contractors are commenced. At this age the trees will have attained a mean girth of about 3 feet 6 inches, at which size they are considered fit for tapping. All the trees to be reserved in these coupes are specially marked, and tapped "*à vie*," whereas all the unmarked trees can be tapped "*à mort*," or removed at once by the contractors.

A period of 5 years is allowed to the contractor for tapping the reserved trees and removing the other produce from the coupe. After the completion of the first tapping operation the trees are allowed five years' rest, and then the second tapping takes place, say from 45 to 50 years, and then another rest of 5 years is allowed till the trees attain the age of 55 years, when the final coupe takes place. After careful observations and much discussion it has been decided that the final fellings in this forest shall consist of clear fellings or *coupes à blanc étoc*, and for several years this has been the plan in force.

The main reasons for this rather unusual treatment of pine forests are :—

(*a*) The seed of Pinaster being extremely light is carried to a great distance, and is produced abundantly almost every year.

(*b*) There being little or no grass in the forests the seed can easily reach the soil where it germinates with great facility.

(*c*) The young plants thus produced are said to make much more vigorous growth than those produced under the shade of the parent trees.

In the treatment of this forest an attempt was made by a late Inspector General to adopt the regular system of a heavy seed felling followed after production of the new crop by a final felling, such as was applied to the fellings of Scotch Pine in the forest of Haguenau, but it is said not to have been a success, and has, therefore, been abandoned.

The Forest of La Teste is in charge of a Brigadier and six forest guards.

Fire-protection.—Owing to the dryness of the climate and the inflammable nature of the species these pine forests are extremely liable to conflagrations, and elaborate arrangements have to be made for their fire protection. This renders them, in consequence, extremely instructive to officers about to proceed to India, or on leave therefrom. The arrangement for fire conservancy consists in dividing the 12 blocks across their centres by means of a main fire line 50 feet broad. Also along the outer boundary on the Western side a line of similar dimensions is maintained. In addition to this each block is divided into two parts by transverse fire lines, 35 feet wide. Owing to the fact that there is little or no grass in these forests the maintenance of the fire lines is naturally a much simpler operation than in India, and they are said to require sweeping and digging once in two years only. The result of fire protection has not been very successful of late, and in blocks V, VI and VII near Simaphore, as already stated, we passed through an area of about 1,200 acres, which was the scene of a very disastrous conflagration during May 1893. The fire is said to have commenced in a private forest on the eastern side, and as there was a high wind blowing at the time, it soon crossed the outer fire line. The difficulty of checking the fire was also materially increased by the fact that the burning fir cones are said to have jumped across the line far up in the air, so that when the establishment was combating the fire in front they suddenly found that the conflagration had broken out in their rear. The fire is also stated to have crossed several of the internal fire lines, but was finally extinguished on the third day by means of a counter-fire. The result of the conflagration has been most disastrous, and almost every tree in the area burnt is now dead. A sum of 1,100 francs was paid to the neighbouring villagers for assistance rendered. In several other parts of the forest we noticed burnt patches, so that forest fires in this part of France are apparently of frequent occurrence, especially during a dry season like 1893. The age of the burnt area varies from 20 to 30 years, and all the burnt poles are now being cut up and exported to England and Wales as pit props. It was, however, satisfactory to note that in these forests it invariably happens that after a severe conflagration a splendid crop of seedlings springs up.

Resin-tapping operations.—As explained above, the main object in the treatment of these forests is the production of resin, and the annual coupes are arranged accordingly, and sold with this object in view. At the annual sales the right to tap for resin

the different coupes is sold subject to the following conditions:—

In the compartment being clear cut the contractor can tap "*à mort*" all the trees standing at his disposal, four years being allowed for the tapping and five years for the extraction of the timber. In the other compartments where thinnings are to be executed, the trees to be reserved and tapped "*à vie*" are carefully marked, and the contractor is at liberty to do with the rest as he chooses. He is allowed five years for the tapping and export of the coupe, and it is stipulated that the cuts shall not exceed four inches in width and about 4 in. in depth. During the first year the cut shall not exceed 22 inches in height, the 2nd, 3rd and 4th 20 inches, and the 5th year 40 inches, so that at the end of the five years the total height amounts to 12 feet and 8 inches. He is further charged with the supply of a certain amount of fuel to the forest guards, also to keep the fire lines in order and to supply workmen up to a certain number and value, for works of improvement such as sowings, thinnings, &c., in the neighbouring forests. At the time of my visit, the resin-tapping operations were practically at a stand-still, but we found the workmen still in the forests, and the whole operation was shown to me by them, and they seemed to be very expert in the use of the special tools employed for this work. The method of procedure I found to be exactly in accordance with the explanation given by Colonel Bailey at page 55 of the *Indian Forester* for February 1888, so that further explanation is superfluous here. My observation tended to confirm my opinion that our Indian workmen have still a good deal to learn in the method of collecting and economic storage of the resin, but the use of the heavy axe (*abchotte*) is not likely ever to be adopted by the Indian workmen by whom just as good work is probably done with the native 'bassola.'

At the time of my visit the dry resin or "*barras*" was being collected by means of a kind of scraper called a *barrasquite*, a cloth being spread below the tree to receive the resin as it falls down. This is packed either in the usual barrels containing 520 lbs or in palm leaf baskets containing about 200 lbs. These latter are brought from Algeria or Egypt by the proprietor of the private forest in which we observed them in use.

When collecting the "*barras*" the workmen, as a rule, do not mount the trees by means of the pole ladder, in the use of which they are apparently very expert, but use the hooked "*barrasquite* fixed on a long pole. At the time of my visit nearly all the liquid resin had been conveyed to the factories from the tubs or reservoirs placed along the cart roads in the forests, and the carriage of the "*barras*" was then in progress. It should be noted that the work in these forests is never interrupted by snow, so that carrying work by means of carts can go on all the year round. The State in these forests has arrived at the happy stage of having nothing to do with the collecting or manufacture of the resin, for as the industry has now been established for more than 100 years it is all done by

private enterprise. The collecting in the coupes sold is all done by contract, the workmen being allowed to retain half of the total amount collected both of moist and dry resin during the year, the cost of conveyance being borne by both parties. The average number of cuts which two workmen (generally a man and his wife) can look after is said to vary from 5,000 to 6,000, which represents from 2,500 to 3,000 trees. The price obtained at the auction sales for the right to tap in the forest of La Teste is said to have improved of late years.

Manufacture of resin.—At the village of La Teste I was enabled, through the arrangements made by M. Grandjean, to visit the important and interesting factory of M. Lesca, who is one of the most thriving resin manufacturers in the neighbourhood of Arcachon. M. Lesca was absent at the time of my visit, but his agent kindly showed me over the factory, and explained all matters of interest with regard to the manufacture, a short description of which I shall now endeavour to give :—

The crude resin after being carried from the forests in wooden barrels containing 529 lbs. each is run or scraped out of the casks and then subjected to a careful system of filtration.

If it is in a liquid state at the time of its arrival it is run through straw filters, but if too hard for this treatment it is at once thrown into a large boiler or vat and gradually heated. Here the lighter substances rise to the top and are skimmed off, whereas the heavier ones fall to the bottom, and are afterwards removed. The heating of the crude resin is a most delicate operation, and is said to be the most difficult operation in the whole manufacture, for if heated unequally it is apt to catch fire, &c.

After the resin has become quite liquid it is transferred to another vat by means of ladle and trough, being subject to a further filtering "*en route.*" As the operation of heating and filtering goes on a day in advance of the actual manufacture, two vats, as above described, are kept alternately in operation.

From the second vat, the melted resin is ladled into a small tank of the same capacity as the retort in which it is kept hot till required. From this tank the nearly pure resin is let into the retort by means of a tap from time to time, together with a small quantity of water, and is then subject to distillation in the usual manner. After all the spirit of turpentine has been drawn off from the still, the top hole is opened and the liquid colophony is allowed to run into a filter placed over a heated vat, for even this resin is still found to contain a certain amount of impurity, most of which is caught in a sieve, or falls to the bottom of the vat in the form of a black deposit resembling pitch. This vat is provided with a pipe placed about half way down, through which the liquid colophony again runs into another vat when its manufacture is complete. From this last reservoir the colophony is ladled into large casks containing about 800 lbs.

In order to prevent fraud by dishonest persons who are said to be in the habit of passing off inferior colophony under the name of M. Lesca, he has adopted the plan of placing an iron plate in the liquid colophony with the name of his firm, &c., printed on it, which becoming imbedded can be easily seen when the cask is broken open. Each barrel is numbered and samples taken, which are similarly numbered, and which are kept in a cabinet for reference. All the subsequent sales of each barrel take place in accordance with these samples, and this arrangement obviously prevents all possible misunderstanding between seller and buyer.

As regards the turpentine, it is ladled from the tank placed at the end of the still into a metal barrel mounted on a truck, and is conveyed by means of a light tramway to the turpentine shed, which for safety is situated at some distance from the main factory. Here it is pumped into large metal vats, 10 feet high by about 6 feet in diameter, where it is allowed to settle for some time before being sold. No system of purifying is in practice, and it is sold just as it issues from the still, and is said to be quite pure enough for the ordinary market.

The manufactured colophony is classed into four main classes, *viz.*, spring, summer, autumn and winter, the first being the most transparent and consequently most valuable, and the last, produced mainly from the "barras," being the least so. I was provided with samples of these different classes of resin, the appearance of which varies much.

The outturn in manufactured produce from the crude resin, I was informed, stands, as nearly as possible, thus :—

From a *barrique* or barrel of crude resin which, as already stated, contains 520 lbs., I was informed, that the outturn amounted to 364 lbs. of colophony, 110 lbs. of turpentine and 46 lbs. of refuse.

The prices obtained at the factory for the manufactured produce are as follows :—

1*st*—best quality—12 shillings and 9 pence per 100 lbs.

2*nd*—from 7 shillings and 6 pence, to 7 shillings per 100 lbs.

The turpentine is selling at present at 25 shillings per 100 lbs. This appears to be a slight advance on the prices stated by Col. Bailey at the time of his visit in 1886.

Most of the manufactured produce is taken first to Bordeaux, from whence it is shipped principally to Holland, Belgium, Germany, Italy and England.

Management of Private Forests near Arcachon.—Whilst proceeding to Simaphore we passed through extensive areas of private forest, acquired, as explained in para 5. All these forests, notably that of M. Conseil, are managed mainly from a resin-producing point of view, the trees being tapped in the same manner as in the State forests. The forests are, however, much

younger, and the contractors are apparently not tied down by such strict conditions. Most of these private proprietors, some of whom possess considerable areas of forest, have started their own factories; and these, I was told, are much on the same plan as those of M. Lesca.

The Sand Dunes of La Teste.—On the 2nd December I accompanied M. Grandjean to the great littoral sand dunes, situated to the West of La Teste along the borders of the Bay of Biscay, and he was kind enough to explain all details with regard to their formation, the damage done by them, and the measures taken to prevent their advance. The formation and action of these sand dunes having been so clearly explained by Col. Bailey in the article already referred to, it would be superfluous for me to attempt a fuller description here, and I shall therefore confine my remarks to a few points of interest, which I especially noted.

One of the most important natural elements employed in fixing the loose sand dunes is a grass called gourbet (*Arundo arenaria*), and which much resembles the Bent grass found on the shores of Scotland. The utility of this grass has been more fully taken advantage of during late years by the Forest Officers, and it now plays a most important part in the work of regulating the height of the dunes, checking their advance, and consolidating them.

Along the shore of the Bay of Arcachon we noted that the ravages caused by the drifting sand are by no means so important as along the coast of the Bay of Biscay, where the loose sand is naturally exposed to the full force of the Atlantic gales. In the first part of his charge, therefore, the Forest Officer finds the maintenance of the works of minor importance as compared with those along the Atlantic shore, and they consist principally in the following operations:—

Above high water mark and along the base of the dunes gourbet grass is planted and sown, and the slopes, when in a loose state, are covered over with branches of gorse, broom, &c., which are kept in position by means of heaps of sand piled on their thick ends.

Pine seeds are also sown or plants spring up naturally, and in course of time these banks become gradually consolidated, but, of course, require constant attention. In places where large gaps have been formed by the action of the wind, rows of fascines about 4 feet high are erected, and, as the sanddrifts top them, others are constructed, till the gap is gradually filled up. In some places we saw small faggots placed on end employed in a similar manner to check the drifting sand.

On our way along the shore and near the place where the Bay of Arcachon meets the Bay of Biscay we saw what has taken place in the case of a private proprietor to whom a large area of

State forest was sold some years ago, together with the artificial dune then in good order. Since that time the works have apparently been neglected, so that the great white dune is now steadily advancing landward, at the rate of about 100 feet per annum, and swallowing up a fine pine forest in its steady advance.

The great artificial dune in charge of M. Grandjean extends along the Bay of Biscay from Simaphore as far as the commencement of the Department of the Landes, a distance of about 8 miles, and from this point it extends for about 100 miles more, as far as Bayonne. This work was commenced about 40 years ago in a regular manner, and has proved most successful in checking the rolling sand. It should be noted that, as far as possible, the construction of the artificial dune has been commenced at a point well above high water mark, and a zone of about 500 yards wide has been left along the sea shore which is not interfered with, except so far as the planting and cutting of the gourbet grass goes in certain places. At a place about 2 miles south of Simaphore the sea had, however, commenced to make inroads, and has nearly demolished the whole of the artificial dune for a distance of about 1½ miles. An estimate amounting to about 20,000 francs for the repairing of this breach is being prepared by M. Grandjean, and the work is to be taken in hand at once. The height of the artificial dune is about 40 feet above high water mark, the top about 160 feet wide, and the base of about 300 feet. The dune has principally been constructed by means of the system of movable planks or palisades described by Col. Bailey in his paper already referred to. The slope of the dune on the sea-ward side is from 30 to 40 degrees, whereas on the landward side it varies from 45 to 50 degrees.

One most important point to be attended to is the maintenance of this barrier at a uniform height, and also to prevent its being cut into by the strong westerly gales. This is now being more effectually arranged for by an improved plan of planting the gourbet grass. By a Departmental order it appears that a hard and fast rule was laid down that the grass tufts should only be planted about 1½ feet apart, and no deviation from this rule was permitted under any circumstances whatever. M. Grandjean, however, found that the arrangement had the effect of causing the accumulation of too much sand in some places and allowing too much to pass in others, so that great irregularity of height was the result, a new rule has therefore been sanctioned permitting the officers in charge of such works to regulate in a rational manner the distance apart at which the grass should be planted according to local circumstances, also to cut the old grass where necessary. By this new arrangement the maintenance of the artificial dune is much facilitated, and in the canton of Are, of which M. Grandjean formerly held charge, and which is situated to the north of Arcachon, the annual saving in repairs has been reduced from 40,000 to 20,000 francs.

In marching along the dune we were struck by the fact that the small pines, at the back of the great artificial dune, and in places where they were quite sheltered from the wind, appeared to be in a very stunted condition, whereas the trees situated about ½ a mile off, and subject to the full force of the western gales seemed to be in a much more flourishing state.

This state of affairs is apparently quite contrary to the accepted theory that trees exposed to the perpetual force of the sea breezes always remain stunted and unhealthy, and the reason can apparently be best explained by the assumption that the leaves of the pines close to the sea become cut and choked up by the very small particles of drifting sand, whereas those further off, though exposed to more wind, are not so much subject to this influence.

Concluding remarks. —In concluding this report I beg to offer a few remarks by way of comparison with similar works and forest operations in our Indian forests :—

As regards the area under the charge of M. Grandjean, consisting of about 6,000 acres of State forests, and about a similar extent of Cummunal Forests, it seems to an Indian Forest Officer ridiculously small. Details of fellings, sowings, maintenance of the artificial dunes and other operations can, therefore, receive much greater personal supervision than can be exercised by Indian Forest Officers to the numerous works of a similar nature going on in some divisions.

Regarding the system of exploitation *à blanc étoc* now universally practiced in the cluster pine forests, I was not quite convinced that the regular system of coupes as applicable to Scotch pine forests, if properly tried, would not give better results, as far as the out-turn of resin goes and the reproduction is concerned. One point seems certain that the thinnings in the State forests are apparently not severe enough, and a much better out-turn of resin would probably be obtained if the trees were more isolated.

As regards the system of tapping the cluster pines, *viz.*, in three long cuts, 12½ feet high, during their successive periods of 5 years with two intervals of 5 years each, I am of opinion that it has no apparent advantage over our present system of tapping Chir in the Jaunsar Division, which consists in making 2 or 3 cuts at the same time, and extending tapping over a period of four to five years after which the tree is abandoned. Our system has certainly the advantage of concentrating work much more in one place, and no great harm is apparently caused to the Chir trees which continue to flourish, although in the case of the cluster pine our system would probably constitute *gemmage à mort*.

An important point, however, has to be noted, *viz.*, that the Chir trees tapped in Jaunsar are on an average from 7 to 8 feet in circumference, whereas the cluster pines rarely exceed half that size.

Regarding the collecting and storing of the resin, I noted many minor points in which improvements in our system are desirable, and which I shall endeavour to carry out in Jaunsar as soon as possible. As a matter of course, the system of selling the right to tap a certain area to a contractor, by whom the work is done by experienced men accustomed to it from their youth, has a great advantage on our present daily-labour tapping system as practiced in Jaunsar, as all details are naturally managed with the greatest economy. If possible, a system of tapping on contract in Jaunsar might now be considered and tried.

Regarding the use of the French tapping tools I am of opinion that they are a great deal too heavy for our workmen, and probably just as good work is done by the hill men with the native 'bussola' to which they are accustomed.

One great advantage the operations in the forests of the Landes enjoy in comparision with Jaunsar is that the carrying work can be accomplished by means of carts, and is not interrupted by rain and snow during five months in the year.

As regards the manufacture of the crude resin into colophony and turpentine, I observed that much greater care is exercised than we have been accustomed to give up to the present, in the matter of separating the resin of the different seasons ; also in thoroughly cleaning the melted resin by means of an elaborate system of filtration. It is, of course, evident that this special industry which manufacturers like M. Lesca make their sole business, can be managed much more efficiently and economically on a large scale, than in the case of our small experimental factory at Dehra Dún. As regards the French turpentine it probably contains less acid than our Chir turpentine, but the quality seemed to me to be much the same as that produced at Dehra Dún.

Finally, with regard to the important question as to whether the resin industry, as at present practised in France, is a paying one, I was told that there is generally a keen competition for the coupes at all the annual auction sales. And as regards manufacturing trade, it seems to be in a flourishing condition, at least as far as M. Lesca's business is concerned ; and I was told that all the produce of his factory is generally sold long before it is actually manufactured. Judging, too, from the fact that this gentleman is considered to be a very rich man at Arcachon, the French resin industry seems to be a paying one at present.

FEBRUARY, 1895. } E. McA. MOIR.

Note in the Regulation of Forest Concessions in Oudh.

There are probably still in India many forest areas burdened with rights under settlement, or with concessions by executive order, neither the one nor the other being defined as regards amount, locality or method of exercise. Forest officers convinced of the importance of a final record fixing the maximum demand on areas in their charge, or entrusted with preparation of reports with a view to definition of rights and concessions may be interested in learning how this work has been effected in the Province of Oudh. It will only be possible here to give the barest outline of the scheme; the detail of the work of years cannot be compressed into a few lines, nor is this necessary.

I.—The basis of the Scheme.

I. The basis of the definition of concessions is the area cultivated in the "Hadbast" village.

II. The unit for the record of concessions is taken as ten pacca *bighas*, this is the area cultivated by one yoke of oxen or plough.

III. For each unit one homestead is allowed. The homestead consists of one house, sheds and cattle enclosures.

II.—The Amount of the concessions.

I. The amount of the concessions required in timber has been accepted as 20 c.-ft. of unreserved timber per annum per unit, this being ample for the up-keep of existing buildings and replacing agricultural implements. To allow of expansion, an increase of 50 per cent. or 30 c.-ft. per annum per unit has, however, been fixed.

II. In the same way one cart-load of thatching grass per annum has been increased to 1½ cart-loads per unit.

III. Dry fallen fuel and thorns for field protection are allowed up to the actual utilization. Dry Sal timber for wells and bridges is given on the written permission of the Forest Officer.

IV. The number of cattle allowed grazing is fixed at 4 heads per unit, calves under one year old not being enumerated. Ten per cent. of the cattle may be buffaloes.

III.—The Exercise of the concessions.

I. The timber concession is accumulative for three years; the produce is supplied on half yearly indent by villages; royalty is taken at one-third market rates; the felling area must be within 8 miles of the village site; if Sal timber is available it may be given instead of unreserved woods, but the grant is then reduced by two-thirds, the life of Sal being three times that of soft woods.

II. The grass concessions are exercised similarly.

III. The grazing concessions are exercised in forest blocks to which groups of villages are assigned. These blocks must be conveniently situated to the village groups, and entry of other cattle prohibited. One acre of forest is thrown open for each head of cattle recorded. These cattle pay one-half the ordinary grazing rates. Cattle in excess of the number recorded may graze at full rates in other open areas.

IV. There is no restriction on the collection of fallen dead fuel and thorns. These articles and other petty forest produce are free, as is also dead Sal for certain purposes at the discretion of the Divisional Officer.

IV.—The Results of the Definition.

I. As regards the timber concession there is a fixed maximum demand; the fellings for concessionists can be located; instead of spreading over large undefined areas they may form part of the prescribed fellings in any forest not more than 8 miles from the village. As a nominal royalty is taken the actual utilization is recorded and the wasteful exercise of concessions always following free grants is prevented. Illegal sale or barter of free produce given in unlimited amounts ceases so soon as the concessions are restricted to a liberal estimate of requirements.

II. The same remarks apply to the grass concession.

III. With regard to grazing it is intended to benefit the cultivating classes and to prevent illegal utilization of the grazing privilege. The number of cattle allowed per unit is sufficient for the welfare of the tenant; if he wishes to keep more he must graze them at full rates outside the area allowed to the village group. The grouping of villages is in order to define responsibility in the event of injury to the forest.

IV. The free grants of fuel and minor forest produce are safeguarded, as indeed are all the concessions, by the prohibition of sale or barter with the penalty of temporary removal from the privileged list.

V.—General.

I. A few remarks on the method adopted to arrive at the unit mentioned under paragraph I and the amount of concession detailed in paragraph II. The following statistics were collected for nearly 200 villages within three miles of two ranges:—

(*a*) The area of the villages and the area under cultivation;
(*b*) The number of houses of the 1st, 2nd and 3rd classes; also the number of cattle sheds and enclosures.
(*c*) The number of ploughs.
(*d*) The number and species of cattle.
(*e*) The actual utilization of timber for the last five years.

Each village was personally visited, and any peculiarities in its requirements specially reported on. The reason for not exercising concessions or only exercising these in part were recorded. Those villages which did not utilize the forests or did not wish to do so, were removed from the list of privileged villages. The proposals for the remainder passed the scrutiny of the District Officer and the Commissioner before final approval by Government.

II. The unit and amount of concessions being thus established for the Province the detail work became easier. Personal inspection of each village was still necessary for the reasons given above, but there remained no necessity to enumerate the houses and the statistics regarding cultivation; ploughs, cattle and utilization were all available from the District or Forest Officer. For each forest block taken up, a detailed proposal, with all information, is sent to Government through the proper channels, and when the proposals are approved the record by villages is drawn up, and after receiving final sanction is circulated to all villages and land owners concerned.

No claim either to originality of method or to any other novelty is put forward in this note, it is merely a record of a work which should have been carried out 20 years ago, and which fixed the demands of concessionists to nearly 1,000 square miles of State forests. There can be no doubt that similar records are urgently required in many thousands more miles, where in some instances rights exist without a record, and the longer the definition of these rights is delayed the greater will be the ultimate burden on the Reserves, owing to the extension of cultivation and to the wasteful utilization, consequent on supply being regulated by demand and not by legitimate requirements.

The Quality of quickly grown Teak-wood.

Mr. Porter in his article "On the management of Forests producing Teak," printed in your April Number, has called into question the quality of Nilambur Teak, and has virtually challenged the production of evidence to show that the quality of that grown in the plantations is as good as that of Anamalai Teak. Dr. Nisbet has also in his article on "the Diseases of Trees" in the same number, referred to the growth of teak and its attack by fungi on very rich soils. I should like to try and show how it is that I think they are both, to some extent, mistaken.

I must preface by stating that this paper is being written sitting in a dry nullah bed under the trees after a hard morning's walk, and whilst waiting for the sun to go down before returning home in a skin boat. I have therefore to trust to memory, and have but little available time to revise my notes. I trust that due allowance will be made, therefore, for any petty inaccuracy which may occur.

The words in Dr. Nisbet's article, which I specially wish to discuss, are as follows:—

"Though producing a very much quicker growth of teak, 'these alluvial plantations can never be expected to furnish sup- 'plies of the finest quality of timber, and if the degree of fertility 'exceeds a certain (indefinite) limit for the given circumstances 'of soil and situation, then it seems almost certain that there will 'be predisposition towards disease either in individual stems or as 'a general characteristic of the whole." This is the theoretical statement which Dr. Nisbet subsequently states is verified by experience, and he gives his example. Now, what does this example prove when carefully examined? It proves this, that, if to an excessively fertile soil be joined a want of drainage and a bad treatment (in crowding the individual trees and not permitting a free circulation of air), there is a tendency to disease in teak. I think no one will deny this. Almost every writer that I have studied, Sir D. Brandis in Burmah, Mr. Bourdillon in Travancore and all the various officers who have written about Nilambur have shown, that on a soil which is not well drained, teak will not grow, or if it does grow the wood produced is of poor quality. This, I maintain, is not due to the excess fertility of the soil, but to want of drainage. There is a magnificent example of this at Nilambur. One compartment, known as Eddacod 1846 (date of planting) consists of a rich alluvial soil on which there are about 70 trees to the acre, or perhaps more. The quality of the wood is superb, as is shown by certain windfalls which were collected and sold last year realizing nearly Rs. 2 the c.-ft. in the plantation. But in one corner the ground slopes towards the river, and there forms a small plateau, which is flooded nearly every year and on which the water stands. This corner is also planted with teak, and to all appearance the trees are sound, but a careful examination shows them to be hollow to the core. Mr. Hadfield will remember a nice log we saw lying on the bank. We wondered why it was not taken with the rest, as from a distance it looked beautiful, but on close examination we found it quite a shell, hollow up to a length of 60 feet.

Now I come to the point that these quickly grown trees do not produce timber of the finest quality. The Nilambur plantations are a standing testimony to the contrary. It is on the richest soils, provided always that the drainage is good, that we expect the best crop. The oldest plantation is now 50 years of age, and stands on a rich alluvium. The measurements in this plan-

tation, as a whole, are given in your March number. I have estimated that the average girth of 6′-6″ at breast height will be obtained in this plantation in about the 90th year. At present there are no signs of decay, and the timber even of the biggest trees, which reach 8 feet in girth, is excellent. The Persian Gulf traders, who are no fools, buy up the big timber of the windfalls with alacrity; whilst the Moplahs, who are shrewd men of business, will offer fancy prices for the bigger trees as they stand. All this is evidence to show that the plantation teak is good timber, though grown fast on a rich soil. But why should this be different to the natural grown timber of the Nilambur Valley which gives some of the much valued Malabar Teak. The teak from Nellikutta and Kareenpoya blocks, though grown on a low-lying, rich alluvial soil has been worked for years, and there are no signs of fungoid decay. On the contrary, except for parasitic growth, the wood would be splendid, and I fancy much must have found its way to the Bombay dockyards. So much for indirect evidence, but we have also direct evidence on the quality of the plantation teak.

In 1876, I think it was, Col. Beddome raised this very question, and on it stopped planting. This annoyed Mr. Ferguson who protested all he knew. Canny Scot that he was, he was not going to have this improved argument shoved down his throat. He sent specimens cut from the plantations of about 30 years old (and you may be sure they were from the quickest grown trees as he was so proud of them) to the Superintendant of the Gun Carriage Factory to be tested with Malabar (natural grown), Anamalai and Pegu wood. The result was as follows :—

In order of density came—(1) Anaimalai, (2) Malabar, (natural), (3) Nilambur, (4) Pegu. In order of resisting strain—(1) Malabar, (2) Nilambur, (3) Anamalai, (4) Pegu. Considering the specimens sent were young timber, I do not think that the trial showed that the plantation teak was not of the finest quality, and the Superintendent's certificate was very favourable.

Specimens were also sent to the Paris Exhibition, where they were much admired, and no fault was found with the quality of the wood.

I think, from what I have noted, it may fairly be urged that Dr. Nisbet's statement as regards plantation teak on rich soils is not borne out, in the case of Nilambur at any rate; and that Mr. Porter's suspicions as regards the quality of Nilambur teak, are groundless.

COIMBATORE DISTRICT,
8th May, 1895. } P. M. LUSHINGTON.

II.—CORRESPONDENCE.

The Legal Position of "Forest Rights"

DEAR MR. EDITOR,

From your note in the *Indian Forester* of March 1895, p 96, I regret to perceive that there must have been something in my former letter which was not clearly expressed. I did not put forward any *opinion*, on the advisability of the powers of the Forest Settlement Officer: it is a fact, plain on the face of the existing Forest Law, that the Settlement Officer, be he young or old, *has* the discretion (subject to the remedy of appeal, etc.—I need not repeat this proviso every time I mention 'discretion') to decide whether a 'claim' to any right of user is to be admitted wholly or in part. The Act does not use the term 'easement,' nor does it define any requirements; it does not say (*e. g.*) "only such claims shall be admitted to be legal rights as have been exercised continuously not by mere contract or on sufferance, but openly, peaceably and as of right, for full 20 years, &c." According to the general principles of Indian law, where there is no express provision, of law, the deciding officer is to follow "equity and good conscience." And so doing, the Forest Settlement Officer has the unfettered discretion to admit any claim; and, having admitted and recorded it, it becomes, under the Act, a full legal right, and the Forest Settlement Officer is bound to provide for it in one of the ways allowed or prescribed by Secs. 13, 14, 15. The passage you quote from the Orders of 1886 has really nothing to do with the point at issue: the passage refers to the matters dealt with in Sec. 22: it refers to creating *future* or new rights, making *prospective* provision, etc., and requires the Settlement Officer to deal only with claims as *they exist*. But as to existing claims, it is quite clear that the law allows him to admit them, whether they naturally come within the strict legal ideal of a 'right' or easement, or not. Not only is the law quite plain as it stands, but it was the deliberate policy of the Government of India that it should be so.

Only quite recently, when referring to a very misleading article in the *Times*, about scientific German Officers having no sympathy with the 'rights' of the people, &c., Sir D. Brandis pointed out to me, that he himself was the advocate of this policy, and that his minute *was published*. If you could have access to the papers of 1878 you would see it was so.

It was fully understood, that neighbouring villages could often claim (and would really very much need and value) the power of grazing, wood-cutting, &c., although they might not have had it for full 20 years, and though (which was always the case) they had exercised it on mere sufferance, and on the full understanding that if the jungle land was wanted for lease 'grant' or other purposes, they would have to give up; and it was deliberately decided, that such technical objections should be waived; and that if the Forest Settlement Officer thought the 'claim' a fair one and really wanted and equitable, he should admit it and *treat it as a full right*, under Secs. 13, 14, 15, as already said.

My point was this. Mr. Hight had said that all the 'privileges' (better called 'concessions' or 'licenses') that were recognized should properly be called 'rights.' I replied 'No.' The Forest Settlement has already provided for all rights, and that on a very liberal scale, for the Act directs that all fair 'claims' should be allowed as *rights*, even though technically, according to the rule, *e. g.*, in Sec. 26 of the Limitation Act 1877, they are not exactly legal easements. Hence when further 'privileges' are allowed to meet hard cases, they are most assuredly *not* properly called rights. Unquestionably the Settlement Officer has discretion to *admit*, on general equitable grounds, any 'claim' he thinks well founded; equally unquestionably, the claim once admitted to record, becomes (whatever it was before) a strict *right*, and is dealt with by the Forest Act. Even then, there are occasional instances, where though no 'right'—even of this liberal character—is admitted, still some provision is required; then it is that the revocable license or privilege is given.

Allow me briefly to resume the position of the forest area. First, let it be remembered that Forest Law applies only to a very small part of the entire waste area of India. No forest conservancy was attempted, except in *surplus* waste lands, *i.e., after* the land Revenue Settlements; but either (as in Bengal, N.-W. P., Oudh and Punjab) given over in full ownership to estates and villages, a large and liberal area of adjoining waste; or—as in the raiyatwari provinces—had set aside grazing grants, &c., for village use. That is very important, because where once this arrangement was made, it followed, almost as a matter of course, that the forest and waste lands *near* the villages and estates in which what are most nearly regular *rights* of long standing were likely to be found, were given over to the villages or estates, and so the majority of rights could have been fully provided for, *before* a thought of making State forests out of the residuary waste was entertained. Still, no doubt, some cases remained where either such arrangements were defective or where, otherwise, land was *forest* (under the Act) and yet so situated, that some villages etc., were in or near it, and that

these *had* some kind of 'claim.' The Forest Act liberally provides that these claims are to be entertained, and that being 'admitted in whole or in part' they are to be treated on the basis of actual *rights* of area. There can be no doubt that this is the law. I venture to say that if one could go over the different records of forest *rights* (not revocable licenses), recorded and formally provided for by the Forest Settlement Officer in the different forests, and each right could be tested by the *strict legal principle*—was it of full 20 years, standing, without any such "interruption" or "intermission" as would vitiate it (*vide* Sec. 26 Exp. Act XV of 1877); was it hitherto exercised, not on sufferance or in full knowledge that it could be stopped when the land was wanted, but *as of right* openly and peaceably?—I venture to say that nine-tenths of the 'rights' would not stand the test, either in one or other of the requirements. Yet on the equitable policy of the Government, they have been 'claimed' and 'admitted;' and are, in consequence, now full legal rights.

OXFORD,
5th April, 1895, } B. H. B.-P.

Seeding of the Thorny Bamboo.

SIR,

Mr. Nicholls has, I see, run a tilt at me for saying—(1) that the thorny bamboo dies down at intervals of from 25 to 30 years; and (2) that 8 or 10 years must elapse before full sized culms can be obtained.

For the first statement my authority is Col. Beddome, who in his *Flora Sylvatica*, pp. CCXXIX says: "*Bambusa arundinacea* 'dies down after it flowers, and springs up again only from seed. 'A very general flowering takes plece almost throughout our 'western forests about every 30 years, and nothing but dead 'culms are to be seen over miles of the bamboo tracts, and the 'forest fires are much intensified. This occurred three or four 'years ago all over the Wynaad, Malabar, Coorg and South Canara, 'extending over a period of 2 or 3 years, and I learn from 'many quarters that a similar event took place about 30 years 'ago, and from records I see it occurred also about 1804."

NOTE.—Col. Beddome commenced the *Flora Sylvatica* in 1868, and completed it in 1873, so the flowering he refers to probably occurred about 1869-70.

Mr. Nicholls, on the other hand, considers that a general flowering only occurs once in 50 to 55 years, and as he has written at a much later date than Col. Beddome, and with much better information he is more likely to be right, but I do not think it would be safe to conclude, on that evidence alone, that, because no one recorded a general flowering of the bamboo in South Travancore between the years 1817 and 1869, none occurred. The number of Europeans in this State in or about 1840-5, the half-way period between the above dates, must have been very small indeed, and a general flowering may easily have escaped notice and record.

As regards the age at which full sized culms can be obtained, the idea I wished to convey was that it required at least 8 or 10 years after flowering before the bamboo was large enough to cut. I should have chosen a higher figure, but knowing that bamboos are cut to float timber within 8 years of the flowering, I selected that period, to be on the safe side.

Since seeing Mr. Nicholls' letter, I have been making further enquiries, and they tend to confirm his figures as to the long time required for the growth of full sized culms, the bamboos in those valleys where there was a general seeding between 1879 and 1882 being still undersized.

It may interest Mr. Nicholls to know that a short time before the general seeding in South Travancore about 1869-70 mentioned in my Report, a very severe drought and famine occurred in the same part of the country. They may have had no connection with each other, but there is more than a possibility that they had. Unfortunately, I cannot give precise dates, both the severe drought (and its resulting famine) and the seeding having occurred before I came to the country.

QUILON, April 27th, 1895. } T. F. BOURDILLON.

P. S.—

Since writing my last letter on the seeding of bamboos and famine, I have ascertained that the famine in South Travancore to which I alluded occurred in 1861, and the seeding of the bamboos only in 1869-70, so that in this instance these events seem to have happened independently.

QUILON, May 7th, 1895. } T. F. BOURDILLON.

III—OFFICIAL PAPERS & INTELLIGENCE

The Resolution on Forest Policy.

The Resolution of the Government of India appeared in our number for November 1894, and we have now received from Mr. Ribbentrop, Inspector General, (at present on leave), a copy of his own circular on the subject :—

In a Circular of the Government of India, dated the 31st October, 1894, I have been directed to submit suggestions as to the best method of giving effect to the principles which the Supreme Government have, in their recent Resolution of 19th October, 1894, laid down for the administration of State forests.

2. The question at issue varies very much in importance in the several Provinces of the Empire, but its practical solution appears to me to be the same in every case. It is necessary, in my opinion, to work from detail to general results, or, in other words, to solve the question in the first instance for what forest officers term "forest units" of management.

3. Without a detailed consideration of all facts concerning each forest area it is, I think, quite impossible to gauge correctly the importance of that area in any particular respect, or to decide what main purpose it shall serve in order to be of the greatest advantage to the surrounding population in the first, and to the general public in the second, instance. An existing pole forest, or even a scrub jungle, may offer greater advantages to the people of the vicinity than would a high tree-forest; and this circumstance may render its maintenance, in its present or in an improved form, desirable on economic grounds, even though such maintenance is not essential for climatic or physical reasons. If these latter reasons render it desirable that the area should be set apart for the growth of fodder only, they may outweigh in importance considerations favouring any other form of treatment.

4. In the first place it should, I think, be decided whether the particular area considered shall be strictly preserved as Government forest property, or whether it shall be excised for permanent and self-supporting cultivation, or be abandoned because it composed of plots so intermingled with existing cultivation, and so small as to render its maintenance a source of trouble to the people without offering to them sufficient compensating advantages. When it has been decided that any area shall be retained under State control, it is essential that the principles should be laid down which shall rule its systematic management; for otherwise the management can have no direct aim, and may not merely irretrievably damage the property, but may also injuriously affect those very interests of the people of the vicinity which we desire to safeguard.

5. The first step towards the introduction of systematic forest management is a careful consideration of the extent to which the area is burdened with permanently-settled rights; the next is an enquiry into the

reasonable requirements in forest produce, including grazing, of the adjacent villages with special reference to previous customs. When these enquiries have been completed and the results recorded, the area itself should be examined in regard to its general capabilities and to the existing forest growth, and it should be decided—in consideration of all the facts elucidated as to the productive capacity of the area and the requirements of the people in forest produce which must or which ought to be supplied from it—with what main purpose it ought to be worked. It is evident that the method of treatment must vary with the purpose to be served.

6. It will be a matter of rare occurrence that difficulty will be found to exist in permanently meeting local demands for timber and fuel; and even as regards fodder, if the grass could be cut, the quantity produced would be almost invariably far in excess of requirements. But the present stage of agriculture and existing customs in most parts of the country render necessary the maintenance of large grazing-areas, and it is only in this respect that any real difficulties are experienced. These difficulties, however, are not so prevalent and widespread as is frequently supposed. They are really confined to a few Provinces, where they have been accentuated by the existence of nomadic herds, and have sometimes probably been caused by the reservation of scattered blocks of forest.

7. There can be no doubt that in any forest, whatever may be the system of management, tree-reproduction as well as tree-growth is considerably retarded and interfered with by grazing. The demand for timber and fuel, however, is small in comparison with the gross area of forests in the possession of Government. With the exception of areas, the preservation of which is essential on climatic as well as on physical grounds, and of those limited forests which afford a supply of valuable timber for commercial purposes, all Government reserves, even if the growth of wood is to be the main object, can, under systematic treatment, yield a considerable amount of grass fodder. A systematic treatment with located fellings is, however, essential, as in this way alone is it possible to close and to specially protect forests undergoing the process of reproduction. Areas whose main purpose is the provision of pasture frequently also produce wood, and this is an important fact, especially in view of local consumption. It has to be decided whether this supply of wood is to be permanent, or whether all attempts to sustain it must be abandoned. The former course necessitates localization of fellings and periodical closure.

8. I will now assume that the main purpose which any given forest area is to serve has been determined, and that the management rules which are essential for the permanent fulfilment of that purpose, and which may, and generally will, provide for periodical closure against grazing, have been prescribed. The next step is to calculate the area over which grazing can take place, and to estimate roughly the quantity of other forest produce available. It should then be ascertained whether the rights of user, as well as the ordinary local demand for produce, can be fully provided for, and what surplus will probably remain for use by the general public. It is to my mind essential that the requirements of the adjacent villagers should be safeguarded before other needs are taken into consideration. If it should be found that, with due regard to the maintenance of the forest area in question, the local requirements, especially in respect of grazing, cannot be fully met; and if the inhabitants cannot supply themselves otherwise, it may become necessary to curtail the extent of forest open to

grazing, and at the same time to protect areas for grass-cutting, and so to ensure a large fodder-supply We do not help the people by allowing them to destroy the sources from which they draw their requirements. Such cases, however, will, I think, be very rare.

9. If thus we allow, in every individual case, as great an extent of forest to be used for grazing as is compatible with that treatment which will insure the permanent fulfilment of the purpose to be served by the area so set apart, and if we limit the number of cattle admitted and the season of admission only to the extent required in the interests of the right-holders and of the surrounding population, we have exercised, as regards the amount of produce which can be made available for the adjacent agriculturists, the utmost liberality which it is possible to exercise permanently.

10. The next point to be considered is the manner in which and the price at which such produce should be made available. In my opinion these questions should also be settled on the basis of local circumstances and of enquiries made on the spot. In some cases, especially where agriculture still retains many of the characteristics observed in respect of shifting cultivation, *i. e.*, where it exists on and consumes the stored-up richness of the soil, or where for other reasons it is in a backward condition, the agriculturists may supply themselves with the timber, fuel, thatching-grass, etc., which they consume, and so probably will the purely labouring class if the forest is within reasonable distance. More frequently, however, produce of this kind is extracted by middlemen. The real agriculturist has not the time to do so, and can otherwise better employ the labour of his men and of his cattle. Where the custom of self-supply co-exists with the contractor or is suspected to co-exist, both possibilities should be taken into consideration, and the material of the annual coupes should be disposed of to contractors in such a manner as to enable agriculturists in the vicinity to supply themselves if they feel so disposed. In fact it would be advisable to adopt this as a general principle. I think this can best be done by retaining unsold a portion of the area of the annual coupes from which the direct supply is drawn, and by selling the unextracted balance with the next year's coupes. I would recommend for consideration that, for a certain limited number of months after the felling, each coupe should be thrown open for the free gleaning of any wood below 2 or 2½ inches in circumference. This concession may in many instances considerably benefit the poorest classes, who either use the wood themselves or sell it in head-loads.

As regards the price to be charged for timber and fuel, the tax payable by the agriculturist, when he supplies himself direct, will always act as a check on the price the middleman can obtain in the open market, and therefore on the rates at which the middleman can offer produce for sale. There need then be no further restraint on the middleman. The amount of royalty chargeable to the agriculturist is a purely financial question, and it rests entirely with Government to decide to what extent the interest of the consumer shall govern the fiscal policy of forest administration.

The manner in which the fodder supply, produced on the areas available for its growth, is to be utilized, cannot possibly be laid down in general rules.

That any given area can only produce fodder for a limited number of cattle is a fact which should not be lost sight of; and the principle may be accepted that the requirements of the local agriculturist must be met before those of the professional cattle-breeder and trader, and that due regard must be paid to the contentment of the people as well as to their material advantage, as pointed out in paragraph 12 of the Government of India Resolution.

The general removal of restrictions regarding entry of cattle into open areas without limitation as to number or as to season of grazing, may cause considerable injury to the surrounding population by a rapid consumption of the whole year's supply, and may force, which is not desirable, the local agriculturists to assume nomadic habits in their turn. Beyond this one principle everything must again depend on local circumstances, and consequently on the result of local enquiries. In such enquiries the fact must not be forgotten that an area from which the grass is cut before consumption can support more cattle than could be advantageously grazed over it. This is more especially so with reference to areas of small extent surrounded by cultivation, and in localities where private owners preserve grass lands for stall-feeding. I may repeat that, in my opinion, it is only by a systematic management of the individual areas, the aggregate of which represents the fodder-producing landed property at the disposal of Government, that we can hope to support the largest number of cattle from this course, and that the question should, therefore, form a leading part of every forest working plan, preliminary plan or annual plan of operations.

As regards the price to be charged for fodder or for cattle-grazing, this is a purely financial matter which rests entirely with Local Governments, who have also the power to exempt certain classes, or people of certain localities, from payment, and who can lower the general rates so long as no permanent rights of user are created.

The following is the Circular of October 31st referred to :—

With reference to the Government of India Resolution, dated the 19th instant, on the subject of forest policy, I am directed to invite attention to an aspect of the matter to which the Supreme Government attach great importance. There is no doubt that, in certain Provinces, the strict forest administration which has prevailed of late years has given rise to serious discontent among the agricultural classes. The Government of India believe that the more lenient policy which is prescribed in the Resolution mentioned above will, by removing what has undoubtedly been felt as a grievance, do much to strengthen the reliance which the people repose in the Government, and confirm their feeling of attachment to it.

2. But, apart from the benefit that must ensue to Government from the general promotion of contentment among the classes which are its mainstay, there is a very special benefit to be derived from a relaxation of the restrictions that have hitherto been too often imposed upon grazing. The degree of stringency of these restrictions is intimately connected with the head of cattle that can be maintained by the people, and in some cases the substitution of a smaller number of superior cattle for the half-starved herds of inferior animals, which are so common at present, has been openly alleged as one of the objects to be attained by a restrictive policy. Even

if we admit that this substitution is to be desired from an economical point of view, the enunciation and enforcement of such a policy as the above is liable to misconstruction ; and it is not the desire of the Government of India to shape its administration of State properties with the view of unduly hastening the natural sequence of events, and of enforcing upon the people an economic reform which may be repugnant, not only to their ideas of material comfort, but also to their religious convictions. The Governor-General in Council believes, therefore, that, in addition to the material advantages which the people must derive from the scheme, a definite and immediate political benefit will ensue from the early introduction and steady prosecution of the policy now laid down ; and I am to ask that the matter may be taken up promptly and vigorously. The Inspector-General of Forests has been requested to submit suggestions as to the best method of giving effect to the principles of the Resolution.

IV.—REVIEWS.

Forest Administration Reports for 1893-94 for Ajmere and the Forest Surveys.

The officer in charge of the *Ajmere* forests is Sardar Hira Singh, Extra Assistant Conservator. He seems to be doing excellent work in his area of 139 square miles of reserved forest, and 8 square miles of village reserves, and he records an improvement in natural reproduction in the present year, as well as success in sowing 25 acres in patches five feet apart in the Makerwali-Hokran Reserve, with seeds of various trees (we wish he would give the scientific names as well as the vernacular ones, as it is not everybody who knows the native names of the trees of Rajputana) which have germinated well and survived the cold and hot seasons.

The chief departmental work has been two coppice fellings, in which 594½ acres were gone over, yielding 179,400 c. ft., which sold for Rs. 5,505. The average outturn was therefore nearly 302 cubic ft. per acre. If the rotation is 20 years, this amounts to about 15 c.-ft. per acre per annum.

In fire-protection good work seems to have been done. There were 10 fires which burnt 844 acres. The forest officer remarks on the practice of villagers carrying about flint and

steel, matches and other materials used for lighting fire, and suggests that it ought to be just as much a forest offence as the carrying of an axe, but in this the Commissioner does not agree.

Grazing as usual meets with some discussion, the fixed ratio for the Ajmere forests being one head to three acres; but we suppose that, as elsewhere, though this is calculated on the whole area, it is only the parts nearer to the villages which are actually overrun.

The working plan made by Mr. Coventry has not yet been sanctioned and put in force.

The financial results of the year were:—

Receipt ...	... Rs.	14,343
Expenditure ...	... „	15,696
Deficit ...	... Rs.	1,353

We will conclude with the following extract from the Commissioner's Review, which seems open to much discussion. Mr. Martindale says:—

"An initial difficulty is presented by the extremely narrow 'limits of Forest Administration in this tract. The first reserves 'were formed less than twenty years ago. From the outset to the 'present time there has been no idea of making them remunerative 'to Government. It was indeed settled at the first that two-thirds 'of any possible profits arising from them should be made over to 'the right-holders whose land was taken for their formation. 'Their *raison d'être* is to provide the villagers with grass and fuel. 'Large timber trees of value will not grow in them except in 'isolated hollows. They are too remote from railways, present 'and prospective, to be useful for sleepers, even if the right sort of 'trees were found in them. The same obstacle applies to the pro-'duction of charcoal in considerable quantities. They are too 'limited in extent to exercise an appreciable climatic influence. 'The growth in them is limited for the most part to scrub jungle 'formed of thorny shrubs and a comparatively small growth of 'dhokra, salar, kalia, gol, and dhak, with here and there an isolat-'ed sisam, nim, or babul. The objection of the Public Works 'Department and of the villagers that in some cases they obstruct 'the flow of water into the irrigation tanks on which the prosperity 'of the country depends is now the subject of practical test. It 'was apprehended that if the practically unlimited grazing and 'cutting previously permitted were allowed to continue, the supply 'of grass and fuel in the District would gradually become insuf-'ficient to meet increasing local demands. The policy therefore 'pursued, with interruptions, has been to secure the future by 'increasing the area reserved, and by restricting the number of 'cattle admitted to it. Notwithstanding the most liberal conces-'sions granted by Government, especially of late years, in regard 'to grazing in the reserves, all forest restrictions are thorough-'ly disliked by the people generally. It is satisfactory therefore 'to be able to record that during the year under review, the area

'of village reserves was increased from 5,305 acres to 6,803 acres. 'This was brought about by the formation of two small reserves 'on the Nagpahar Range in the Ajmere District.

"This success is the more gratifying in the face of the 'failure to form the proposed Rajgarh reserve mentioned in last 'year's Report. The villagers in the neighbourhood of Rajgarh 'at first agreed to set aside 6,000 acres of land for a bir, but 'afterwards refused, despite all the efforts of myself and other 'officers (I personally camped at Rajgarh for a week chiefly with 'this object) to explain to them the advantages they would derive. 'The main objections in all these cases resolve themselves to 'these,—

'(1) the land remaining would be too limited to afford sufficient unrestricted grazing, as goats and camels are excluded 'absolutely from village birs and other cattle during part of the 'year;

'(2) the reserves will become like the State forests, which 'are still regarded as profitless and worse;

'(3) many people would be required to watch the cattle 'instead of letting them roam at pleasure;

'(4) there would be something to pay every month for watch 'and ward."

The *Forest Survey* was at work during the year in Bashahr in the Punjab; in the Kheri, Bhira and Gonda forests in Oudh; in Narsingpur, Raipur, Balaghat, Nagpur, Seoni and Chhindwara Districts in Central Provinces; and in the Tenasserim and Pyinmana forests in Burma, the cost rates being pretty much the same as last year. Besides regular surveys, a very large amount of smaller work, chiefly of mapping, was done for various Provinces, and the whole arrangements seem to have been excellent and most creditable to Mr. W. H. Reynolds, the Superintendent, and his staff. The Report is illustrated by sketch maps, showing plainly the gradual progress of work.

Report of the Napur experimental Farm for 1893-94.

This Report is written by Mr. R. S. Joshi, the Superintendent, and reviewed by Mr. R. H. Craddock, the Commissioner of Settlements and Agriculture. But the chief interest in it lies in the two Appendices, which are notes by Dr. J. W. Leather, the Agricultural Chemist.

For us forest officers, agriculture and agricultural experiments are, of course, interesting, but for the pages of the *Forester* it is natural to look out for such points as may be of special note and of importance to forest officers. The general work done at the

farm seems to have been, like the similar work in Bombay which we have reviewed from time to time, excellent.

In Mr. Joshi's Report there is a paragraph on the effect of trees on agricultural lands adjoining them, and this paragraph and his recommendations have attracted considerable notice. He says :—

"*The effect of trenches in checking the damage caused to spring crops by the roots of trees adjoining them.*—It has been supposed 'that trees damage crops by their shade ; but this has not been 'found correct. The crop really suffers from lack of moisture 'caused by the absorption of the soil moisture by the tree roots. 'The experiment of cutting off the fine tree roots by digging 'trenches during the rains was noticed by the Commisssioner of 'Settlements and Agriculture in his review of last year's Farm 'Report. The experiment has been continued with success, and 'the number of trenches has been increased. They are dug to a 'depth of 3 feet at distances varying according to the size of the 'tree from 3 to 12 feet from the tree trunk. The trenches were 'dug at the end of August, and kept open during the cold weather. 'Where protected by these trenches the wheat crop suffered no 'injury whatever, while elsewhere the proximity of trees damaged 'it very conspicuously. The trenches are filled up before the 'rains to prevent erosion, dead leaves are used in part for filling 'them, and this will lessen the trouble of re-excavating them next 'August."

The experience thus gained is well worthy of note by Local Boards and officers in charge of avenue trees, for if Mr. Joshi's experiments are conclusive, good trenches outside the trees might put a stop to the objections which cultivators have to the planting of roadside trees.

The part of these Reports which we have been most interested in, comes in Dr. Leather's first note. It refers to a new departure to which, we believe, we have before now drawn attention, *viz.*, the attempt made by the Commissioner of Settlements and Agriculture to start a little Forest Department of his own. Our readers will see that Mr. Fuller has not been very successful, and that the grazing difficulty, which, when discussed by forest officers, draws down on them so often the wrath of officers like Mr. Fuller, interested in a large land revenue and high rates of assessment, has made itself felt even under the model arrangements by which the Central Provinces Agricultural Department intended to teach us our business. We can understand the position taken by the Commissioner of Agriculture, though we note that Mr. Craddock, in his Review, leaves the subject severely alone, but we do not understand the position taken by an Imperial officer like Dr. Leather in the last paragraph of what we quote below. Either of the Conservators in the Central Provinces or any of the Divisional officers could have answered his question. When

you lose your way in the London streets and want to get home, the first and most obvious suggestion which occurs to you is 'Ask a Policeman;' if the Agricultural Department want information as to the ryot's requirements in wood and the fuel out-turn of a given area, the equally obvious suggestion is 'Ask a forest officer'! It is, at any rate, amusing for forest officers to find that some of those who are most given to making attacks upon them are beginning themselves to appreciate in a practical manner the difficulties which the forest officers have to contend with :—

"*The Telenkheri Fuel Reserve.*—An open piece of land on 'the top of a low (basalt) hill at Telenkheri has been recently 'taken up by the Commissioner of Settlements and Agriculture 'with a view of converting it into a fuel reserve. Babul, khair, 'teak, bamboo, and sal have been sown in lines at several places 'within the area, and the babul and "khair" are especially giv- 'ing promise of success. One portion of the land was planted 'with "ber" by the Forest Department some years ago.

'The soil is doubtless thin and very stony, and this will pro- 'bably form a stumbling block to the work. But although 'difficulties will be encountered in growing trees on such poor soil, 'the experiment should be prosecuted and given a fair trial.

'In the meantime the cattle are a source of considerable mis- 'chief, and I found numbers of young trees nibbled off. Mr. Joshi, 'the Farm Superintendent, has prosecuted two of the owners, but 'the only satisfaction obtained is a fine of Rs. 2 and, as he said to 'me, 'These g'wallas do not mind such a punishment. It repre- 'sents the sum they pay for the food of their cattle for a long 'time.'

'So long as open grazing is permitted, so long will it be 'futile to attempt to provide firewood, and the owners of cattle, 'who deliberately turn their cattle loose at night to graze where 'they please, should be punished in a manner commensurate with 'the damage they cause. I see it mentioned in one of the Farm 'Reports that they go at night into the farm fields, and I am in- 'formed that the same takes place in the case of cultivators' land.

'So far as the Telenkheri Reserve is concerned, I would 'recommend that a fence of 'prickly pear' be put down as fast as 'may be possible. It would, I am informed, be very expensive to 'hedge in the whole area, and that being the case, I would suggest 'that the areas on which trees have been actually planted might 'be first enclosed.

'I do not place so much value on this attempt to establish a 'fuel reserve at Nagpur, merely for the purpose of providing 'Nagpur with fuel. I value it more because of the fact that at 'present we are almost without data, as to the amount of fuel 'which may be obtained off a given area, and we are totally with- 'out information as to the r'yot's requirements in the way of wood. 'We are also equally ignorant as to the most suitable trees to grow 'for the purpose. It is for these reasons that I think it especially

"important to establish fuel reserves wherever the necessary supervision can be provided, and I hope that though the difficulties may be great at Telenkheri, the experiment may be pushed for some years."

We have never visited Nagpur ourselves, but judging from our experiences of Southern India, the recommendation to plant prickly pear is about as useful a suggestion as it would be if an Australian sheep farmer were advised to introduce rabbits. We hope the Government of the Central Provinces will give the Agricultural Department 'plenty of rope' in their endeavours to make themselves practically acquainted with some of the difficulties of forest conservancy.

Forest Administration in South Australia, 1893-94.

The area of forest reserves in South Australia on the 30th June, 1894, was 215,526 acres, or 337 square miles, chiefly in the Northern District, and in this area 11,425 acres are enclosed for planting and natural regeneration. This is little more than 5 per cent. of the whole, and seems to us to be ludicrously inadequate. We have tried to ascertain, from the Report before us, what the system of working of the rest was, but have failed to find any useful information. Even that on artificial reproduction is very meagre indeed, and there is nothing of interest worth quoting.

One of the duties of the Southern Australian Forest Department seems to be the search of eaves for guano, and the Conservator, Mr. Walter Gill, records the discovery of one eave containing stalactites of great beauty, but no guano.

The most interesting matter in the Report before us is the cultivation of the date palm. It is interesting to find the record that of nine palms that flowered six were male and three female. We wonder if this may be taken to be an average, and if in Indian plantations one in three may be expected to be fruit bearers. Fertilization is effected artificially, and it is interesting to find that fresh pollen is not necessary, for good results were obtained with pollen from a male branch, which had been kept six weeks in a box. The financial results of the year were :—

Receipts	...	£4,169
Expenditure	...	£8,008
Deficit	...	£3,839

V.—SHIKAR AND TRAVEL.

Elephant Catching Operations.

The Sad Sequel.

Mr. Hadfield's prophecy, I regret to say, has proved only too true. Of the four elephants captured in 1894, *Penelope*, a big cow, died on the 31st December, 1894; *Forester*, the big tusker in February, and *Ganesh*, a young male, also in February, 1895. The fourth *Elsie*, a big cow, is still alive, but very ill, and is reported to be dropsical. The list now reads :—

17 Captured.
1 Sold.
3 Transferred to South Malabar, still living.
5 Living in the District, but are seriously ill.
8 Dead.

Not a very brilliant record.

P. M. LUSHINGTON.

Elephant Catching.

DEAR SIR,

In my paper on elephant capturing operations on the Anaimalai Hills, which appeared in your last issue, animals are described as being "injured in the *face*" : it should be in the *fall* not *face*.

[We regret the mistake, and have already corrected it in 'Errata.'—HON. ED.]

VI.—EXTRACTS, NOTES AND QUERIES.

Obituary. H. H. Davis and G. A. Richardson.

We regret to announce the death within the short space of a little more than one month of each other of the two veteran Forest Officers of Bengal, Mr. H. H. Davis and Mr. G. A. Richardson. Mr. Davis joined the Forest Service of Bengal on the 1st October, 1868, and passing through all the grades of the

Department was promoted permanently to 1st grade Deputy Conservator on 30th January 1887. The whole of his service of over 26 years was passed in Bengal, where his local knowledge and extended experience often proved useful. He twice held officiating charge of the Circle in 1889, and again in 1894. His health had been shattered for some time past, and he died at Kalimpong while in charge of the Tista Divison on the 10th April 1895. Mr. Richardson was only a little over a year junior in the service to Mr. Davis ; he joined on the 6th December, 1869, and pssed the greater part of his service in the notoriously unhealthy forests of the Buxa-Duars, which Division he left to enjoy three months' privilege leave. During this leave he was seized with an attack of pneumonia, and already suffering much from enlarged spleen, he was unable to shake off the attack, which unfortudately resulted in his death at Benares on the 5th March, 1895.

Death of a Cape Forest Officer.

A correspondent at the Cape has sent us the following cutting from the *Cape Times,* which we are glad to reproduce, as recording the services of a good Forester.

"There died at Somerset Hospital on Friday evening last a 'young forest officer of great promise and strong achievement. 'James Cooper, the son of an Irish country gentleman, came to 'South Africa in 1882, and shortly afterwards began his official 'career in the Knysna forest. His industry and exceptional cap-'abilities brought him early to the front, and before long he was 'given local charge of the Storms River forests, a distant and 'inaccessible but valuable group of forests lying about midway 'between Knysna and Humansdorp. At the end of 1889 he was 'appointed Conservator over the whole of the Knysna forest, a 'difficult position that he has filled with admirable tact and judg-'ment nearly the whole time since.

'Three weeks ago he came to Cape Town on business connected 'with the new Knysna regulations, suffering, it was thought, from 'influenza ; but the malady increased, and was shortly prononnced 'to be typhoid fever. It did not at first appear to be of a severe 'type, but a week ago grave symptoms supervened. There was a 'rally on Tuesday and Wednesday. On Thursday morning the 'case was pronounced hopeless. He was only twenty-nine when 'he died. The pine plantations at Concordia near Knysna were 'his creation. A few years ago a pine-tree was a rare sight—an 'unknown tree in the forests. Yesterday, in a quiet corner of the 'Mowbray Cemetery, his last tour of inspection finished, he was 'laid to his rest amongst the pines he loved."

Walking-sticks and Umbrella-handles from New South Wales.

A couple of years ago I issued the circular referred to below to personal friends and correspondents. I received a number of valuable replies in consequence. Through the pages of the *Gazette* I am enabled to appeal to a wider audience, and I beg to bring the subject under the notice of its readers.

Walking-sticks, canes, umbrella-handles, &c., of one sort or another are always in demand. At present, although we import a very large number of finished sticks, our quota to the world's supply of raw sticks is mainly limited to a few Mitchenbills* or Walking-stick Palms *(Kentia monostachya)*. It is a matter of everyday remark that sticks of useful or ornamental character are noticed in the bush, and are either passed by or cut down for temporary use and then cast away. But in the ornamental or curiously-shaped sticks that we so often see in the bush, I see a prospective minor industry. The collecting of sticks is not going to rival gold-mining, but the accumulation of them at odd times (like the gathering of certain gums and resins), will be remunerative as soon as our people have learnt how and what to collect. Sticks of the kind required will not take up much room, nor are they objectionable in any way. If each family in the bush can make just a few pounds a year out of sticks, it will be with no interference with the ordinary duties of each member; but it only leads to disappointment if sticks be gathered without reference to what will probably be required, and therefore the hints which follow are commended to careful consideration.

[CIRCULAR.]

I am collecting information in regard to the suitability and availableness of Australian saplings and timbers for walking-sticks, umbrella and parasol handles, and I shall be grateful if you will help me in the inquiry,

I have jotted down the following general notes *re* walking-sticks. They should possess :—

(*a*) Rigidity.
(*b*) Strength.
(*c*) A good root or excrescence to form a handle.

Weight is not material, Straightness is not absolutely essential as any sticks can be straightened by suitable processes. They should taper to the end. There should be facilities for collection and shipping, as they would require to be delivered at the port of shipment at a very low rate.

Sticks are of two kinds :—

1, Those cut out from the solid, *e. g.*, Forest Oak, Native Pear, Blackwood, Red Ironbark, and the outer portion of the stem of the Cabbage Palm,

* *Vide* note, P. 244.

2. Saplings, such as Tea-trees, Wattles, small Palms, and innumerable others. It is to this class that we should mainly look for suitable sticks.

There are innumerable kinds of suitable saplings to be obtained, and, they might be procured at odd times by children and others, kept until a fair number accumulate, and then disposed of.

Peculiar sticks, such as saplings with twiners round them, are desirable.

In the course of this inquiry I put myself into communication with Messrs. Henry Howell and Cy., cane and stick manufacturers, of 180, Old-street, London, E. C., who are well known to be far and away the largest firm in the trade. I found that this firm had published some hints on the subject, and the following is a copy of their circular :—

POINTS TO BE OBSERVED IN COLLECTING RAW STICKS, CANES, &C., FOR WALKING-STICKS, UMBRELLA HANDLES, &C.

Length.—The total length should not be less than 42 inches, end to end, but if possible they should be 48 inches.

Size.—The best sizes are of the diameter of ½ inch to 1 inch, measured about *midway* ; they should not be larger than 1¼ inches in diameter.

Form.—It is indispensable that the diameter should gradually diminish from the root or handle to the point, so that the stick is not "top-heavy."

Handle.—It is always better, when possible, to send sticks with some kind of handle ; if the plant be pulled up, the root should be left quite rough and untrimmed ; if a branch be cut off, a part of the parent branch should be left on to form a knob or crutch handle.

Sticks without handle.—Sticks without handle can be used, especially if they are nicely grown, and have any peculiarity of structure or colour —but if there is any handle, however small, it should not be cut off. Young saplings of the different kinds of palms, bamboos, &c., &c., should always have the root left on.

Short handles.—Occasionally, the form of the root or handle part is attractive, while the stick itself is weak and defective ; in such cases the handles only should be sent, and they should measure from 15 to 18 inches in length.

Send only specimens in first instance.—In sending specimens of new sticks it is better to send only small quantities, say, one or two dozen of each kind ; then, if approved, further quantities can be asked for.

All kinds of wood.—Specimens of anything remarkable for form or colour, whether in the roots or stems of woody, herbaceous, or reedy structures should be sent, as sometimes the most unlikely things are found to possess value for use either as umbrella handles or walking sticks.

Details.—Details as to quantity to be procured, prices, &c., should be sent, if possible.

I addressed a number of questions to Messrs. Howell and Co., and perhaps it will be better to quote their reply as fully as possible :—"The subject to which you refer, *viz.*, 'the collection of 'raw sticks suitable for walking-sticks or umbrella handles,' is one 'in which we need hardly say we are particularly interested, and

'we are very much obliged to you for the way in which you are 'endeavouring to bring it before the people in Australia. From time 'to time we have seen sticks from the different colonies of Australia, 'and there has been a considerable quantity of one or two varieties 'sold in this market, the principal one being the midgeon* cane which 'we believe came from the neighbourhood of Brisbane. In an article 'in the *Gardener's Chronicle* of 27th January and 3rd February, '1877, written by Mr. J.R. Jackson, curator of the Kew Museums, 'that gentleman gives a list of sticks from Australia, amongst which 'he mentions the Cardwell cane (a species of *Calamus*), also the 'Loya,† apparently of some species of Calamus or rattan, but of 'very small diameter, and with fantastic roots; there is also the 'bramble, which possesses a root something like a potato, and which 'grows to a pretty good size, but none of these canes seem to have 'met with any success beyond the Midgeon, and unfortunately this 'has gone completely out of fashion, so that at the present time it 'is a complete dead letter in the market. We think, however, 'that there must be a very large number of plants which would be 'suitable either for walking-sticks or for the handles of sunshades 'or umbrellas, and if you could succeed in getting any intelligent 'collector to send us samples, we should be very glad to give our 'opinion as to their value, and if we saw any chance of using them, 'to give orders for a sample parcel in order to try the market. The 'present time is peculiarly suitable for the introduction of some new 'articles of this character, as the staple sticks now in use have had 'their day, and the trade generally would be glad of something 'new. It is, however, quite a mistake to suppose that any kind of 'stick possesses a value; it is essential there should be some pecu- 'liarity in the sticks themselves, which will render them attractive, 'otherwise they are reckoned almost as firewood, the price realised 'for which would not suffice to pay the freight. In other words, 'we should not want firewood sent from Australia."

"We note with much interest your printed circular in regard 'to the collection of these goods, and we must say that you have 'indicated with remarkable exactness the class of goods which 'would be likely to prove most useful in the market here, and con- 'sequently of commercial value. Especially is this the case with 'the description you give under No. 2, *viz.*, saplings such as tea- 'trees, wattles, small palms, &c. We think that something new in 'palms or natural saplings would be more than anything else likely 'to meet with demand here. Sticks cut from the solid, unless 'having a peculiar marking like figured ebony, palmyra, letter- 'wood (or snake-wood of British Guiana) do not seem to meet with 'any favour. We should like, however, to see a specimen of the

* *Kentia or Bacularia monostachya*, the Midginbill or Mitchenbill or Walk-stick Palm of our northern rivers (N.S.W.), and usually known in Queensland as the Midgeen Cane.

† (?) A corruption of Lawyer.

'stem of the cabbage-palm. If the outer hard portion should be of 'sufficient thickness to make a rigid stick, we think there will be a 'good deal of character in it. Of course it is understood that our 'sticks are finished, and consequently are very much smaller, espe- 'cially in the handle part, than they would be in the rough state. 'We like all sticks sent untrimmed, the root or handle part left as 'large as possible, so that we may use our own discretion as to the 'form of handle we may make. The round hook sticks, you will 'easily understand, are artificially bent, so that it does not follow 'that all sticks without handles are valueless, provided they possess 'some distinctive character, so as to be of use either for bending, or 'having artificial heads put on them. Seeing that they are usually 'sent with the bark on, which has often to be removed, the size of 'the sticks should be about 1 inch in diameter, measured about 'midway.

"As to the kinds of wood which can be used in our trade, 'it will be sufficient to point out that large quantities of mullein '(*Verbascum*), teasel (*Dipsacus*), as well as certain kinds of Cacti, 'the woody structure of which presents a very remarkable appear- 'ance when cleared of the fleshy matter which is so abundant on 'this plant, have been employed as sunshade handles, and they make 'a very light and graceful handle. We think it would be well if 'you could get some person to interest himself sufficiently to study 'the matter, and to send us about a dozen of each specimen of wood 'which seems at all likely to be useful, taking care to keep dupli- 'cates of the same properly numbered, so that in the event of an 'order being given there might be no doubt as to their identification, 'and as to what is required. If they are addressed to us, we will give 'a prompt reply as to the kinds which might be utilised. We 'think it is as well to mention that it is most unadvisable for any 'large quantity of sticks to be sent away unless they are properly 'selected to suit the market. We have known several instances of 'persons having done this, who have invariably lost money by it. 'To sum up the matter, we may say that we should like to see 'specimens of every kind of palm which can be obtained in Austra- 'lia, also anything of an herbaceous character, having, when dry, 'sufficient rigidity to carry a sunshade. In addition, any kind of 'wood which possesses any kind of 'figure' on the surface of the 'bark, or on the wood immediately under the bark. We have used 'an enormous quantity of English furze (*Genista*) lately. This, as 'you know, is very peculiar in its structure, having holes and knots 'in the wood, which when finished present a very distinctive ap- 'pearance. Anything of the 'Genista' type we should think would 'be likely to be of some use. Some time ago we saw some sticks 'purporting to come from Australia, called the 'Australian Bay.' 'It had a peculiar nutty brown bark when dry, with longitudinal 'indentations, and was inclined to be somewhat flat or square-sided, 'rather than rotund. A stick of this kind, if it could be obtained 'with a good handle, would certainly be of some value here. In

'reference to the prices and quantities of sticks which might be 'imported, you will see from observations that it is impossible to 'furnish this information until we have seen the woods and been 'able to form some idea as to their value."

In a list of sticks supplied to the London market, I find that small saplings of Tasmanian Blue-gum (*Eucalyptus Globulus*) are supplied by Algeria, and none from Australia. Orange and lemon sticks are supplied by Algeria and the West Indies. Surely we could supply these as cheaply as anywhere else.

The variety of sticks we could supply with our remarkably rich vegetation should be unusually great. The industry seems to be full of bright possibilities, but, as this article has already exceeded the length I had intended, I will defer any further remarks to a future issue of the *Gazette*.

No doubt many gentlemen who do not desire to enter into the collection of sticks themselves will be able to furnish the Department with valuable information, which will further the industry as far as this Colony is concerned. In such cases, letters addressed to the Under Secretary for Mines and Agriculture will receive careful consideration. Those who are prepared to embark in the industry at once, or who have accumulated specimens of what they deem to be suitable sticks, are recommended to communicate with Messrs. Henry Howell & Co., direct, at the address given above, *(J. H. Maiden, in a paper published by the Department of Agriculture, N. S. Wales).*

Consumption of Timber in the British Isles.

The following is an abridged translation of a paper by Monsieur A. Mélard in the number of the *Revue des Eaux et Forêts*, of the 10th of December, 1894.

It has frequently been imagined that the increasing consumption of iron and steel has reduced the demands for timber, so that some people look on complacently while forests are cut down or deprived of their large timber ; the present paper has therefore been written in order to show the incorrectness of such an opinion.

The British Isles are the chief iron-producing country in Europe, as the following table shows :—

ANNUAL PRODUCTION OF PIG-IRON IN THOUSANDS OF TONS.

(The French ton is about 1-20th in excess of the English ton.)

British Isles, 1893		...	...	6,830
Germany, 1891	...	...	...	4,404
France, 1893	...	...	...	2,010
Belgium, 1889	...	...	...	832

Russia, 1888	...	...	...	667
Austria, 1892	...	...	...	631
Sweden, 1892	...	...	...	486
Spain, 1886	...	...	...	148
Italy, 1892	..	...	...	13

Thus Britain produces nearly as much pig-iron as all Europe combined.

If, therefore, the production of iron can reduce the demands for timber, this must be most evident in the British Isles, which is far from being the case, the consumption of wood in Britain having, on the contrary, largely increased. As only a small area, about 3,000,000 acres, is under forest in the British Isles, and the timber required there is chiefly imported from abroad, the variation of the timber imports is a measure of its consumption in Britain. These imports have risen from 2,727,000 loads of 50 cubic feet, in 1860, to 7,212,000 loads in 1890, the increase being 168 per cent. ; whilst the total imports of all kinds into the British Isles, during this period, has increased only from £375,000,000 to £749,000,000, or by 100 per cent.

Most of the imported timber is in squared logs, planks, and scantling, and is, therefore, only about four-fifths of the standing timber from which it is taken, so that the quantity of the latter required for the imports of timber into Britain in 1890 was about 9,000,000 loads. This figure must be extremely encouraging to the forest-owners who supply the British markets, and give them full confidence of finding a good sale for their produce. They may anxiously ask, on the other hand, whether their forests can possibly meet such an enormous demand, and to give a clearer idea on this subject the following figures are given :—

According to a recent public statistical (a translation of this paper appeared in *Nature*) account of the yield of the 7,000,000 acres of French forests which are managed by the State Forest Department, the yield in 1892, exclusive of firewood, was 5,300,000 loads, or about $\frac{3}{4}$ load per acre. The imports of timber into Britain at this rate require, in round numbers, 12,000,000 acres of forest for their production, and only 1·1 per cent. of this timber is re-exported from Britain.

The French share in the British timber imports has risen in value from £430,000 in 1881, to £950,000 in 1893, being about half the total of French timber exports, the quantity of standing timber, to supply which amounted to 648,000 loads. France, however, imports on the average 2,892,000 loads, or, deducting her exports about $2\frac{1}{2}$ million loads annually is the deficit in standing timber, which her forests fail to supply.

Britain is now the best timber customer France possesses, and in 1893 received from her the following imports :—

Timber in logs, &c.	...	...	£441,200
Mine-props	...	...	£422,600
Hoop-wood	...	...	£52,280
Cork	...	...	£21,560
Miscellaneous	...	...	£12,360
Total ...	...	...	£950,000

The rate of increase in the mine-props exported from France to Britain has increased most remarkably. Before 1870, this trade was quite insignificant, but has steadily increased from £32,000 in 1870, to £422,600 in 1893, consequent on an increased production of coal in Britain from 112,125,000 tons in 1870, to 188,437,000 tons in 1891.

Anyone acquainted with the timber trade knows that the large increase of its bulk in Britain has not been accompanied by any increase in price, but by a fall of 29 per cent. in 1893 compared with prices during the period 1867-77, when they reached their maximum. The explanation of this fall in the price of timber, in spite of an increase in the quantity imported, is due to the great bulk and weight of timber, the price of which from distant countries, is largely made up by the cost of transport.

Without considering the great extension of European and American Railways since 1870, marine freights have fallen by 50 per cent. In Britian, according to Sir T. Sutherland, the president of the P. and O. Company, there are now more ships than are actually required, the British mercantile fleet having increased between 1885-1891, from 7,430,000 to 8,279,000 tons.

These reduced freight-charges enable remote countries to compete in the European timber market, and the price of timber is consequently reduced.

As, however, we are dealing with a substance, the demands for which are steadily increasing, while the supply is diminishing, for private owners are everywhere steadily destroying their forests, there can be no doubt of a speedy recovery in the price of timber. Twenty or thirty years of bad prices are disastrous to individuals, but are nothing in the life of a nation. France may, therefore, be confident in the future and continue to preserve her forests of oak, beech, and silver-fir, for the use of future generations.

As to the industries which use up timber in Britain, besides the enormous annual demand for railway sleepers and mining pit-props, there is a large demand for wood for the construction of railway carriages, both for home use and export, £2,240,000 worth of railway carriages having been exported from Britain between 1889 and 1891.

During 1891-1893 more than 1,000,000 tons of shipping was constructed, more than the whole French commercial fleet. The interior of these ships consumes large quantities of timber.

Between 1882-92, the population of the British Isles has increased by about 3,000,000, and the building of new houses employs large quantities of wood.

Britain has imported annually during 1886-91, £611,200 worth of staves for barrels and casks. There is not a single industry which does not use more or less wood for the frame-work of its machinery, or as raw material.

The annual exports from Britain are valued at £240,000,000, and include a great number of fabrics which must be carefully packed for safe despatch to all quarters of the world, so that packing-cases alone absorb large quantities of wood.

Under the circumstances reported by M. Mélard, I am certainly of opinion that owners of land unsuitable for farming need not fear to plant quickly growing timber, while the Crown forests of Britain should be made to yield their utmost in valuable oak, ash, larch, and other timber suitable to the locality. M. Mélard has under-estimated the production of an acre of forest in France, which he put at 1/5th of a load, and the correct figure ¾ load has been substituted. In Britain, at least, one load per acre can be produced annually.—(*W. R. Fisher in 'Commerce,' 27th March, 1895.*)

The Whittall Memorial.

We asked to publish, for the information of the subscribers, the following accounts of this Memorial :—

	Rs.	A.	P.
Cost of gravestone with country and chaplains' fees	329	1	0
Investment of Rs. 200, to provide for preservation	211	1	10
Subscription to the Mayo Hospital	13	13	2
Total subscribed	554	0	0

VII.—TIMBER AND PRODUCE TRADE

Churchill and Sim's Circular.

May 2nd, 1895.

EAST INDIA TEAK.—A delivery of 1,436 loads in April, against 729 loads in the same month of last year, has refreshed the market in London. The four months' deliveries this year amount to 3,362 loads, as compared with 4,297 loads in the same period of 1894. Prices have remained steady, but continued activity is much needed to prevent accumulation of stock.

ROSEWOOD.—A small parcel just arrived will test the market, which has been without supplies for some time.

SATINWOOD.—There is a fair stock, but demand rather quiet.

EBONY.—Small shipments of really good logs would sell readily.

PRICE CURRENT.

Indian Teak	per load	£10	to £16.
Rosewood	„ ton	£5	to £8.
Satinwood	„ sup. foot	6d	to 18d.
Ebony	„ ton	£6	to £8.

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, May 1st, 1895.

Cardamoms	per lb.	2s.	to	2s. 6d.
Croton seeds	per cwt.	20s.	to	27s. 6d.
Cutch	„	20s.	to	32s.
Gum Arabic, Madras	„	20s.	to	35s.
Gum Kino	„	£25	to	£30.
India Rubber, Assam,	per lb.	1s. 7d.	to	2s.
„ , Burma	„	1s. 7d.	to	2s.
Myrabolams, Bombay,	per cwt.	7s. 9d.		
„ , Jubbulpore	„	6s.	to	7s.
„ , Godavari	„	5s. 6d.	to	6s. 6d.
Nux Vomica, good	„	5s.	to	9s.
Oil, Lemon Grass	per lb.	1⅛d.		
Orchella, Ceylon	per ton	15s.	to	22s.
Redwood	per ton	£3. 10s.	to	£4
Sandalwood, logs	„	£35	to	£55
„ „ chips	„	£9	to	£30
Seed lac	„	30s.	to	90s.
Tamarind	„	9s.	to	11s.

INDIAN FORESTER.

Vol. XXI.] **July, 1895.** **[No. 7.**

Babul in Guntur.

The taluk of Guntur in the Kistna District is as nearly devoid of forest growth as it is possible to be. With the exception of half a dozen very nearly denuded small hills there is nothing capable of being converted into Forest Reserves except some areas of babul growing on black cotton soil.

Six patches of babul were selected originally by Messrs. Boileau and Homfray with the idea that they would be useful for the Southern Mahratta Railway fuel supply,—that railway (under the name of Bellary-Kistna State Railway) being, at the time of selection, under construction.

These six patches were therefore notified for forest reserves, and have since been settled as follows :—

Nidamarru Block i A & B, ii, iii	393	acres.
Kurugallu	1,305	„
Gollamudi	194	„
Kolakalur Block i, ii ...	1,356	„
Narakodur Block i, ii, iii ...	515	„
Lám Block i, ii ...	1,077	„
Total	4,840	acres.

The settlement unfortunately has reduced what appeared to be six fairly compact reserves into 12 somewhat multi-angular blocks, and this, of course, increases the expenditure in demarcation and upkeep of boundaries.

The original object for which the Reserves were formed has fallen through, for the Southern Mahratta Railway now uses Singareni coal. But there are several cotton ginning mills in the neighbourhood, some at Guntur and one at Mangalagiri ; and seeing that the Municipalities of Guntur and Bezvada are only 13 and 22 miles from the furthest points of these six reserves, and that there are other large villages, (the largest of which is Mangalagiri) within the circle, the centre of which is Nambur,

(half way between Guntur and Bezvada,) and the radius is the distance to the furthest point of any of the Reserves, about seven miles, there is no difficulty in disposing of the wood.

Mr. Alwar Chetty, late District Forest officer of Kistna, proposed making a working plan for the whole of these six Reserves, on the simple principle of clean felling, with a rotation of 20 years for the whole area. The present District Forest officer made out this working plan ; but substituted 'coppice under standards' for 'simple coppice,' retaining only 5 to 6 standards per acre to provide larger wood for agricultural implements.

The working plan has been sanctioned and has been in operation now for two years. The order of felling adopted is that given above in the list of Reserves, as the ages of the trees in the areas were estimated to vary between 18 years old in Nidamarru and 10 years in Lám Reserve. The areas of the first two coupes were 265 and 228 acres respectively ; coupe 1 being Nidamarru Reserve, Block 1 A and B, and coupe 2 being Nidamarru Reserve, Blocks II and III, and 100 acres of Kurugallu Reserve divided off by a right of way.

Tenders were called for for the purchase of the wood standing, at so much a ton (the usual method of purchase in the District). The tonnage was determined by means of sample acres chosen alternately by the District forest officer and the contractor, the average tonnage per acre was found out from them ; and that tonnage, multiplied by the number of acres in the coupe, gave the total number of tons to be paid for.

In the first coupe of 265 acres, six sample areas were taken, two of five acres each and four of 2½ acres each, or a sample of 7½ per cent. of the whole. In the second coupe, eight sample areas of 2½ acres each were taken, or a sample of 8¾ per cent. of the whole.

The first year we obtained a tender of Rs. 2-4-0 per ton for wood over 2 in. in diameter, and a lump sum of Rs. 100 for all small wood and thorns, also Rs. 100 for babul pods, and Rs. 65 for grazing ; the second year we received Rs. 2-4 per ton for wood over 2 in. in diameter, Rs. 0-8-0 per ton for wood under 2 in. in diameter, As. 10 per 100 yoke loads of thorns (0·89 tons), *i.e.*, As. 8-11 per ton, and Rs. 86 grazing and minor produce, so the revenue derived was nearly Rs. 3,700 the first, and Rs. 2,700 the second, year; or an average of Rs. 3,200 per annum.

Babul trees of 4 ft. girth are worth in this taluk about Rs. 3 to Rs. 5 each : so, as we have left from 5 to 6 standards, half grown, per acre, so that at the second rotation the value should be increased by, say :

5 Trees per acre over 242 acres, @ Rs. 3 each = Rs. 3,630 per annum.

The following table shows the results :—

Coupe No.	Reserve Name.	Reserve Block	Area of Sample A	No. of Trees. Per Sample	No. of Trees. Per Acre	Tons of Wood. Per Sample. Over 2" diam	Tons of Wood. Per Sample. Under 2" diam	Tons of Wood. Per Sample. Total	Tons of Wood. Per Acre. Over 2" diam	Tons of Wood. Per Acre. Under 2" diam	Tons of Wood. Per Acre. Total	Tons of Thorns. Per Sample	Tons of Thorns. Per Acre	Remarks.
1	Nidamarru	I A	5	413	83	31·3	11·3	42·6	6·26	1·26	7·52	4·46	0·89	
	,,	,,	2½	346	138	21·7	8·3	30·0	8·68	3·32	12·00	2·23	0·89	
	,,	,,	2½	231	92	8·0	2·7	10·7	3·20	1·08	4·28	1·24	0·53	
	,,	I B	2½	74	30	6·5	1·5	8·0	2·60	0·60	3·20	·89	0·36	
	,,	,,	2½	206	82	17·1	5·9	23·0	6·84	2·36	9·20	2·89	1·16	
	,,	,,	5	640	128	37·4	10·6	48·0	7·48	2·12	9·60	3·12	0·62	
	Total ..		20	1,909	553	122·0	40·3	162·3	35·06	10·74	45·80	14·83	2·45	
	Average per acre		..	..	92·16	..	..	..	5·83	1·79	7·62	..	0·74	
2	Nidamarru	II	2½	a.	a.	0·80	0·60	1·40	0·32	0·24	0·56	1·15	0·46	
	,,	,,	2½	..	..	14·40	3·50	17·90	5·76	1·40	7·16	0·45	0·18	
	,,	III	2½	..	..	6·59	1·46	8·05	2·64	0·58	3·22	0·40	0·16	
	,,	,,	2½	..	..	13·24	3·77	17·01	5·30	1·51	6·81	0·40	0·16	
	Kurugallu	,,	10*	..	..	69·30	16·04	85·34	6·93	1·60	8·53	2·10	0·21	
			20	..	..	102·33	25·57	127·70	20·95	5·33	26·28	4·50	1·17	
	Average for the 2		years	..	..	..	..	..	4·19	1·07	5·26	..	0·23	
				..	..	..	..	..	5·01	1·43	6·44	..	0·49	

* not recorded. Four separate samples were taken here, but details for each sample were not given.

A few other statistics were collected by the writer when measuring up the sample acres of the first coupe.

A large number of cross sections were examined with a view to compare the number of annual rings with the diametric measure-

ments, with the following results :—

Diameter in inches.	Average No. of annual Rings.	Which gives.	No. of years growth.	Girth in inches.	
2″	8·0	...	...	...	Note :—The sapwood varied from 3 to 6 rings in thickness.
3″	13·6	...	10	7″·1	
4″	14·0	..	15	13″·9	
5″	15·6	...	20	19″·4	
6″	18·0	...	25	24″·9	
7″	22·3	...	30	34″·1	
8″	25·0	...	35	43″·2	
9″	26·2	...	...	...	
12″	31·0	...	...	...	
15″	36·0	...	...	...	

Another experiment that was undertaken was to find a reducing factor. Now in the case of babul it is difficult to take measurements breast high as the tree is so very apt to branch near its base ; so it was determined to find a reducing factor for the girth measurements taken 6 inches from the ground.

In the first sample area the sizes of stumps were as follows, and the cubic contents shown below them are as if the trees were taken as a cylinder with the basal measurements as the mean measurement. It was easier when the trees were felled to take the diameters rather than the girths, but in calculating the cubic contents the diameters have been reduced to girth :—

MEASUREMENTS IN S. P. No. 1.

Diameter of Stumps	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	11 in.	12 in.	
Average height of tree	18 ft.	19 ft.	20 ft.	21 ft.	22 ft.	23 ft.	24 ft.	25 ft.	26 ft.	28 ft.	Total
No. of stumps in S. A. No. 1	29	55	86	93	54	57	20	10	2	7	413 trees
Cubic contents	20·13	71·65	184.17	301·68	249·53	359·27	166·49	107·09	26·94	120.91	1607·33 ct.

Now it was found by a series of measurements and weighings that an average cubic foot of wood was 74 lbs., varying between 99 lbs., for a large piece of heartwood and 49 lbs. for a piece under 2 inches diameter.

The weight of the wood if taken above as a cylinder would therefore be $\frac{1607\cdot34 \text{ by } 74}{2240}$ tons = 53·10 tons ; but the weight as found by actual weighing came to—

Wood over 2″ diameter + Wood under 2″ diameter + Thorns

31·30 + 11·30 + 4·46 = 47·06 tons.

Therefore the reducing factor is—

$\frac{47{\cdot}06}{53{\cdot}10} = 0{\cdot}8862$ if we take it after squaring the quarter-girth or

$\sqrt{0{\cdot}8862} = 0{\cdot}94$ if we take it as a multiplier of the girth, taken at 6 inches from the ground.

As regards the reproduction from the babul stumps, it was fairly good. About 1 out of every three reproduced by coppice shoots, in places the reproduction was even better—1 out of every two stools. Besides this there were numerous seedlings everywhere, in some places so thick as to form a regular carpet, but this was exceptional. The height of the coppice shoots after a felling one year back was from 2 to 5 feet, about 2½ feet on the average; after a felling of two years back they were on the average between 5 and 6 feet high.

It may be remarked that the area under babul is generally submerged for 3 or 4 months every year by floods from the Kistna River as the land lies low; and one of the chief difficulties to contend with is the short duration of time to cut and remove the wood; for the soil, being black cotton, is extremely heavy if at all damp.

A. W. LUSHINGTON.

Tea in the Upper Chindwin.

The following is a list of the villages of the Upper Chindwin which export tea seeds, the inhabitants of all being Shans:—Kaungkan, Tingin, Kawya, Maungkan, Tason, Onbet, Mainwe, Tamanthe, Malin.

Tradition says that these *kins* (clearings) were cleared and planted some 200 years ago, the seed having been brought from Palaung (Northern Shan States). No one has ever heard of wild tea in the jungle; nor have I ever come across wild tea in the forests, in spite of having always kept a very sharp look out for it, and it is my opinion that the tea plant is not wild, at any rate west of the Irrawaddy (by the way, wild cinnamon [*C. Zeylanicum*] has been found by me fairly common in the evergreen forests of the Uyu).

The gardens were originally planted for the sake of the leaves, that is, to make *letpet*, the so-called pickled tea of Burma. However, some 20 years ago there arose a demand for the seed, at first intermittent, but since British occupation steady, and this has now become the main source of income to the owners, though the pickled tea is still collected and made as of old.

The first thing to be done in planting a *letpet-kin* is to find the right kind of soil, what is known as myeni, literally red earth. In this soil the tea-tree flourishes to perfection; the look of this earth is very characteristic, being a light red or buff-coloured fri-

able loam, which occurs in patches, and wherever these patches of red earth are found on the banks of the Chindwin there villages have been built and tea planted. The jungle being cleared of all brushwood and undergrowth, 3 or 4 seeds are dibbled into holes, the holes being either 2 or 4 cubits apart. The object of dibbling in more than one seed is to guard against blanks; however, all the seeds that germinate are allowed to grow. After the plants come up all the tending the gardens receive is periodical clearing of grass, small plants, weeds, and brushwood; the ground is never hoed, nor are the plants pruned, except when the ravages of a parasite known as *chibaung** have become so extensive as to kill the portions above ground, the dead tops are then hacked down with the ordinary Burmese dama, the plant at once throwing up stool shoots or root-suckers which in three years take the place of the old cut down plant. The small plants become large enough to give a crop of leaves in 3 years if the *kin* is kept free of jungle, but not till 5 years if the garden is dirty. Seed is borne when the plants are 8 years old, but they do not come into full bearing till 15 years of age, the normal existence of a tree being 40 to 50 years if not attacked by the parasite mentioned above. Some trees last longer than this, but old trees do not bear such good crops of seeds or leaves as middle-aged ones, being usually stagheaded, and are generally cut down, their places being taken by vigorous shoots thrown up by the stools, some stools as large as 3 feet in girth being seen. A light shade is beneficial to the plants and lessens the labour of keeping the gardens clean, as the shade kills out the rank grasses such as *thekke*, &c., which spring up if there is no shade. Heavy rains are not good for the seed crop, as the seed drops off without ripening; however, if the seed-crop is poor the leaf-crop is usually good and *vice versâ*.

Each house owns from one to three *kins*, the various properties being bounded by rough cactus hedges.

As already stated there are two kinds of crops—the leaf-crop and the seed-crop, (*a*) *The leaf-crop*.—The trees flush three times a year in—(1) Tagu to Kason (April—May); (2) Wazo to Wagaung (July—August); and (3) Towthalin to Thadingyut (September—October). Of these three flushes the first gives the best leaf and brings the highest prices. The method of plucking is to pluck the whole shoot except one leaf which is left. Thus if there are three leaves in a shoot the shoot is nipped off just below the second leaf. Each owner then takes his crop of leaves and throws it into an iron cauldron† full of boiling water; it is left in this water till the leaves turn a yellow colour; the water is then thrown away and the leaves rolled by hand on mats; it is then ready to be sold to traders, who take it away either packed in bamboo crates or in the internode of the *myetsangye* bamboo

* Loranthus Sp.

† The ordinary Dè of Burma, exactly the same as that which cutch boilers use for cutch boiling.

(*Dendrocalamus Hamiltonii*). If one wanted to keep this tea it must either be kept buried in the ground, or the crates and bamboos must be kept in water. Kawya village, which has the largest extent of *kins*, makes on the average 20,000 viss of *letpet* annually. The price at the village for the produce of the first flush is usually Rs. 16 per 100 viss, for the other and later flushes Rs. 12-8-0 per 100 viss.

The seed-crop ripens in October and November ; it is then collected, dried in the sun, and sold to Burmese traders, who come up for it. The trader shoots the seed into the bottom of his boat, the bottom being roughly lined with mats, and then takes it down to Kettha or Tonhe ; where he sells it to the native agents of "tea-seed chiefs."

The price of the tea seed on the garden varies from Rs. 3 to Rs. 10 per basket, but to understand the method of buying the seed one must bear in mind that the trader, always a Burman, comes up in January or February to bargain for the seed crop of the following November. If possible, the trader makes a contract that the owner will sell him all the produce of the garden for a fixed sum per basket. Thus in January 1894 the Maungkan villagers contracted to sell all their seed at Rs. 5 a basket. The trader then advances on the condition that, if the villagers cannot pay him back in tea-seed, they must pay him 100 per cent. on his money. If the trader cannot get a contract for the whole crop he always manages to make advances for a certain proportion of the crop on the same condition. Thus, this year, all the villagers of Kawya have had advances on the condition that they pay back next November (in seed), each basket to be counted as Rs. 3. Any left after the villagers have paid back their advances usually brings double the contract price. The trader then hires boats and takes the seed to Kettha or Tonhe, the rate of boat hire being from 2 annas to 4 annas per basket according to distance to Kettha. He will sell to agents of the tea planter for an average of Rs. 17 per maung (a maung—1 basket 10 pyis or 26 pyis). This is practically the end of the business as far as Burma is concerned, as from here it is carried by Chin or Manipuri coolies in baskets, Scotch fish-wife fashion, to Manipur. No tax is collected or any transit dues exacted anywhere along the route. The Chins are said to carry a load of one basket and a quarter, the average weight of one basket being 14 viss, and get Rs 5 to Rs. 6 for the journey.

It will be seen that as in most trades the middlemen are the best off and absorb most of the profit. The Burman trader makes, even if he does not go in for the advance system, over cent. per cent., and of course his profits are doubled if he does. No Thaungdut coolies or men in any way are interested in the trade, the development of which is solely due to the Bengalis and Burmans. I believe Messrs. The Bombay Burma Trading Company are experimenting as to the feasibility of sending seed to

Assam *via* Calcutta ; of course if they succeed that will settle all matters of transit dues both for Thaungdut and Manipur. I see no reason why the Bombay Burma should not succeed as no care to prevent shaking, the effects of damp or of heat, is taken, any way prior to the seed reaching Manipur, by the present method which seems to be as unscientific as possible, and yet the tea-seed has, as is well-known, a first class reputation in Assam for germinating properties. The tea-seed experimented with, however, I would recommend being bought at any cost in November ; the best way, of course, would be to advance money on the following season's crop, this system being the custom ; or else only the leavings and old seeds which have been lying about can be got, which naturally would not have the same germinating power as fresh ripe seed.

From what I saw of the gardens they were wonderfully healthy considering the little care taken with them, as, with the exception of the parasite referred to, the trees all seemed clean, vigorous, and full of leaf. I should say tea-planting with European methods would be a great success if only the labour question could be successfully dealt with. That once-settled, all a planter who proposed planting in the Chindwin would have to do would be to prospect for red earth, and from my own experience of the forests I am sure I have come across several tracts of similar earth to that on which the tea is grown.

There are two other points to be touched on, *viz.*, a "maung" weight is spoken of above; this I am pretty sure is only a corruption, or rather the Burmese pronunciation of the word maund. I was informed that a "Maung" weighed about 22¾ viss (viss = 3·68 lbs.) and that would bring the "Maung" to about 80 lbs, *i.e.*, the Bazaar maund of India.

2*ndly*, I believe some people still doubt that "Letpet" the pickled tea of Burma is made from *C. Theifera*; the plant in the Chindwin and Katha is undoubtedly *C. Theifera*, and is not Elocdendron; and it seems absurd that such a point should need proof, considering most of the gardens in Assam have had all their extensions for some years planted with plants grown from Chindwin seed. Besides this Mr. Oliver sent specimens in 1892 to Calcutta which were identified as *C. Theifera*.

C. W. A. BRUCE,
Div. Forest Officer, Upper Chindwin.

II.—CORRESPONDENCE.

Commutation of Rights.

SIR,

Your editorial note in your March Number, headed "Commutation of Rights," and dealing with the duties of a Forest Settlement Officer, was shown me 6 weeks ago by the Deputy Conservator of Forests, Upper Chindwin, Burma (Mr. Bruce), who was then with me on Forest Settlement work, and I promised him to write to you, and explain the reasons why I differed from you. The matter is of considerable practical importance in Burma, where many forests yet remain to be settled. I should perhaps mention that I have just finished about 5 months' work on special duty as a Forest Settlement Officer.

B. H. B.-P. is quoted by you as saying that a Forest Settlement Officer should allow all that he considers may equitably be allowed as rights, *even when not proved to be legal easements.*

You say the Government of India does *not* take the same view, but the words you quote in support of that assertion seem in perfect harmony with B. H. B-P.'s statement. The words of the Government of India quoted by you are these.—"There is 'nothing in the Forest Act that justifies the Forest Settlement 'Officer in providing for the prospective wants of non-existing 'settlers, or of a future and possibly more numerous generation; 'nothing that permits the concession by a Forest Settlement Officer 'of more extensive rights than those to which he finds claimants to 'be entitled at the time of settlement. The rights, claimed must be 'actually existent rights, vested in an individual or person, or in a 'definite body of persons like a number of co-owners or a village 'community." These words prohibit a Forest Settlement Officer providing for rights more extensive than he finds "*existent*" "*at the time of settlement*;" but that is quite a different thing from saying he is not to provide for those existing rights that may not be legal easements.

For example, if there were a village that for the past 10 years had been taking bamboos from the area to be reserved, the orders you quote would forbid the Forest Settlement Officer granting rights three times more extensive than now exist, merely because the village is likely to increase to three times its size. But these orders would not, as you seem to suppose, forbid the Forest Settlement Officer recognising, and in some way providing, for the rights that now exist. The rights exist, though they are not legal easements. All the Government of India says to the Forest Settlement Officer is, "Confine your attention to existent rights;" what you seem to suppose it says is—"Do not recognise rights which are not legal easements."

The instructions issued by the Madras Government, quoted by you, are but an indifferent clue to the intentions of the Government of India. That the Government of India intend Forest

Settlement Officers to take some such view of their duties as B. H. B-P. indicates might be proved by the wording of the Forest Acts. There is nothing in any of these Acts known to me which requires Forest Settlement Officers to reject claims to rights, if not proved to be legal easements. Writing within narrow limits, however, it is perhaps better, instead of discussing the Acts, to invite your attention to the Instructions to Forest Settlement Officers in Lower Burma, and the similar instructions for Upper Burma. These seem to have escaped your notice, and are likely to modify your opinion more than any arguments drawn from the Acts which presumably were before you when you wrote. So far from assimilating the procedure of the Forest Settlement Officers to that of the Civil Procedure Code, as appears to be done in Madras, the Burma Instructions, while in harmony with the orders of the Government of India quoted by you, yet say that the Forest Settlement Officer must ascertain by full and careful enquiry the actual state of things and the manner in which the preservation, if carried out, will affect the people living in the neighbourhood. He is told that he is "bound to enquire .....into the existence of any right or practice, though no formal claim may have been presented." All this would be impracticable if he were hampered by the Civil Procedure Code. There is nothing either in the Act or the Instructions about legal easements, and a long course of practice has made it clear that, as the reservation of a forest is a restriction on the general liberty of the public in respect of the area reserved, the business of the Forest Settlement Officer is to decide how far the proposals of the Forest Officer need to be modified, in order that the people living in or near the reserve may suffer as little inconvenience as possible. The necessity for this is not sentimental at all. As the discontent of the Constantinople proletariat used to be shown by burning bakers' shops, so the discontent of the people living near reserved forests has often been shown by disastrous forest fires. The discretion of the Forest Settlement Officer as to procedure is, very wisely, fettered as little as possible, but what goes far to meet your views on one point, his orders are *all* expressly subject to the confirmation of the Chief Commissioner, and are only confirmed with such modifications as the Chief Commissioner may decide to make, after considering the objections of the Forest Officer, and the criticisms of the Deputy Commissioner, Commissioner and Conservator.

The people affected by Forest Settlements are mostly ignorant and illiterate villagers, and to confiscate their rights and privileges, merely because they cannot fight for them in the manner prescribed by the Civil Procedure Code, or because our law, ignoring many things, also ignores such rights as theirs, would be a gross injustice, all the more revolting because it is perpetrated under the forms of law. Rights and easements, in the legal sense of these words, are often legal quibbles at best, and the *work of a*

Forest Settlement Officer is rather that of an administrator than of a judge. After he has found out all that the law allows him to do, he has next to find out what he ought to do. Things may be lawful which are not expedient. He must not, like the bailiff in Fielding's novel, "spare his conscience exactly according to law," or, if he does, he assuredly fails to carry out the wishes of the Government of India.

An excellent Conservator of Forests, in a private letter to me 6 months ago, demonstrated that there was nothing in the law to prevent the Chief Commissioner of Burma, prohibiting Ya cutting at once in nearly every part of Burma. He was quite right. But what is lawful is not expedient. To prohibit Ya cutting at once in nearly every part of Burma would be "Government by blind man's buff." It would mean an immense amount of suffering and many deaths, and no Chief Commissioner would ever dream of doing it. The law does not forbid such a thing; but common-sense and justice forbid it.

So much for the legal question. I am quite aware why Forest Officers are anxious to limit the powers of Forest Settlement Officers. But errors in Forest Settlement, so far as these are due to Forest Settlement Officers, are to be avoided by Forest Settlement Officers learning more about forests, and the uses of them and need for them, rather than by Forest Settlement Officers being confined to the automatic functions of a kind of Notary, recording "legal" rights. For instance, if the people of a village have been in the habit of resorting to a forest for house posts, and the supply of houseposts in it is limited, and is needed by many other villages besides those that have rights in it now, the fairest plan to all concerned is to give rights to the villagers that now resort there, but only to such a limited number of large trees as, with the use of the saw, might be made to suffice, rather than to the number, probably 10 times as many, which they would need if they did not use the saw. Small fees might or might not be expedient, according to circumstances. On the other hand, if a village were left in the heart of a reserve, it would be expedient to treat it very liberally were it only to secure the good-will of the villagers and prevent forest offences. Similarly as to Ya-cuttings, and to stop it peremptorily, "by a cold dastard spurt of the pen," and leave people to starve would be legal murder. But by various judicious arrangements, grants of lands, remission of trees and agricultural loans, I think that if necessary 100 of the people who now devastate the forests by Ya cutting in Burma could be induced, within a few years, to take to permanent cultivation; much to their own benefit, as well as to the benefit of the forests, and the country generally. This is already being done in some parts of Burma. Progress in this way is gradual, but it is real progress and, above all, it is the rigorous condition precedent of the extensive preserves that yet remain to be made in many parts of Burma. It is,

we may be sure, only in some such way as this that the Local Government or the Government of India, will allow Ya cutting to be stopped, however lawful it may be to stop it to-morrow by a paragraph in the *Gazette*.

The successful reservation of large areas of forest is essential to the permanent well-being of Burma, and particularly of Upper Burma, and can be managed by degrees, not only without hardship, but even with great benefit of the people concerned, and with little trouble ; *provided it be done before any large influx of Indian immigrants takes place.* But the work will be done, if at all, by Forest Officers and Forest Settlement Officers studying the country and not the Civil Procedure Code, and—I hope you will not be grieved to hear it—that is what most of them are doing.

RANGOON, *23rd May, 1895.* } DAVID WILSON, *Forest Settlement Officer.*

NOTE.—We hope to have something to say about this letter later on, the writer having apparently not fully understood the position advocated in our Note.—HON. ED.

Compounding Forest Offences.

SIR,

In a recent notification of the local administration the following officers are empowered to compound forest offences, *viz* :—The Chief Forest Officer of the Province, all Deputy and Assistant Conservators, Extra Deputy and Extra Assistant Conservators when in charge of forest divisions, and all Deputy Commissioners and subdivisional officers.

Under this rule, a man convicted of having committed a forest offence was allowed by the Divisional Forest Officer the option of compounding, or of having his case taken into court, and chose the latter alternative. After the case had been partly heard, he expressed his willingness to compound before the Deputy Commissioner for half the sum fixed by the Forest Officer, and without consulting the latter, the Deputy Commissioner, as *district head of the Forest Department* (the Forest Officer being his Assistant in forest matters), accepted the sum offered and compounded the case.

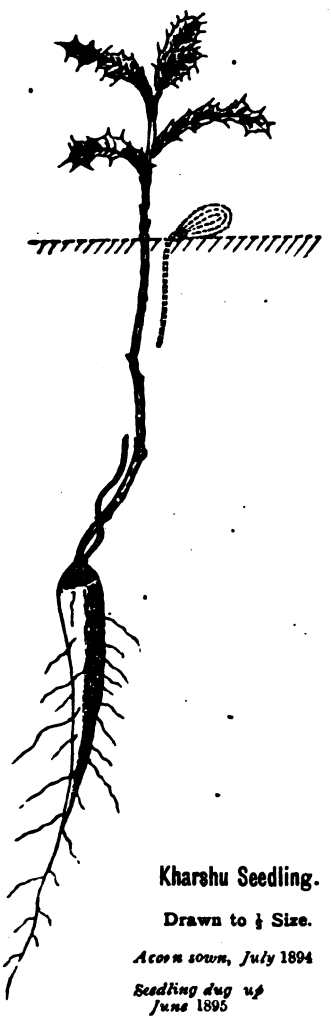
I should like to know whether any ruling exists on the point involved, *i. e.*, whether an offender may, after formally refusing to compound a case before one officer empowered to accept compensation, afterwards do so before another officer similarly empowered, without the consent of the former having first been asked for and obtained? In the event of this practice becoming general, forest offenders will, undoubtedly, where the District Magistrate has the reputation of looking leniently on offences of this class, refuse to compound before the Forest Officer, and afterwards do so before the Magistrate. This will lead to cases being taken into Court by the Forest Department, and having finally to be dropped on com-

pensation being accepted by the Magistrate, and the trouble and expense of procuring the attendance of witnesses, as well as the loss of time of the forest officials engaged in the prosecution, will be needlessly incurred.

It will be noticed further that not Deputy Commissioners only, but also subdivisional officers, to whom the Forest Officer can in no sense be considered subordinate, are invested with this power, the use of which ought surely to be subject to some restriction.

ASSAM.

Germination of Kharshu.



Kharshu Seedling.

Drawn to ½ Size.

Acorn sown, July 1894

Seedling dug up June 1895

DEAR SIR,

My best thanks are due to Mr. Keshavanand for his reply in your April number to my note on the apparent failure of the Kharshu sowing on "Cheena" in July last.

On Monday I found an opportunity of visiting the nursery, which had been given up as a complete failure in October last, and found that matters were exactly as Mr. Keshavanand expected they would be. Seedlings were sprouting up all over the place, some only just appearing above ground, others with several pairs of leaves already developed.

The accompanying sketch may serve as an illustration to Mr. Keshavanand's descriptive account. I was unable to dig out a seedling with the acorn still attached to it; but the shrivelled up acorn lying on the surface of the ground alongside of the seedling with the remains of the root-like process running down for an inch or two into the soil, and a similar dried up filament inserted at the top of the root proper, left no doubt of these processes having originally been united to each other. The acorns were sown in July, so that the seedlings are now just a year old.

The object of this elaborate method of reproduction is pretty evident. The Kharshu acorn being, relatively, such a large seed, and ripening and falling, as it does, in the rains when fresh

grass and other herbs form a dense covering to the ground, has very little chance of getting nearer than 3 or 4 inches to the soil; so that its first business is to set up a connection with the soil, and then transfer the germ seedling with all its store of food materials down to a secure resting place. With such a firm basis to start from, the seedling has a much better chance of survival than if it began its upward growth directly from the acorn, and with a delicate twisted tap-root, often externally as much as six inches long, for its only connection with the soil.

NAINI TAL,
12*th June*, 1895. } F. A. LEETE.

III—OFFICIAL PAPERS & INTELLIGENCE.

Cutting of Bamboo Shoots in order to favour Teak.

We hear that an experiment is on foot in Burma in which the bamboo shoots of the year are being cut out as they appear in the hope that the parent clumps will die, and that their death will be followed by improved growth of the suppressed teak seedlings which abound in the bamboo areas. It is well-known that the exceedingly rapid and thick growth of bamboo clumps is one of the greatest obstacles to the extension of teak in the forests of Burma. The removal of bamboo clumps artificially would be a work of such magnitude as to be prohibitive. So that it is only when general flowerings and the general death of the bamboo clumps take place and are followed by fire that teak seedlings get a chance. This, however, only happens at long intervals, so that any operation which can be easily and cheaply carried out in order to lessen the time necessary, is likely to be of value. We should be very glad to hear more of the experiment and the results that have so far been obtained from it.

IV.—REVIEWS.

The Timber Trades Journal.

The twentieth annual number of this well-known Journal is a volume of some 200 pages, containing all kinds of information regarding the trade of the United Kingdom and the colonies. The numerous illustrations demonstrate the progress made in wood-working machinery, extensions of docks, saw-mills, and other matters, necessary for the merchant, importer and dealer.

We notice that there is an advertisement for East Indian Padouk as a high class wood suitable for furniture, veneers, house and ship-building and railway carriage work. There is an

interesting article on mahogany and logwood cutting in British Honduras from which we extract the following :—

"The mahogany hunter is the first to commence operations. 'He must be a good bushman, for it is no easy task to find your 'way about in these pathless forests. When a sufficient number of 'trees have been found, a main road, or 'truck pass', as it is called, 'is cut, and from it bye-roads, or 'wing passes,' are made to each 'log. This work is done by the old gang in the latter part of the 'year. The new gang of mahogany cutters, cattle-drivers, 'bread-'nut'-cutters, and pitpan-hands, is hired at Christmas time, when 'all hands come down to Belize to have a spree and spend their 'year's wages. The gang goes up to its destination in dug-out 'crafts, called 'pitpans' and 'doreys,' and may be expected to 'get to work about the middle of January. Then roads are 'finished, and everything got ready to begin trucking as soon as the 'ground is dry enough, which may be hoped for about the end of 'February or the beginning of March. Most of the falling is done 'by negroes, or Creoles, as they are usually called, in contra-distinc-'tion to Spaniards, Caribs and Indians, and they are splendid 'axemen. The spurs of the tree reach up to 8 or 10 ft. from the 'ground, and a "barbacue" has to be made to let the axemen get 'at the trunk above them. This is a platform of the roughest 'description : two long forked sticks are planted in the ground, 'inclined to and supporting each other. In them the ends of two 'stout sticks are placed, and the other ends inserted in a piece of '' tie-tie,' or vine, bound round the trunk ; one stick on each side 'of the tree. The man stands, straddling, on this frail structure 'and chops very much at his ease. He will fall two or three good-'size 'sticks' for his day's task. The log is roughly squared in 'the bush, and sawn into convenient lengths for the truck. This is 'very much like an ordinary timber waggon, roughly built, and 'with wheels cut out of the solid heart of some hard wood. It is 'drawn by a 'set,' or seven pairs, of cattle. The trucks usually 'have three drivers each, and set out on their trips about midday, 'going on very slowly, on account of the heat, to the loading-place. 'With skids and ropes, and much screaming and shouting, the great 'log, weighing, perhaps, three or four tons, is got up on the truck, 'and despatched on its journey to the 'Bank.' Soon after dark 'the drivers carry torches of pinewood, and it is a picturesque sight 'to see them coming along with their flaring lights through the 'inky blackness of the forest night. Very often the road is so hilly 'and steep that two teams have to be joined together to help over 'the difficulty. The descent of such places is managed by putting 'all the cattle, except the "tongue steers." or wheelers as we should 'call them, behind the truck, against which they quickly learn to 'haul back with all their might and main. The cattle are watered 'twice, and fed three times a day on bread-nut (Brosimum ali-'castrum), a forest tree with leaves glossy and dark green in colour, 'shaped something like a bay-leaf, only larger. It is most

'excellent fodder, and cattle thrive upon it once they have got used 'to it. This tree can be left quite bare one year, and the next will 'have an abundance of leaves again. Arrived at the 'Bank,' the 'log is unloaded close to the river, to await the flood which is to 'take it down to Belize. When the rains begin in the month of 'June, trucking has to be given up, and the smaller wood, which 'may be still left in the bush, is brought out on "slides," which 'run pretty easily till the mud gets too deep. In construction they 'are much like the freight sleighs used in Canada in winter time. 'Towards the end of June the first flood may be looked for; and 'this may rise 10 to 40, or even more, feet in height. The wood is 'now heaved into the river, each log being started by itself on its 'long journey to the sea. Two or three men go ahead in a 'dorey' 'to stop them at the place lower down the river where they are to 'be rafted in comparatively smooth water. The foreman, or captain 'of the gang, follows behind the logs to haul stragglers out of bush, 'or off snags, or sandy spits, and send them on their way again. 'This is called 'driving mahogany.' The wood, when it reaches 'Belize, is hauled up on its owner's and wharf; prepared for shipment 'with a broad short-handled axe, called a "beating-axe." So 'skilfully is this done, that the surface looks as though it had been 'sawn. A few years ago all the timber from Belize was shipped in 'sailing vessels, chiefly Norwegian; now this is all changed, for the 'London and Liverpool lines of steamer carry the bulk of the export. 'The annual amount of this varies very much with market prices, 'but it is stated in the Honduras Handbook to have risen as high as '13,719,075 ft. in 1846, and to have fallen to 3,146,582 ft. in 1878. 'The normal quantity is believed to be about 6,000,000 ft. As 'regards the future, the outlook for the mahogany business of this 'colony is anything but cheerful; and two causes will, it is believed, 'operate to greatly restrict it. One is the enormous quantity of 'inferior West African wood now flooding the market, which 'owing to peculiar local conditions of labour, can be produced at 'a price with which it is impossible for Honduras to compete; the 'other is the change from silver to a gold standard of currency which 'has recently been carried out here. Prior to this the mahogany 'cutter realised a considerable profit by the sale of his drafts against 'shipments, which helped to cover some, at any rate, of his loss on 'his wood. This year the number of gangs at work were fewer 'than usual, but next year it is said it will be very small indeed."

Another article, possibly more interesting to the 'Indian Forester' is that on Australian hardwoods, especially Jarrah and Karri. A consideration of timbers leads up to the important question of street paving material, and here we cannot do better than extract a few paragraphs :—

"An undeniable proof of the superiority claimed for wood 'paving is in its adoption, to so large an extent, in London and in 'many of our large provincial cities. The softwoods make a splen- 'did road surface, and fulfil most of the functions demanded, but in

'one most essential point they have failed. The soft fibre gives way 'too readily, and although the blocks have in some instances been 'subjected to especial treatment to ensure greater stability, this has 'only proved partially successful; the pores are closed up—this 'tends to create dry rot—the nature of the wood asserts itself, the 'surface gives out too soon and wears unevenly; it freely absorbs 'liquid, becomes sloppy and slippery in bad weather, and, all too 'soon, this class of paving requires frequent repairs; it must be 'taken up and relaid in too short a time to be compatible with an 'economical point of view.

'Here is the application, to a good use, of Australian hardwoods; 'an immense field of utility lies open for a timber that in the form 'of paving blocks can solve the paving problem. Many of them 'have been tried, and here again karri and jarrah assert for them- 'selves a marked individuality, they have been laid in many parts 'of London and in other towns, and *with them the nearest approach 'to the perfection of street paving has been achieved.*

'More than 10 million blocks of Australian hardwood have 'been laid in London streets; a large proportion is jarrah. It was 'not until 1888 that karri made its appearance here as a paving 'material; it was laid at the same time as jarrah and softwood in a 'portion of King's Road, Chelsea. The karri blocks were cut 'only 2⅛ in. wide (they should be not less than 3 in.); in 1893 the 'evidence of wear proved the hardwoods to be superior to the soft- 'woods to a most surprising extent. In February, 1893, these two 'hardwoods were laid in Euston road, side by side with yellow 'creosoted deal; where the hardwoods showed only ⅛ of an inch 'wear the deal blocks had worn ⅞ of an inch.

'In recognition of the extent to which this branch of our sub- 'ject bears so directly upon a matter of public welfare, I may 'presume to take advantage of the opportunity by devoting more 'time to the special adaptability of hardwoods for street paving 'purposes than upon some of the other uses to which they may be 'applied.

'It has been found in places where these blocks have been laid 'with open joints or with uneven foundation the results have not 'been so satisfactory as when laid with close joints, but it is to 'be borne in mind this is from no defect or fault of the timber used.

'Near the West Strand Post Office it was found that pine 'pavement, laid in 1889, was worn through in twelve months. In 'September, 1890, jarrah blocks were laid; they were removed in 'September 1893 (having worn only 2¼ inches in three years). 'Karri blocks are now being tried in this position, they have now 'been down twelve months and are said to be lasting better than 'the jarrah. At this place it is noted 400 busses pass in an hour 'in addition to other traffic. Whatever material may be found to 'bear so severe a test with satisfactory results will earn distinction 'and renown.

'In the Lambeth district an experimental piece of hardwood 'paving, put down nearly three years ago, shows the difference 'between the wear in jarrah and karri to be very slight. Both 'have preserved an excellent surface, and outwear the softwood laid 'to a remarkable degree.

'Karri blocks have been laid in the City of London, on a gradi-'ent of 1 in 27, in Queen Street approach to Southwark Bridge; 'this pavement has proved to be dry and not slippery when the 'adjoining soft-wood, retaining more moisture, is both slippery and 'dangerous.

'It is found to be necessary to put a small sprinkling of sand 'or gravel upon the hardwood blocks only in frosty weather, and 'not in such quantities, or so frequently, as upon softwood pavement, 'therefore a much cleaner surface can be maintained at less cost.

'In a question bringing such important issues to bear upon the 'welfare of great communities, due regard is to be paid to the res-'pective claims made on behalf of the various paving materials now 'contesting the position of supremacy.

'The good qualities so far displayed by well constructed hard-'wood paving, laid with close bituminous or pitch joints, on a good 'foundation, entitle them to a fair and exhaustive trial in all condi-'tions under which the merits of the best of paving materials are to 'be established.

'A word of advice may be given to the producer; it is that 'more care must be exercised in the cutting, seasoning, and select-'ing of all timber intended for the European market. It must be in 'good condition, and the best of its kind. Complaints are made about 'samples having been sent off in a green condition unfit to stand 'the ordeal of a voyage through the tropics, the result being that 'they are condemned on sight. A bad impression once created is 'not easily got rid of."

With this article is given an interesting picture of a Karri forest.

Further on it is stated that the East India Forest Department are preparing to exploit the market with their native hardwood "Pyingado," which is said to possess peculiar properties for paving purposes. In this connection we should like to see a trial made of the wood of *Mesua ferrea*, the Nahor of Assam. It grows in large quantity within easy reach of the finest waterway in India, and the export would present no difficulty.

Indian Museum Notes, Vol. III. No. 5.

This new part of the Notes begins with a retrospect by Mr. E. C. Cotes of the work done during the last ten years by the Entomological section of the Indian Museum. He gives an account of the condition the collections were in in 1884, and of the gradual improvement which took place between that time and

1894, when he himself left the museum for other work. The chief point of interest, of course, so far as we are concerned, lies in the progress of Economic Entomology ; and Mr. Cotes gives an account of how in 1888, on the suggestion of Sir Edward Buck, the investigation of that branch of work was made a regular part of the business of the Entomological section, and the publication of results in the form of the Indian Museum Notes determined on. Three volumes of the publication are now nearly completed, and contain a large amount of most valuable information, brought together and recorded by Mr. Cotes' own exertions and affording basis for a future exhaustive work on the insects which are useful, like the silk moths, bees, lac-producers, &c., and on those which are harmful to the crops and the forests. Mr. Cotes has now left entomology to take up work of a quite different character, but we hope that the researches will still go on, that the Trustees of the Museum will find some one just as enthusiastic to continue them, and that we shall periodically see new volumes of the 'Notes' appear as full of interest as those which have gone before. The present part contains much that is of interest to us as Forest Officers, and we purpose, as usual, to give some extracts from the notes on insects connected with forest work or investigated by Forest Officers.

The first insect discussed is the 'Potu,' that well-known pest of the hills of the North-West Himalayas, and we think it best to reproduce the whole of the account given of it :—

"THE POTU FLY.—In July 1893 specimens of the Potû fly 'collected in the previous May by Mr. C. G. Rogers, at an elevation of about 3,500 feet in the Tons valley of the North-West 'Himalayas, were forwarded by the Director of the Imperial Forest 'School, Dehra. Careful comparison of the specimens with the 'late Dr. Becher's figures and description of his *Simulium indicum* 'from Assam shows them to be identical with this species.

'The insect is noticeable on account of its relationship to the 'notorious "black fly" (*Simulium molestum*) of the North American continent. It is said to be very troublesome in the North-'West Himalayas, but little beyond bare technical description of 'the species has hitherto been recorded. A series of questions 'were therefore submitted to the Director of the Forest School 'with a view to eliciting such information as might be forthcoming from the forest officers stationed in the School circle. From 'the replies kindly furnished by Messrs. Gamble, Rogers, Moir, 'and Smythies the following points seem to be established.

'The Potû is so similar both in its bite and superficial appearance to the *pipsa* of Sikkim, as to make it likely that it is either "identical with or very closely allied to this form. In view therefore of the fact that the specimens from the North-west Himalayas agree exactly with Becher's figure of a specimen from 'Assam, the conclusion seems to be a justifiable one that *Simulium*

'*indicum* occurs in the intermediate ranges of the Himalayas. 'Both in the North-West Himalayas and in Sikkim the insect 'chiefly frequents elevations ranging from 3,000 to about 10,000 'feet. It has been noticed as specially common in Chir (*Pinus* '*longifolia*) and Deodar (*Cedrus Deodara*) forest, over newly dis- 'turbed soil, and where sheep and buffaloes have been camping, 'but is by no means confined to such localities.

'In the North-Western Provinces it is said sometimes to occur 'in such numbers that the air seems to be full of the flies, but it is 'less abundant in Sikkim where the climate is moister. The 'worst months are April, May and June, *i.e.*, the hot season, but 'the flies are not uncommon in the low valleys in February and 'March. When the rainy season sets in they usually disappear, 'and are not seen again until the following spring.

'The insect flies noiselessly, and its bite in the first instance 'is so painless that the creature is seldom noticed at work until 'its yellow and black body is to some extent coloured with the 'blood it has absorbed. It is then too late to do much good by 'brushing it away."

'It leaves a characteristic mark due to the presence of a little 'globule of blood, about the size of a pin's head, beneath the skin. 'The bite soon becomes irritable, but the effects vary in different 'individuals. Generally speaking, the irritation passes off in a 'few days, but in the case of new comers and persons in bad 'health it often causes troublesome sores and ulcers. Mr. C. G. 'Rogers writes: "This year my cook was so badly bitten at 'Saia that his whole face swelled up, and he was in great pain. 'Another of my servants was very badly bitten in the Upper Tons 'valley and got his legs so sore that he could hardly walk."

'The common method of treatment is to squeeze the blood 'out of the wound immediately, as this allays the intolerable itch- 'ing, though even then some swelling is usually produced. 'Deodar oil and Eucalyptus oil also are freely used for rubbing 'over the hands and face to keep off the insects which are most 'annoying where they occur.

'Dogs are sometimes bitten upon the nose by the insect so as 'to draw blood. Cattle and sheep also are thought to be attacked, 'but no definite information is available upon this point.

'Nothing has been observed of the life history of the insect, 'and, although the localities where it occurs are never very far 'from hill streams, it has not been specially noticed as prevalent 'near to water.

'From what is known of the habits of European and Ameri- 'can species of the same genus it is to be expected that the female 'lays her eggs in quick flowing hill streams, the larval and pupal 'stages being passed in the water.

'The specimens forwarded to the Indian Museum proved to 'be all females with mouth parts developed for blood-sucking,

'the male is likely to be a harmless insect with rudimentary 'mouth parts."

The next insect of forest interest discussed is the *Melasoma populi*, Linn, which was found in 1892 feeding on willows in the Jaunsar hills, chiefly on *salix elegans*. Mr. Cotes says of it:—

'Specimens of a Chrysomelid beetle found by Mr. C. G. 'Rogers on Deoban, North-West Himalayas, also a Tachinid fly 'parasitic on it, were forwarded in July 1893 by the Director of 'the Imperial Forest School, Dehra Dun. The Chrysomelid 'proved to be unnamed in the Indian Museum collection, but a 'careful comparison of it with Oliver's description of *Melasoma 'populi*, Linn, which has been recorded as feeding upon willow 'trees in Europe, did not disclose any appreciable difference 'between the two forms. It may be looked on, therefore, as 'belonging to this species. The parasite is a Dipterous insect 'which seems to be most nearly related to the genus *Masicera*, 'as represented in the Museum collection ; the specimen, however, 'is in too poor a state of preservation for satisfactory identifica- 'tion.

'The following information is taken from a series of rough, 'but most interesting notes made by Mr. Rogers. The larvæ of 'the beetle were first noticed on 9th June 1893 at Deoban, 9,000 'feet above sea level, in the North-West Himalayas. They 'ranged from 0·10 inch to 0·51 inch in length. The head was 'black, the body yellowish white with black markings. On the 'back were numerous paired glands from which little transparent 'globules of strong pungent-smelling fluid were extruded when 'the insect was touched. After a while the globules were drawn 'in again into the glands, but could be again extruded two or 'three times over, before the insect became exhausted. The 'odour, which is compared to that of prussic acid, scented the 'whole bush where they were feeding, and was a very characteris- 'tic feature of the insect. The larvæ which were kept in captivi- 'ty moulted but once before pupating. Pupæ were formed bet- 'ween 14th and 21st June. The chrysalis had much the same 'general markings as the larvæ. It remained partially enclosed in 'the larval skin. In nature the pupæ were found suspended from 'the undersurface of leaves and branches of the food plant. 'Beetles began to emerge on 22nd June and continued to appear 'in the rearing box until 27th June. They afterwards lived for 'about a week in confinement, but, as in this period they were 'carried down to Dehra Dun, elevation 2,100 feet above sea level, 'their ordinary period of existence in this stage is likely to be 'longer. Out of fifty-one larvæ and pupæ six were found to 'harbour grubs of the Dipterous parasite noticed above. The 'grub pupated inside the body of the beetle larva, flies emerging 'on 30th June."

The identification of insects for forest officers has been carefully carried out, as the following extracts will shew :—

"In September 1893 a Cerambycid beetle, identical with 'specimens in the Museum collection which stand under the name 'of *Xylorrhiza adusta*, Wiedm., was forwarded through the Dehra 'Forest School from the Conservator of Forests, Southern Circle, 'Madras. The insect was reported as ringing the branches of '*Wrightia tinctoria*, a habit which does not appear to have pre-'viously been noticed in connection with this species."

"Specimens of an insect which forms galls upon the spruce fir '(*Abies Smithiana*) in the North-Western Himalayas were for-'warded to the Museum in July 1893 by Mr. A. Smythies. The 'gall consists of an abnormal growth of the terminal shoot which 'becomes superficially much like a small fir cone. The insect is 'either identical with, or very closely allied to, the Aphid *Chermes* '*coccineus*, Ratz., which attacks fir trees in a very similar manner 'in Europe. Specimens have been forwarded to Europe for com-'parison with this form.

"At Deoban (9,200 feet above sea-level) Mr. Smythies 'observed the emergence of the winged imago on the 21st July. 'In the months of May and June immature specimens only were to 'be found.

'*Postscript.*—The specimens have since been examined by 'Mr. G. B. Buckton, F.R.S., who identifies them as belonging to 'the species *Chermes abietis* of Linnæus and Kaltenbach. A full 'account of the habits of this insect may be found in Mr. Buck-'ton's masterly work upon British Aphides, Vol. IV, pp. 24-33. 'The species is new to the Fauna of India.

'In August 1893 damage was again occasioned in the teak 'forests of Berar by caterpillars. The species most numerously 'represented in a somewhat heterogeneous set of caterpillars 'forwarded to the Museum through the Forest Department from 'Ellichpur, was *Hyblæa puera*, Cramer, which would seem to be a 'serious defoliator of teak. The caterpillars were first noticed on '7th June or nearly a month earlier than in the preceding year. 'They attacked the young leaves which were then just beginning 'to appear, but the extent of the damage does not seem to have 'been recorded.

"Two sets of caterpillars of the destructive species *Palyga* '*damastesalis*, Walker, were forwarded in October 1893 through 'the Director of the Imperial Forest School, Dehra, from the 'Ellichpur Division, Berar. From the local report forwarded it 'seems that the insect has been noticed as attacking teak in Ellich-'pur Division for the last three years. It appears in September 'and October, and is specially severe in pure teak forest. The for-'est ranger in charge of fellings Shembadole writes:—

"There was a very severe attack last year. This year the 'caterpillars appeared in less numbers either owing to heavy rains 'after the eggs were laid or to the hailstorm while the caterpillars 'were undergoing their third or pupal stage last year."

'Caterpillars reared by the same officer are reported to have 'been transformed into pupæ in the early part of October, the 'larval stage lasting for about a fortnight.

"In June 1893 a mass of matted silk containing numerous 'cocoons was received through the Provincial Museum, Lucknow, 'from the Principal, Thomason College, Roorkee, who wrote that 'every toon tree in the station was covered with it from base to 'top. The insect was reared in the Museum and proved to be the 'common toon borer *Magiria robusta*, Moore, which is figured in 'the *Notes*, Vol. I, Plate III. The caterpillar of this species tun- 'nels the terminal shoots of toon tree and in this way does a very 'large amount of damage. It habitually spins a cocoon, but the 'formation of a regular web would seem to be unusual.

"Moths reared from caterpillars found feeding upon Teak and 'Eucalyptus trees in Dehra Dun were furnished by the Director 'of the Imperial Forest School in October 1892. One of the speci- 'mens was found to be identical with a moth in the Indian Museum 'collection determined by Colonel Swinhoe as *Boarmia trispinaria*, 'Walker. It may be noticed that the series presented so large 'a range of individual variation as to include forms hitherto looked 'upon as distinct species in the same genus. These will no doubt 'eventually have to be brought together as varieties of some 'central type."

"In September 1893 specimens of the following insects were 'forwarded by Mr. F. Gleadow from Poona:—

'(1) A Pyralid moth which frequents *Bambusa vulgaris*, *Den- 'drocalamus strictus*, etc., but has not been noticed as occasioning 'any great damage. The species proved to be unnamed in the 'Indian Museum collection, so was forwarded to England for 'examination by Mr. F. Hampson, the able author of the first 'volume upon Moths, in the series of the *Fauna of British India*. 'Mr. Hampson has since identified the insect as *Botys cœlesalis*, 'Wlk=*vinoralis*, Wlk.=*itemalesalis*, Wlk.=*strenualis*, Wlk= *interpesalis* Wlk.

'(2) A Chrysomelid beetle belonging to the species *Calopepla*, '*leayana*, Latr., as determined in the Indian Museum collection.

'The insect was reported as cutting unsightly holes in the 'leaves of the Shivan tree (*Gmelina arborea*) but was not noticed 'as doing any great damage. It was said to be black in colour 'with red markings.

'In November 1892 the Officiating Conservator of Forests, 'Hyderabad Assigned Districts, reported that considerable damage 'had been done in the Melghat Forest by a boring insect which 'destroyed the tops of bamboo (*Dendrocalamus*) shoots, thereby 'arresting their growth. Specimens were forwarded to the Indian 'Museum through the Director of the Imperial Forest School, 'Dehra Dun. They comprised the following insects as determined 'in the Museum collection :—

'(1) *Estigmena chinensis*, Hope (Chrysomelidæ), two adults,
'(2) Coleopterous larvæ, two specimens, likely to be the im-
'mature form of No. (1).
'(3) Indeterminable Microlepidopterous larvæ, two specimens.
'Injured bamboo shoots were afterwards forwarded. The
'thicker portion of the stems had been tunnelled by some insect
'which may not improbably have been the Microlepidopterous
'larvæ noticed above. The tunnels, however, seemed insufficient
'to account for the death of the shoots.

'In May 1893 specimens of the fruit of *Garuga pinnata*, Roxb.,
'attacked by insects were forwarded to the Museum from Poona
'by Mr. Marshall Woodrow. The fruit was found to be tunnelled
'by numerous small Microlepidopterous caterpillars. Galls also
'were furnished which contained the remains of a species of
'Psyllidæ. The caterpillars were reared in the Museum, the moth
'emerging on 26th May. It proved to belong to the species
'*Conogethes punctiferalis*, Guén (Pyrales) as determined in the
'Indian Museum collection. The Psyllid proved to be new to the
'Museum collection so was submitted to Mr. G. B. Buckton, in
'England, who describes it on pp. 18 and 19 of these *Notes* as a
'new species of *Phacopteron* which he names *P. lentiginosum*.

'The following insects, as determined in the Indian Museum
'collection, were forwarded in July 1893 by the Director of the
'Imperial Forest School, Dehra Dun, from the forests of the
'North-West Himalayas:—

'(1) Specimens of the Cantharid beetle *Cantharis antennalis*,
'Marseul, found eating the leaves of *Lonicera angustifolia* and *L.*
'*quinqueloculuris*. The insects were taken on 16th June at Deoban,
'N.-W. Himalayas.

'(2) Specimens of the Scutellerid *Scutellara nobilis*, Fabr.,
'found feeding on the leaves of *Casearia tomentosa* at Kalsi on
'the Chakrata Road, Dehra Dun.

V.—SHIKAR AND TRAVEL.

Elephant Catching Operations.

SIR,

With reference to Mr. Marshall's letter, which appeared in the *Indian Forester* for May, I write to state that I have known three cases in which an elephant has managed to get out of a pit by itself. The pit was about 10 or 11 feet deep, but there was some 6 or 7 feet of brushwood in it. In two cases the animals were very large cow elephants of 8 feet or more: in the third case the animal was a tusker and escaped from the pit by goring one side with his tusks sufficiently to make a slope up which he walked out. In this case, a youngster had also fallen in the same

pit: it too escaped by the same path as the tusker. I agree with Mr. Marshall in thinking that a pit of 8 or 9 feet deep would be ample for capturing animals of the size we require, *i. e.*, not above 7½ feet high. I also adhere to my belief in bedding. During the last season of my tenure of charge in South Coimbatore I caused 12 new pits to be dug: the dimensions of these were 10 ft. by 10 feet, but the forester in charge of the work by mistake dug them with *vertical* sides, and not sloping as the rules of the Board prescribe. I do not attach, however, so much importance to sloping sides as Mr. Hadfield does, and although I had intended these new pits to be dug with sloping sides in accordance with the rules, I did not consider it worth while altering them from what I found them on my arrival at Mount Stuart. I mention this fact, as my last letter published in the May number of the *Indian Forester* seems to have conveyed an impression that no *new* pits were dug during my tenure of charge in S. Coimbatore, an impression which I did not intentionally mean to convey to any one, as I am quite prepared to accept all responsibility for the slight deviations from the Board's rules, and these deviations Mr. Bradley, the Collector of Coimbatore, at my request, informed the Board of some time ago.

PALAMCOTTAH,
24th June, 1895.

H. B. BRYANT.

VI.—EXTRACTS, NOTES AND QUERIES.

The Late Dr. H. F. C. Cleghorn.

The following extract from the *Scotsman* of May 17th, 1895, will interest all those Forests Officers who knew the late Dr. Hugh Cleghorn. We feel sure they will all join with us in regretting the death of a veteran forest officer, who did so much for forestry both in India and in his native Scotland :—

"The death is announced of Hugh Francis Clarke Cleghorn, 'M. D., L.L.D., F.R.S.E., F.L.S. &c., late of the Madras Medical 'Service, which took place at his estate, Stravithie, Fifeshire, last 'evening about half-past six o'clock. Dr. Cleghorn was born in 'Madras on the 9th August 1820, his father then being Administra-'tor-General in the Supreme Court. Brought up at Stravithie, Dr. 'Cleghorn as a boy was trained to rural pursuits and rendered 'familiar with agricultural routine, and these early lessons no 'doubt led to that love of flowers and trees which became so pro-'nounced in his after life. He was educated at the High School 'of Edinburgh and at the University of St. Andrews. On leaving 'college in 1837 he was apprenticed to Professor Syme for five 'years, and held in the last year the position of one of the house 'surgeons of Edinburgh Royal Infirmary. After graduating in '1841, he proceeded, at the age of twenty-two, to Madras, where he

'was attached to the Madras General Hospital to study Indian 'diseases, and in this post, which entailed a life of constant march- 'ing here and there with regiments, he had many opportunities for 'studying the native languages and of extending his botanical 'knowledge. In 1848 he came home on sick leave on the *Sutlej*, 'which was wrecked, and it was with difficulty the passengers 'were landed at Cape Town. After a short residence in Great 'Britain, during which he assisted in the preparation of the cata- 'logue of raw products for the great Exhibition of 1851, Dr. 'Cleghorn returned to India. His attainments in botany had by 'this time attracted attention, and he was appointed Professor of 'Botany at Madras. In 1855, the Governor of Madras, Lord 'Harris, requested Dr. Cleghorn to undertake the task of organis- 'ing a Forest Department, so that the wasteful system of native 'cultivation known as "koomri," which led to great devastation of 'the woodlands, might be checked. He visited Burmah and other 'parts of the country in connection with his inquiries, and presented 'a preliminary report to the Government embodying the scheme for 'a Forest Department—afterwards to become so important in India. 'In 1861 he returned to Scotland and married Mabel, daughter of 'the late Mr. Charles Cowan of Penicuik, and formerly M. P. for 'Edinburgh. On his return to India, he and Sir D. Brandis were 'appointed Joint Commissioners for the Conservancy of Forests; and 'at the request of Lord Canning, Governor-General, Dr. Cleghorn 'spent three years in examining the forests of the Himalayas, 'including Cashmere and the trans-Indus territory. Through such 'labours a systematic plan of conservancy and management was 'instituted. In 1867, when Dr. Brandis returned home, Dr. 'Cleghorn acted as Inspector-General of Forests. Finally, in 1869 '—his father having died in 1864, leaving the family estate to him '—Dr. Cleghorn retired from the Indian Service, and his conscien- 'tious and able work while a member of it was acknowledged in 'a minute of the Government, which said:—"His long services 'from the first organisation of forest management in Madras have 'without question greatly conduced to the public good in this 'branch of administration; and in the Punjab also Dr. Cleghorn's 'labours have prepared the way for the establishment of an efficient 'system of conservancy and working the forests of that province." 'On the return to this country, Dr. Cleghorn, on account of the 'serious illness of Professor Walker Arnott, was unexpectedly 'called upon to conduct the Botany class in the University of Glas- 'gow, and gave a complete course of lectures on systematic botany 'which were much appreciated. Settling at Stravithie, he subsequ- 'ently devoted himself to the life of a country gentleman—taking 'his share in the management of local business and endeavouring to 'forward every philanthropic movement in the country. As a Justice 'of the Peace and a prison visitor, he was especially interested 'in efforts to give discharged prisoners a start in life again. His 'favourite pursuits were not neglected, and among the first things

'he did was to plant in the grounds at Stravithie a collection of 'rare pines and shrubs which, since they have grown up, have been 'considered worthy by botanists and arboriculturists of special merit. 'He was a member of the Edinburgh Botanical Society and pre-'sident for several years of the Royal Scottish Arboricultural So-'ciety, by the members of which he was held in the greatest love 'and esteem. For many years, likewise, he selected candidates for 'the Indian Forest Service, and was Examiner in Forestry to the 'Highland Society. He was an active promoter of the Forestry 'Exhibition held in Edinburgh in 1883, and on appropriate 'occasions he never ceased to rouse public attention to the necessity 'for systematic training of forestry students in this country. To 'his exertions were largely due the founding of the Forestry Lec-'tureship in the University of Edinburgh and the promotion of a 'scheme for the establishment of a Forestry Chair, the latter of 'which has not yet come to fruition. He was a witness who gave 'important evidence before the Forestry Committee of the House 'of Commons. In 1885 the University of St. Andrews bestowed on 'him the honorary degree of Doctor of Laws, and in 1888 a large 'number of his friends presented him with his portrait in apprecia-'tion of his service to the cause of arboriculture in India and in 'this country. The sum of £200 over was, at his request, devoted 'to forming a Hugh Cleghorn Forestry Library in the Museum 'of Science and Art in Edinburgh. In private life, Dr. Cleghorn, 'quiet, gentlemanly, and unassuming in his ways, was greatly es-'teemed by all with whom he came into contact. Dr. Cleghorn's 'sister married Mr. Alexander Sprot, eldest son of Mr. Mark Sprot 'of Garnkirk, and their son Major Sprot, is the heir, and succeeds 'to Stravithie.—(*Scotsman*)."

Obituary. H. Moore.

We regret to hear of the death in England of Mr. H. Moore, Deputy Conservator of Forests, who had been recently invalided from the Central Provinces. Messrs. Moore and Hooper were the first two students, who for their early apprenticeship in France, were placed under the immediate tuition of M. Broillard, to whose thorough instruction in practical sylviculture so many of our Indian Foresters owe their success in the Department. Unfortunately, Moore's constitution was unfitted to withstand the exposure and hardships of service in Central India, and his health failing all too soon after his arrival in India, he has only dragged on through an uneventful career of 20 years, his periods of service being constantly interrupted by terms of severe illness and sick leave.

Good and bad Turpentine.

We reprint the following extract:—"India is rich in trees 'that might be made to yield turpentine and resin—and imports 'turpentine from America. On its way out *viâ* England it is 'largely doctered with kerosine, naphtha and benzoine. When 'it gets to India it is further improved upon in the bazar, and 'now that the traits of the pure article have been so long unknown, 'a trade organ says:—'If on occasions really genuine turpentine 'is offered for sale, buyers fight shy of it on the idea that such an 'unwonted material must be bad."—(*Indian Engineering*).

This was what would seem to have happened to the turpentine manufactured in Dehra Dun. Samples sent to Calcutta were examined and very doubtfully reported on; and it seemed as if the Merchants fought shy of it as it was too pure. Their doing so did not matter much, as the demand in Upper India so far exceeds considerably the supply that can be obtained until better communications have been established with the Upper Tons forests.

Management of 'Minor Forests' in Madras.

The following extract is from the Report of an interview which a representative of 'Commerce' had with Mr. C. Krishna Menon, the Lecturer on Agriculture at the Sydapet College, Madras, who was in England on leave during the winter.

We have always been of opinion that 'village forests,' such as the Forest Acts provide for, might be more largely established than they are, and that perhaps by degrees the responsibility of management might teach the villager the necessity for husbanding forest resources better than many orders of Government:—

"Have you anything further to propose?"

"Yes, certain proposals dealing with the forests. Not that 'I want to say a single word against the Forest Department. It 'has done an immense amount of good. But there are certain points 'in which a revival of the old communal spirit might enable the 'villagers to look after their own requirements in the matter of 'fuel and fodder reserves."

"I shall be glad, Mr. Menon, of some particulars."

"You shall have them with pleasure. We are only concern-'ed with minor forests and pasture lands. Minor forests are 'scarcely forests in the true sense, but they grow plenty of inferior 'trees, useful for fuel and for ordinary farm tools. A great dan-'ger to Indian agriculture lies in the scarcity of fuel. Cattle dung 'is used for fuel, and thus there is a lack of manure. Now I think

'the Board, whose formation I have been advocating, should have 'charge of such forests, and look after the interests of the people 'of the villages, and see that they have a proper supply of wood 'fuel. As regards the pasture lands, the Government of India 'have already declared that 'it will generally be possible to lease 'or otherwise manage the unoccupied lands of villages through the 'agency of the community.' Nothing more can be wanted than 'that the responsible officers shall carry out the instructions of the 'Government."

English Timber Supply.

Mr. A. D. Webster's letter, dated February 27th, drawing attention to the present low prices of forest produce has not yet been answered in *The Daily Chronicle*, but Mr. Webster has repeated his advice to landowners not to plant, in a recent number of the *Timber Trades Journal*, and it therefore seems necessary that something should be said on the other side of the question. The fall in prices is felt everywhere, and is chiefly due to the cheapening of transport, notably by sea, and the consequent opening out of remote forests to the timber trade, of which the British Isles are the centre, and regulate prices throughout the world.

All countries, except perhaps Germany and Scandinavia, either produce insufficient timber for their own requirements, in spite of their excellent system of forestry, as in France, or as in North America and Russia are wasting their forest resources on a gigantic scale and without any care for the future. Our annual imports of timber of about 6,000,000 loads, of 50 cubic feet each, the produce of as many acres, is steadily increasing, and imports of timber are increasing in France and other countries insufficiently stocked with forests.

In spite, therefore, of the present fall in prices, which is only due to temporary causes, we have to deal with an increasing consumption and decreasing production of an article which it takes scores of years to mature. Anyone planting at present cannot hope for any return, except from thinnings and underwood, for the next thirty to sixty years, and present prices of timber have nothing to do with those which will then rule the market. Unless former generations had planted or protected their forests, where would our present supply of timber be, and what will our descendants do unless we plant? The prices of timber during 1894, as given by the *Timber Trades Journal*, were as follows :—

	Per cubic foot.		Per cubic foot.
Oak ...	6d. to 2s. 6d.	Beech ...	4d. to 1s. 4d.
Ash ...	8d. to 2s. 6d.	Elm ...	6d. to 2s. 0d.
Sycamore	6d. to 3s. 0d.	Larch ...	6d. to 1s. 6d.
Spanish Chestnut ...	8d. to 1s. 6d.	Scotch Pine	1½d. to 0s. 9d.

The great variations in the price of timber at different places throughout Great Britain are due to differences in quality and in local demand, and in many cases to the high inland railway rates, whilst foreign timber, sent at reduced rates, direct from a port to the place of consumption is unduly favoured. Mature oak, ash, sycamore, Spanish chestnut, and larch are everywhere in demand locally, as in the Chiltern Hills, and the same applies to elm. The low prices quoted for Scotch pine are due to the market being temporarily glutted by the millions of trees which have been blown down in Scotland. This wholesale destruction of the Highland forests is admitted by the Scotch Arboricultural Society to be due to a disregard of sylvicultural rules in planting and felling, and their annual excursion this year is to Germany, where the Scotch foresters hope to study the proper system of protecting their forests against gales.

Another reason for bad prices of home as compared with foreign timber is that much of it is grown for ornament, game preserves, shelter, and not for economic purposes; being of inferior quality, it cannot possibly compete with the fine picked timber which is sent us from abroad. Until our woods are rationally managed, they cannot be remunerative, one of our chief defects being the absence of a steady annual supply from each forest which would enable merchants to make proper arrangements for conversion and transport.

To show that, in spite of low timber prices, which are, however, better in the British Isles than in any other country, forests can still be made to pay their way, I give the following average results of the last ten years for three Crown forests, the figures having been kindly supplied to me by Mr. E. Stafford-Howard, the Commissioner of Woods and Forests:—

	Average Annual Receipts.	Average Annual Expenses.	Net Revenue.	
			Total.	Per Acre.
ESHER WOOD Oak standards mostly self-sown over ash, hazel (area in acres, 849) and other coppice.	£ 881	£ 438	£ 443	£. s. d. 0 10 5
HAZLEBOROUGH WOOD— Oak standards probably planted 1830-5 (area in acres, 489). Underwood of no value.	789	253	536	1 1 11
SALCEY WOOD— Oak standards probably planted 1832-46 (area in acres, 1,260). Underwood, ash, and hazel of little value.	1,730	678	1,052	0 16 8

All conceivable charges, such as local rates, receivers' commission, erection of cottages, &c., have been included in the expenses, and the oak-bark in the Esher wood, as well as the lop and top, is given to the purchaser of the standards, so that the present low value of oak-bark has not affected receipts materially.

Some of the best beech-woods in the Chiltern Hills yield a net profit per acre of £1 2s. 6d., after paying rates, taxes, and all other expenses. It is everywhere admitted that larch plantations pay well, provided they escape disease; so do those of Spanish chestnut and ash. The owner of the Welsh fifty-six-year-old larch plantations, which were recently sold at £90 an acre, has replanted his land.

The above facts tend to show that neither the State nor private landowners who own waste lands are justified in leaving them unplanted, provided the work is intelligently done. Future generations will certainly require timber for railway sleepers and carriages, for house, ship, and boat building; for barrels, casks, and packing-cases; for machinery-frames, carts, and furniture; as well as underwood for hurdles, hop-poles, clothes and orchard props, broom, bean and pea sticks, &c—I am, &c.,

W. R. FISHER—*In 'Daily Chronicle.'*

The Preservation of Timber.

There is about to be introduced into this country a process of preserving timber which has been for some years in operation in the United States, the details of which have been worked out by Colonel Haskin. Ordinarily the treatment of timber, to obviate decay, consists in the application, after being dried, of some antiseptic—chloride of zinc, sulphate of copper, bichloride of mercury, and, much more extensively, creosote. But Colonel Haskin believes that the timber in its green state has in itself the properties essential to preservation, and the process associated with his name is designed to utilise those properties. The wood in its green state is placed in a large air-tight vessel, and is there subjected to an air pressure, varying according to the timber, from 150 lb. to 200 lb. to the square inch; and this air is dried first, and heated by passing through pipes over a stove, the ultimate temperature being from 200 deg. to 450 deg. Fahr., according to the nature of the wood. The effect is said to be a chemical change in those compounds—albuminous, glutinous, resinous, or oleaginous—which constitute the sap of the tree, so that the fluid matter becomes insoluble, and coagulated in the pores, preventing decomposition. This result is attained in about eight hours' treatment for, say, a mahogany log 12 in. thick, the time varying with

the thickness. The process has thus the merit at least of great rapidity, but time alone is the arbiter of its preserving qualities. Several specimens are being exhibited at the company's office, 2 Dean's-yard, Westminister, and they seem homogeneous, while some polished slabs, particularly of pitch pine, gain in the richness of grain, due to the fact that the resinous compounds are present in all their natural richness, although, of course, prevented from exuding by reason of the process to which they are subjected, and which is not unlike roasting, or rather boiling an egg. *America Cup in 'Engineering.'*

Our Forest Policy.

The Resolution on the general forest policy which the Government of India desire to see pursued in future, was issued eight months ago. As a very important State paper, it naturally attracted much attention at the time. It was reviewed at length in the *Times* ; it was prominently alluded to by the Viceroy in an important speech ; and it was hailed by the Native Press as foreboding the abolition of those irksome restrictions which, in all countries, have been found to be inseparable from forest conservancy. We understand that the principles detailed in the resolution have not merely been very generally accepted as newly fashioned by the Government of India, but that these principles are supposed to be applicable throughout the length and breadth of the Empire. We learn, however, from Burma, that the local Government has supported the Inspector-General of Forests in the view that the Resolution in all material particulars is inapplicable in that province, while in Madras, whose senior Forest Officer was drawn from Burma, the principles concerned were long ago put in practice. It remains to be seen whether the pronouncement of October last will effect any considerable change in the forest administration of other provinces.

It appears that in Assam and in Bengal the conditions of the forest administration, as affecting the people, greatly resemble those in Burma ; and it seems probable therefore that it is to Bombay and to the Central Provinces that we must mainly look for any considerable change of forest policy as a result of Lord Elgin's Resolution. Few persons could, we think, be found who would disagree with the broad principles of the Resolution ; and we anticipate that if conditions and needs are carefully and intelligently considered on *a strictly local basis* and in the truly liberal spirit pervading the Resolution, nothing but good and a diminution of the discontent which undoubtedly exists in some parts can result. Yet it must at the same time be borne in mind that in forest administration it is necessary to look far into the future. Revenue officials in India and, indeed, Englishmen generally, have not, like their brethren on the Continent of Europe, that personal acquaintance with forests and the possibilities of forest management which is essential if a just conclusion is to be arrived at as to whether a

particular measure of forest conservancy is necessary or not, is liberal or the reverse. There appears to be a popular tendency, most natural in itself, to regard a forest as quite as inexhaustible a source of supply as the widow's cruse of oil. What may now appear to be a liberal measure in view of the present needs of the people may prove half a century hence to have been a most short-sighted and truly illiberal proceeding. The Forest Officer is, or ought to be, in a position to foretell what the condition of a forest will be fifty years hence if the present demand on it for produce is continued or is altered in a particular manner. The Collector, as a rule, has no such knowledge. His main desire usually is to abate present discontents, and an opportunist policy, favouring the clamouring ryot at the expense of his unborn and unprotesting descendant, has been, we believe, in not a few cases the result.

It seems to us that herein will lie the difficulty in applying the recent orders of the Government—orders with the substance of which, as has already been indicated, we are in hearty accord. A note-worthy and most satisfactory feature of the Resolution is that the Government of India, as we understand for the first time, has plainly declared that in forest administration considerations of revenue are to be kept in a subordinate position. The older generation of Forest Officers in India has been nurtured on revenue considerations. A better balance-sheet than that expected by their superiors has been too often the goal towards which they strove. But the true function of the Forest Department is to safe-guard for all time as much of the existing forest as is really and permanently needed in the interests of the public at large, and to manage the forest, so permanently set apart, in the manner most economical and most convenient for the people. The forest may be a grass and fuel preserve, surrounded by cultivated fields and essential to the village economy. Or it may be a remote jungle with which "the people" are not directly concerned, and which is utilized for the supply of timber to the State for public works. The permanent preservation of the former in the immediate interest of the ryots, is at least as much the duty of the forest Department as is the conservancy of the latter, for the indirect benefit of the country at large. In both cases the justification for the interference of the Forest Officer and for the enforcement of the restrictions so as to render permanent preservation possible is the public weal—within limits, the greatest benefit of the greatest number. In neither case, and especially so of the latter, should considerations of State revenue materially influence the general management. The tendency to regard the forests as a fruitful source of revenue is distinctly baneful, and in more ways than one; and any modification of the old theory on rational lines should be welcome. When it is borne in mind what incalculable harm may be done to the forests of the country by a short-sighted system, and how vastly important is the subject of conservation, it will be admitted that too much care cannot be bestowed upon the attempt to improve the administration—(*Englishman*).

VII.—TIMBER AND PRODUCE TRADE

Churchill and Sim's Circular.

6th June, 1895.

EAST INDIA TEAK.—The deliveries for the first five months of this year have amounted to 6,200 loads against 5,311 loads in the corresponding period of 1894. In May this year they have been 2,833 loads, and in May 1894 they were 1,014 loads. Some 1,200 loads of this May delivery were removed direct from the quay, on landing, without having been taken into stock, prices have continued low, and general business depressed. An inferior cargo of Siamese wood has been retailed at auction during the month at low rates, but it has been concurrently possible to obtain rather better figures than of late for picked specimens of good quality, both landed and afloat.

ROSEWOOD.—Some parcels lately arrived sold well, but one small lot remains on hand, the demand not being active.

SATINWOOD.—There is sufficient stock for current demand, which is rather quiet.

EBONY.—Small parcels of good logs would sell well.

PRICE CURRENT.

Indian Teak	per load	£10	to £16.
Rosewood	,, ton	£6	to £9.
Satinwood	,, sup. foot	6d	to 12d.
Ebony	,, ton	£6	to £8.

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, June, 1895.

Cardamoms	per lb.	1s. 8d.	to	2s. 2d.
Croton seeds	per cwt.	20s.	to	27s. 6d.
Cutch	,,	30s.	to	32s.
Gum Arabic, Madras	,,	20s.	to	32s. 6d.
Gum Kino	,,	£25	to	£30.
India Rubber, Assam,	per lb.	1s. 7d.	to	2s.
,, , Burma	,,	1s. 7d.	to	2s.
Myrabolams, Bombay,	per cwt.	7s. 9d.		
,, , Jubbulpore	,,	6s.	to	7s.
,, , Godavari	,,	6s.	to	6s. 6d.
Nux Vomica, good	,,	6s.	to	9s.
Oil, Lemon Grass	,,	14s.	to	15s.
Orchella, Ceylon	per ton	15s.	to	22s.
Redwood	per ton	£3, 10s.	to	£4
Sandalwood, logs	,,	£30	to	£50
,, , chips	,,	£4	to	£25
Seed lac	,,	30s.	to	90s.
Tamarinds	,,	9s.	to	11s.

INDIAN FORESTER.

Vol. XXI.] **August, 1895.** [**No. 8.**

Notes on Changa Manga.

The extensive sissoo plantation of Changa Manga must be known by reputation, at least, to many readers of the *Forester*, though the subject has not often been mentioned in the pages of this journal; and, it is believed, that a few notes, taken from observations made during the last few years and brought up to date, may prove of general interest.

Changa Manga is situated in the Chunian tahsil of the Lahore district, 44 miles by rail south-west of the capital of the Punjab. The scarcity of fuel led to the formation of the plantation on the borders of the Bari Doab Canal, and by about 1877 the whole had been planted up chiefly with sissoo. At the present day, the plantation contains nearly 10,000 acres, of which 8,400 acres are wooded.

For many years the irrigation was unsatisfactory, partly owing to scarcity of water, which could only be granted when not required by the zemindars, but also partly owing to the irrigation channels not having been laid out in the most advantageous manner, so that it is highly probable that some compartments received water irregularly. This has, however, now been remedied, and it is possible to irrigate the whole plantation once, and half of it a second time every year. The appearance of the crop in 1895 proves that the irrigation is much more complete than it was—there is a much healthier look about it.

Coppicing began in 1880-81, and it has been continued ever since; and in 1895-96 the last remains of the seedling forest will be coppiced, so that in 1896-97, the second rotation will commence, and the compartment first coppiced will be taken in hand again. The crop in these compartments will then be about 15 years old on an average, and it will be exceedingly interesting to ascertain the outturn per acre, and the mean annual increment, and compare it with the figures yielded by the seedling forest. My own impression is that neither the outturn per acre nor the increment will be as high as those given by the original plantation.

Mulberry has in many compartments come in, and completely suppressed and killed out the sissoo stool shoots, and the future crop in Changa Manga, after the second rotation has passed, will probably be pure mulberry. It remains to be seen whether at the age of 15 or 16 years this species will yield as much as sissoo, but from its manner of growth and general appearance this seems extremely doubtful. Though at first in the coppice mulberry grows faster than sissoo, yet the latter species catches it up at the age of 16 years, and has a better bole.

An attempt has been made to indicate the height growth of the two trees from the mean of four years' measurements, but owing to differences in the soil of various compartments, and probably to defective irrigation, the result is not as satisfactory as it might be. Still it is better than nothing. [See diagram.]

The statement on the next page exhibits the result of the fellings made since 1882-83, after which year the records have been carefully kept, and may be regarded as reliable and accurate as any such statistics can be in the present state of Indian forestry. The outturn in solid cubic feet has been calculated, according to the reducing factors adopted in the working plan, and the table shows that at an age of 16 years the mean annual increment per acre is at a maximum. The outturn is here taken as the saleable production, only leaving out of account unsaleable brushwood which is burnt on the area, and whatever is lost in cutting. This agrees with what was written in the working plan (para. 64) as far as the age is concerned; but the mean annual increment is there estimated at 100 solid cubic feet, whereas the figures before us show only 83 c.-ft. It is, however, admitted in the "Revised Proposals of 1889" that the yield of the older crops had been over-estimated, and it was believed that the yield of the younger crops had been under-estimated, and that a lower rotation would be better.

As an example of the best individual compartments the following may be taken :—

C.-pt.	Area.	Age.	Fellings.	Thinnings.	Standards.	Total.	Per acre.	Per ann.
75·	150·4	18·0	167,561	78,433	14,245	260,239	1,730	96
76·	63·6	16·5	65,949	28,513	9,824	104,286	1,640	99

So at an age of 16½ years the best compartment shows a mean annual increment very nearly equal to that estimated in the working plan. This is a remarkable result, and certainly indicates the great care with which the working plan was drawn up. It is quite probable that a well-stocked compartment of sissoo on good soil and regularly irrigated would in Changa Manga yield 100 solid cubic feet per acre per annum at the age of 16 years, *when raised from seed.* But it is doubtful whether either sissoo or mulberry *coppice* will yield as much—this must be left for the future to decide.

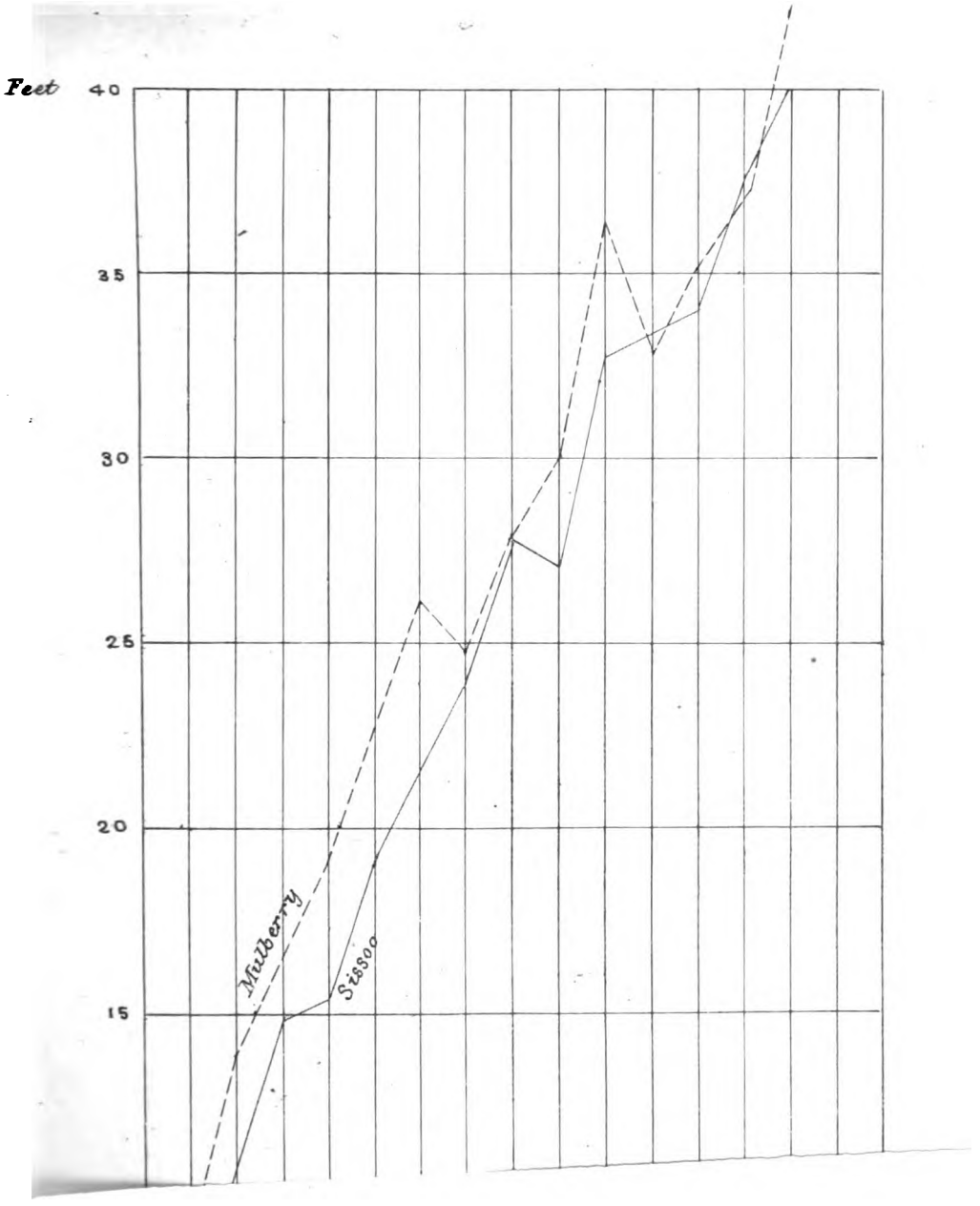
The comparative height and girth of coppice shoots of sissoo and mulberry at various ages are given in the following table :—

Age	Sissoo.		Mulberry.		Remarks.
years.	Height.	Girth.	Height.	Girth.	
	feet.	inches.	feet.	inches.	
1	7·2	2·0	8·7	3·1	
2	10·8	3·4	13·7	3·8	
3	14·7	5·0	16·6	6·0	
4	15·5	6·0	19·2	8·9	
5	19·3	8·7	22·6	11·7	
6	21·5	9·7	26 2	12·2	
7	23·9	12·7	24·8	12·7	
8	27·7	16·4	29·9	16·6	
9	27·0	16·5	*	*	* Sufficient
10	32·8	21·5	36·1	26·	measurements
11	33·1	19·6	32·8	22·1	of this age not
12	33·7	22·1	35·1	29·3	available.
13	37·5	26·9	37·2	33·4	
14	39·8	26·4	4z·2	32·	
15	37·4	24·	37·7	30·	Only 10 acres of this age.

It need not be a matter of surprise that discrepancies should appear in a table such as the above. Certain compartments which have suffered from insufficient irrigation, or a bad subsoil, affect the figures ; they are the best that can be given under the circumstances, and they are taken from a series of measurements made by the Forest School Students during the years 1892, 1893, 1894 and 1895.

FELLINGS MADE IN CHANGA MANGA FROM 1883-84 TO 1893-94

Year.	Compartments felled.	Area acres.	Age.	Outturn in solid cubic feet.				Outturn per acre.	Mean annual increment.	Remarks.
				Principal fellings.	Previous thinnings.	Standards.	Total.			
1883-84	39, 43, 44	148·4	12·67	114,558	15,177	19,600	149,335	1,006	79	
1884-85	19, 20, 23, 24, 27, 28, 32 34, 35, 37, 40, 54, 55	901·8	13.9	570,035	256,368	129,650	956,058	1,060	76	
1885-86	30, 31, 47, 48, 51, 52	517·4	15·0	336,182	145,396	68,800	550,378	1,064	71	
1886-87	pt. of 5, 13 to 17, 49, 50 53, 56	754·7	15·14	505,356	205,218	156,710	867,284	1,149	76	
1887-88	18, 21, 22, 41, 42, 45 46	368·6	16 0	291,709	112,382	87,270	491,361	1,333	83	
1888-89	25, 26, 29, 33, 36, 38 73, (*b*), 75, 76	601·0	16·83	548,106	193,476	56,728	798,310	1,328	79	
1889-90	71, 72, 73, (*a*), 74	414·0	17·5	363,260	158,687	47,401	569,348	1,375	78	
1890-91	58, 59, 62, 69, 70	403·8	17·9	414,917	73,654	49,166	542,737	1,344	75	
1891-92	57, 60, 61, 63, 64, 65	652·0	18·16	638,779	145,807	100,723	885,309	1,358	75	(1) Area includes badly stocked portions of Maujoki Jhand, extension.
1892-93	77 to 94 (1)	565·5	18·0	439,098	67,787	66,689	573,574	1,014	56	
1893-94	95 to 98 (2)	282·8	17·0	243,288	40,535	27,336	311,159	1,100	65	(2) Soil in these compartments inferior.



Tapioca cultivation in Travancore.

Introduced by the Portuguese in their early settlement at Goa, about the commencement of the sixteenth century, the Bitter Cassava or Manioc, familiarly known as the Tapioca, has been cultivated on the west coast ever since. But nowhere, perhaps, on that undulating, palm-fringed sea-board has it thriven so well as within the flowery dominions of His Highness the Maharaja of Travancore, where the soil and climate are variable and equable enough to suit it as well as many another tropical South American species like itself. With an abundant rainfall, a gorgeous and invigorating sunshine and a perennial dew, evergreen species, indigenous and introduced, many and varied, live and thrive. Under these conditions, that a hardy Euphorbia like the Tapioca, indifferent to soil and unmindful of all but extremes of climate, should, when brought under even the rude cultivation of the Malayalee peasantry, cover extensive areas of both hill and dale, must pass without exception.

Towards the middle of October or the beginning of November when the north-east monsoon is usually at its height, suitable areas, often several acres in extent, are selected for cultivation. The soil being then soft, moist and easily worked, is either deeply hoed or ploughed over, and the surface laid out in mounds or platforms each from two to three feet square, and about a foot high. Sometimes circular or rectangular patches, a yard in diameter, are prepared. The platforms and patches are, in some localities, dressed with ashes, leaves or cattle-droppings, but they are, especially in free, loamy soils, usually let alone. A sufficient number of stems for stocking the area are selected from the previous year's growth, which is either still standing or but recently removed. Each stem is cut up into several little bits varying from six to eight inches in length, care being taken to, in so doing, secure for the plantation only the lower and more mature portions of the stems. Should there be too much rain, the cuttings are kept under cover until a favourable break in the weather occurs; for, if put out in watergorged soil, they are liable to decay. It is also for this reason that, as far as possible, the Malayalee selects a well-drained locality—usually a hill-side. But if it be only showery weather and the area well-drained, the cuttings are put into the beds directly they are prepared. A bed or patch is considered fully stocked if it hold two or three cuttings which are put down each at a slant of about 60 degrees and, buried in the soil for nearly two-thirds of their length. Varying from ten days to a fortnight of their being put out, the cuttings strike root, and the young shoots come up vigorously in light-green tufts of pretty palmate leaves. It is interesting to note that the earliest leaves are usually small, and either three or five-lobed, but these are soon supplanted by larger and seven-lobed ones arranged on the

stems in a close alternate phyllotaxis. While the leaves are emerging in all directions over the gradually elongating wand-like stem, the numerous roots, white and thread-like, radiate from its base into the cultivated area around. In a month or two after the cuttings are put out, the lateral development of their roots begins, and, in another eight or ten months they will, in average soil and under ordinary cultivations, have sufficiently developed to be dug up for use. But, as a rule, the roots are allowed to remain in the soil for two more months, in order that the cultivator may, by falling in with the ensuing wet season, secure for the future crop the best results. The rotation of the crops is thus maintained in an uninterrupted annual cycle fixed by the monsoon rains. But should the rains be late and the market favourable, the Tapioca is dug up as soon as it matures, and, as this would be towards the end of the hot season, the new plantation is started at once, but copiously watered once every three or four days until the rains are fairly on. It is said that, so far from interfering with the normal growth and development of the Tapioca, this hot-weather cultivation yields good enough results to quite repay the extra labour it entails. Indeed, the scarcity of water towards the close of the hot-weather alone prevents the practice being more largely adopted. Again, a peculiar race of the Tapioca, which is cultivated here, yields two crops in the year; the first of these is, at the end of six months, harvested in March—one of the hottest months of the year. As the stems cannot be kept for any length of time without drying, the plantation of the ensuing season is started forthwith, the cuttings being watered until the April showers begin, after which the young plants are left to themselves. The hot weather, though short, is sometimes, and especially of late, very oppressive; but the plants rarely fail except in extremely stony or sandy soils, and it is the experience of the Malayalee that the roots produced by these hot-weather plants are more wholesome and delicious than those yielded by the previous cool-weather ones.

The yield of Tapioca varies with the soil, the amount of care bestowed on its cultivation, the nature and quantity of the manure used, the rainfall and the particular race or variety cultivated. Although it grows on almost any soil—from stony laterite through gravel to sand and even clay,—it thrives best on a well-drained soft, sandy loam with an admixture of humus. Stony soil interferes with both quantity and kind, gravel tends to contort the roots often to such a degree as to unfavourably influence their appearance and market value while clayey soils, always cold, prevent their developing to normal dimensions. Again, the larger the quantity of manure used, the better the yield and the more farinaceous the roots. Ashes or ashes and leaves give the best results, while cow-dung or other cattle-droppings frequently only injuriously affect the quality, though they improve the quantity, of the roots of the more nauseous varieties.

A well-grown healthy root is generally about 2 ft. long, 3 inches in diameter and between 6 and 8 pounds in weight. It is generally a little thicker at the attached end, and tapers gradually to a more or less fine point at the free-end. The usual colour of the thin outer skin of the root is a pale brown, a stout, tough white sheath of inner skin closely investing the delicate substance of the root itself. On breaking across it, this brittle substance, turgescent with milky farina, is seen to intimately adhere to and lie around a compact vein of dense, fibrous tissue that runs through the centre of the root for its entire length. This vein is probably the original thread-like fibre around which the farinaceous substance is subsequently developed. The root contains the greatest quantity of farinaceous material in from ten to fifteen months after the cuttings are put out, but if allowed to remain in the soil after that time, it soon grows woody, and ere long deteriorates into a soft, spongy mass, the tough fibrous core at the centre being replaced by a narrow canal containing a pulpy, decaying fluid of grey cellular matter. It is also interesting that, under ordinary conditions, the Tapioca root seldom bifurcates or divides in any way, and that even root fibres are few and far between; so that, absorption of the requisite substances from the soil takes place chiefly through the epithelium of the root itself.

The cultivation of the Tapioca by the hill-men of Travancore is even ruder than that pursued by their more enlightened brethren of the low-country. Every year, towards the close of the hot season, extensive patches of forest are cut down and burnt; and, as soon as the monsoon rains have descended different kinds of paddy, ragi, maize and Indian corn, chilies, dal and other seeds and cereals are sown broadcast and hoed into the soil. Tapioca sticks, too, are put down here and there over the area, and what with the wood-ashes, the humic accumulations of years and the grateful showers, a motley assemblage of plants soon covers the clearing. Each grain is harvested as it matures and, in due season, the Tapioca, too, is pulled up. Directly they are taken up the roots are washed, pealed, and cut up into little irregular pieces which are strewn over mats made of the large Esta reed (Beesha Travancorica) or, what is more usual, upon the bare out-crops of sheet-rock so common on the higher hills; and the sun soon hardens them into the flinty, white chips familiarly known as Kani marachini ("the Hill-man's woody potato"). As a rule, the hill-men cultivate just enough grain and Tapioca to meet their requirements for six months of the year, precariously subsisting for the remaining months on wild yams, bulbs and roots. The more forward among them, however, who shrink less from their cultured congeners of the low-country frequently barter some of their produce in exchange for salt, knives, cloths and other necessaries and luxuries of life. When this is done, it is that their excellent Tapioca finds its way to us.

This hill-tapioca is much prized by the poorer inhabitants of the outlying towns and villages, because it is believed that the varieties cultivated by the hill-men are generally harmless and that, for the rest, any nauseous or bitter principle that may remain is efficiently removed by the thorough drying which the roots undergo.

The various processes adopted for removing the poisonous principle of the root, which is now admitted to be some form of Hydrocyanic acid, are interesting. Certain varieties which under the name of the Avians or Boilables are considered harmless, are eaten plain, or made into curry after a single boiling. They are also frequently roasted and eaten with fish curry. The more poisonous kinds are boiled several times, the water being strained off after each boiling. When this process is adopted, the root, after each boiling, is tasted: should it taste sweet, it is boiled again, and this is repeated until the peculiar sweetish flavour disappears. An extremely nauseous variety known as the "white Tapioca" has to be boiled at least seven times before it becomes fit for food! Again, the roots of certain other varieties are cut up transversely into thin circular or oval slices, which are dried and then boiled. Frequently, the slices are boiled several times and then dried. But when so constantly boiled, the Tapioca, on coming to be cooked, is tough and insipid to the taste and certainly less nourishing. Should the bitter kinds be insufficiently boiled before they are used, violent vomitting, attended with severe pain over the region of the throat and stomach ensues, the victim grows drowsy and general prostration and collapse soon follow. The same symptoms are produced by drinking the water in which the roots are boiled. When eaten with sugar, jaggery or molasses, the nausea is very pronounced, and the comatose condition sets in sooner; on the other hand, cocoanut, cocoanut-oil, curds and tamarind juice act as vigorous and grateful antidotes, while, a solution of assafœtida in water is given to goats and other cattle that are frequently poisoned by eating the leaves of the more nauseous varieties.

Under the local names of Marachini (woody potato) or Kappa Kelangu (ship potato), about seventeen commonly-recognized varieties of the Tapioca are cultivated in Travancore. But these are evidently only races descended from a few distinct varieties and differentiated through long and peculiar forms of cultivation, not to speak of the powerful influences of soil and climate. These races, proportionate to the bitter priniciple they contain, may be conveniently brought under one or other of two heads—the Avians or Boilables and the Maravans or Dark races. For purposes of study, the following classification has, accordingly, been found useful.—

I—The Avians or Easily boilable kinds, characterized by little bitter principle,

(a) *Pacha avian*, (green boilable)—Leaf-stalks pink along their upper surfaces, but green beneath, and at their origin with the blade and insertion at the stem ; stems 2 inches in diameter, light green, average height 12 feet ; flowers rare ; roots pale red, large ; average weight 15 lbs. each, mature after one year.

(b) *Cheenee Avian*, (Potato boilable).—Leaf-stalks and stems pale yellow ; stems delicate, usual height 5 feet ; flowers after one year ; roots white and, like the *Ipomea Batatas* (sweet potato), mature in six months after the cuttings are put out, they start in delicate strands from the base of the stem, and develope a few inches beyond it ; average weight 10 lbs each. This is also called Vellary avian (white boilable).

(c) *Chovalay Avian*, (Red boilable)—Leaf-stalks and stems light-red ; flowers common ; roots small, light red, firmly attached to the stems, mature in one year, average weight 10 lbs each.

(d) *Curry avian*, (the curry boilable).—Leaf-stalks and stems pale pink ; delicate plants, usual height 4 feet ; flowers common ; roots light-red, large, average weight 12 lbs. each ; mature after one year, mealy and wholesome.

(e) *Chànà Avian* (the cow-dung boilable)—So called from the manure usually used in its cultivation. Leaf-stalks pale but red at extremities ; Stems red, usual height 8 feet, roots few, substance of root arranged in two zones—the outer firm and farinaceous, the inner soft, pulpy and unfit for food ; average weight 8 lbs. each.

(f) *Chenkomban* (the red-stemmed) a variety resembling the *Cheenee avian*, but with the leaf-stalks and stems a bright scarlet.

(g) *Neduvengauden* (the Neduvengaud Tapioca)—So called from the district of that name in Travancore where it was first cultivated :—Small race, leaf-stalks and stems pale pink, roots small but numerous ; average weight 4 lbs. each.

II.—*The Maravans or Dark races*, like the particular dark-skinned class of thieves of that name in the Tinnevelly District These are all more or less nauseous :—

(a) *Olley Karim Maravan* (the dark Maravan)—Leaf-stalks deep red ; stems dark green with purple streaks below the attachment of the leaf stalks on the stem ; plants delicate ; flowers rare ; roots mature in one year, few, deep-brown, slightly nauseous ; they are very lightly attached to the stem ; average weight 10 lbs. each.

(b) *Neduvàli-Kian Karim Maravan* (a race whose roots take as firm possession of soil as the tenacious claws of the Neduvàli or Iguana lizard).—A much-branched race with stem and leaf-stalks like Olley Karim Maravan; flowers

common ; roots few, woody and have to be boiled twice before the bitter principle is removed.

(*c*) *Ana Maravan* (the giant Maravan)—Leaf-stalks and stems like those of (*a*) in colour ; but the stems are tall, thick and strong, being usually about 20 feet high ; flowers rare ; roots very large, average weight from 20 to 25 lbs each, and take 15 months to mature ; very nauseous, requiring to be boiled three times.

(*d*) *Kathelay marachini* (Kath-elay, *i.e.* bitter leaved)—Leaf-stalks like those of (*a*) ; stems pale yellow streaked with red ; flowers common ; roots small but numerous. The race was at one time largely cultivated, but it is now rare, nauseous like (*c*).

(*e*) *Koota Maravan* (the Dwarf Maravan)—dwarfed much-branched race, usually 2 or 2½ feet high ; leaf-stalks and stems like those of Kath-elay Marachini ; roots lightly attached to the stem ; very nauseous.

(*f*) *Ellavum Kappa* (areca-like potato)—Tall race like the Ana Maravan ; stems and leaf-stalks dark red ; roots thin and numerous—often 25 to the stem ; flowers rare ; very nauseous.

(*g*) *Avanakkum Kappa* (the castor-oil-plant-like potato)—Dwarfed, much-branched race, 4 feet high ; leaf-stalks red ; stems greenish-ash coloured : roots few—at most four, small; slightly nauseous.

(*h*) *Vellay Marachini* (the white Tapioca)—Leaf-stalks and stems pale green, tall, delicate, much-branched, usual height 25 feet ; flowers rare ; roots brown, lightly attached to the stems ; most poisonous, the bitter principle being eliminated only after at least seven successive boilings ; race growing extinct, being sometimes cultivated in North Travancore.

(*i*) *Olaven*—Delicate rare; stems small, 3 feet high, branched; flowers common ; roots small, few, slightly nauseous.

(*j*) *Kili vakay* (the Parrot green Tapioca).—Stems and leaf-stalks bright green ; leaves few and far apart ; usual height 10 feet ; flowers common ; roots large, few, average weight 12 lbs ; slightly nauseous.

Of these races, the most nauseous, it will be seen, are the Vellay marachini and the Kath-elay, both which, however, are the oldest cultivated, and are now becoming rare ; so that, long cultivation has, in their case, done comparatively little towards improving the quality of their roots. When left to themselves, and especially under cover, all these races grow into tall and lanky plants which in time assume the nature of climbers, many of which are often 30 feet high.

With regard to the position the Tapioca industry occupies in Travancore, it may be said to compare favourably with many another similar industry in that country. Much of it is exported, especially of late, and, judging from the increasingly extensive areas under it, the importance of Tapioca-cultivation as a profitable industrial pursuit is coming to be realized every day. The Tapioca has long since established itself as an important and excellent article of diet with the Malayálee, and the recent steady rise in price of rice bids fair to make it one of the first staple-foodstuffs for him, if it is not that already.

TREVANDRUM,
23rd June, 1895. } A. M. SAWYER.

The "Ceylon Forester."

We have, by the courtesy of the Editor, Mr. H. P. C. Armitage, Forester at Trincomalee, received the first three parts of this new contemporary, which we cordially welcome, and to which we wish every success. It is a small Magazine of about 16 pages monthly, the subscription is Rs. 5 yearly, and the cover shows an old banyan tree with many root props, and a palmyra growing out of its crown.

The first number, that for January, 1895, has an Introduction, and then a short history of the Ceylon Forest Department. There are useful botanical notes on various trees and plants of the Ceylon forests, and the first part of a paper on elephant catching in the Northern Provinces. In the February number is described the saw-mill and Depôt at Batticalva ; the botanical notes are contiuned, and there is a further instalment of the paper on elephant catching. The March number continues these papers still further, and has an interesting account of the Satinwood tree by Mr. Broun, the Conservator. We commend this new periodical to the attention of Indian forest officers, and especially to those in South India.

II.—CORRESPONDENCE.

Commutation of Rights.

SIR,

Will you allow one of the much-abused class of Forest Settlement Officers to offer a few remarks on your editorial note on the subject of "Commutation of Rights," page 97, of the March number of the *Indian Forester* ?

One word as regards the term "Privilege." It appears to have escaped the notice of your correspondent B. H. B.-P. that the term "privilege" is actually used in the Forest Act, Section 15, last sentence, and used as something distinct from a legal right. "The practice of shifting cultivation shall be deemed to be a *privilege* subject to control, restriction or abolition by the Local Government."

But this is not the point which I wish particularly to allude to. You have taken exception to B. H. B.-P's. views as to the power and duties of the Forest Settlement Officers. But it appears to me that B. H. B.-P. does nothing more than accept the obvious scope of the Act itself. Sections 4, 5, 6, 7, 8 give very wide power of enquiring into and determination of rights by the Forest Settlement Officer, and section 14 directs him "to pass such orders as will ensure the continued exercise of the rights so admitted." This section 14 has given rise to much controversy, and in my humble opinion the Resolution of 1886 was in some degree an attempt to over-ride the clear meaning of the Act. Undoubtedly a Forest Settlement Officer should decide claims entirely by law, but the law gives him a very free hand, and enjoins him to consider claims put forward on equitable grounds, and insists on his not merely deciding on claims preferred, but on his ferretting out all possible claims himself. (Section 7.)

Let me take an hypothetical case, and by no means an uncommon one. We find a group of villages in the neighbourhood of a stretch of forest. For years the villagers have been accustomed to graze their flocks and herds within that forest without restriction. But the claim of Government to the ownership of that forest have never been given up. Suddenly the forest is gazetted under section 4, and a Forest Settlement Officer is appointed to enquire into and determine the existence, nature and extent of any rights alleged to exist in favor of any person in or over such lands. Section 4 (*e*).

One view of the Forest Settlement Officer's duty is this. He is merely to take the villages exactly as they stand, and to enquire simply into the rights of individuals at this moment. This, I fear, is generally the view taken by the Forest Settlement Officers.

The other view is that he is to consider the right of the villages individually and as a community, and to provide under section 14 not merely for the moment but for the future. This is undoubtedly the equitable and statesman-like view. To come suddenly down upon a village which has been expanding for years, and duly increasing the number of cattle owned by it and say—To-day you own 200 heads, for 200 heads you shall have grazing rights, but for no more,—is to take a very narrow and inequitable view of the case. What is reasonable is to admit rights to graze such a number of cattle as shall allow a reasonable amount of expansion during which the right-holders can become accustomed to and realize the restrictions now to be placed upon them for the

first time. To this they have an equitable right not as a concession at the will of Government. You must allow a reasonable margin, and it is for the Settlement Officer, subject to appeal, to decide what is this reasonable margin. He is not to make provision for the advent of outsiders, or for hypothetical necessities of the future, but he is to provide for the natural increase within a reasonable time under present conditions of stock in agricultural communities whose prosperity depends in so large a measure on that stock. And in considering the question of whether or not rights exist, he is not to consider the effects of their existence on the forest. This is a point on which mistakes are often made. He has simply to consider the existence or non-existence of these rights, and if he finds rights to exist, which must speedily destroy the forest, he has still no option but to record them. In such a case, however, if the forest is worth preserving, he can, and must, proceed under section 15, and commute the rights by payment, in money or land, or in such other manner as he thinks fit. It is a common mistake to suppose that a right to graze, say, 1,000 head of cattle over 15 acres of forest cannot exist because to do so is a physical impossibility. The value of the right may be very small, but the right may legally exist for all that; and section 15 shows that the framers of the Act contemplated such a possibility. I have heard Forest Settlement Officers found fault with for this very thing. They have as Civil Courts given (*i. e.*, adjudged) rights which must eventually destroy the forest. Under the Act they may have had no option. The rights existed, and they had to decide accordingly.

All will agree that young and inexperienced, or strongly opinionated officers should not be employed on what is difficult and delicate work. But in my opinion the last sentence of your editorial note is radically unsound. It is the duty of a Forest Settlement Officer to decide upon and define the rights which he finds in his opinion to exist, and it is not for the Government, who are practically one party to the case before the Forest Settlement Officer, to say whether rights do or do not exist.

The Government cannot interfere with Civil Courts in such matters, neither can they interfere with a Forest Settlement Officer giving a decision under the Act. The Legislature has provided an appeal from his decisions, and that is the only way in which they can be traversed. Section 16. This may be regrettable, but it is the law, and we must obey the law until it is changed. The Government can revise arrangements under section 14 (see section 21), but they cannot touch a decision adjudging rights under section 11, save that they can order them to be commuted under section 15. The Forest Settlement Officer is an independent Court, and it is most desirable that he should be, and in every claim for rights in a Government Forest, the Government is practically the defendant. The view you have expressed amounts to saying that the defendant should decide the case, the judge merely making recommendations.

Two things should certainly be done :—

In the first place, the period within which an appeal on behalf of Government against the grant, or adjudgment of rights can be preferred should be very much extended. This would require a trifling alteration in the law.

In the second, every Forest Settlement Officer should have strict orders whenever he adjudges the existence of rights in any forest, to send a copy of his order within seven days, to the local Forest Officer, to enable the latter to file an appeal, or report the case for orders in time to get an answer before the expiry of the period of appeal.

The upshot of all this is that Government should only appoint men of tact and experience to discharge what, *experto crede*, is the very difficult task of a Forest Settlement Officer. The life of a Forest Settlement Officer is not a happy one. My own experience is that I was abused by the people for not adjudging them enough ; cursed, *freely*, by the Forest Department for giving too much, and finally handed up to Government by the Commissioner for expropriating land too freely. The special acknowledgment of Government after five years of this was but a poor solatium. No one had a good word for the poor Forest Settlement Officer, which possibly proves that his Settlement may not have been altogether inequitable after all. The only consolation, and a great one was, that I came into contact with some exceedingly pleasant fellows in the Forest Department, and contracted friendships with several which will last for my life time. And I learnt to appreciate some of the difficulties of Forest Administration, and to sympathise deeply with the Departmental Officers in many of their troubles.

R.

Durability of Pyinkado sleepers.

SIR,

I am sending you some small blocks cut from Pyinkado (*Xylia dolabriformis*) sleepers, which had been in use on the South Indian Railway. The condition of the blocks, and the following notes on the subject, would tend to show that the wood is less durable than is generally supposed, it certainly does not deserve the good character you give it in your "Manual of Indian Timbers." Mr. Spalding of the South Indian Railway, to whom I am indebted for the information, says: "The blocks are cut from Pyinkado sleepers that are more than half decayed, and are perfectly worthless for anything but firewood. I cannot tell you exactly when these sleepers were laid, but the first samples

were put down as a trial in 1884. These unfortunately could not be watched; for that particular portion of the line was washed away in the floods of December 1885, and in the restoration of the line the sleepers were mixed up, or else laid in other places. You can, however, take it as certain that the sleepers, from which these samples have been cut have not been in use 10 years. We have creosoted pine sleepers (a very few) on the line between Sahamangalam and Tanjore, that have been in for over 30 years, these are broad gauge sleepers, and would have been removed long ago if the Railway had remained broad gauge, but being altered to a metre gauge, there was sufficient length in the sleepers to shift about, as the portion to which the chairs were originally spiked gave way. The metre gauge creosoted sleepers, which were sent out, are half round sleepers, and are not up to these splendid broad gauge sleepers, but there are still a good many on the line, that were put down in 1874. I do not, however, consider that the life of these sleepers, as a whole, can be safely taken at more than 10 years. Teak sleepers may be taken as lasting 15 to 20 years." Could you give any information with regard to the durability of Pyinkado sleepers in other parts of India; the sleepers in question came from Burma.

TRICHINOPOLY: *7th April*, 1895. } H. J. PORTER.

[NOTE:—We have carefully examined the specimens sent, they undoubtedly are of *Pyinkado (Xylia dolabriformis)* wood. Can any of our readers give other experiences of the durability of Pyinkado as used for sleepers?—HON. ED.]

The New Pension Rules.

SIR,

In the Resolution No. 2958-P, of the 22nd June, 1895, published by the Government of India in the Department of Finance and Commerce, it is recorded that the Inspector General of Forests is eligible for an additional pension of Rs. 1,000 a year, and that orders regarding the Forest (among other) Departments will be issued hereafter.

It is difficult to understand on what grounds such delay as regards the Forest Department can be justifiable, or what it portends, in the face of the Regulations published as an advertisement for candidates for the Forest Service Branch of the Royal Indian Engineering College, Coopers Hill, for 1894, in which candidates for the Extrance Examination were informed:—

"The more favourable pension rules have recently been extended to Forest Officers appointed from England, who are thus 'placed on an equality with Public Works Officers appointed from 'Coopers Hill College."

This "equality" can only be gained by extending to Forest Officers the Rules in Art. 714 (*b*) of the Civil Service Regulations which have been in force for many years past in the Public Works Department, and which give chief Engineers (= Inspector General of Forests) an extra pension of Rs. 2,000 a year, and Superintending Engineers an extra Rs. 1,000, in each case after 3 years' service in those classes. This concession is granted to officers of the Public Works Department whether they were appointed in England or in India (Art. 704).

Clearly the Forest candidates who entered Coopers Hill in 1894 and obtain appointments in the Department can claim their pensions at the above rates, in the event of their rising to the higher grades in the Forest Service, and possibly the 1895 men also, if this year's advertisement is worded in the same way as last year's; but as the additional Pension Rules at present passed give the Inspector General of Forests only Rs. 1,000 and Conservators nothing, if they are not smart and see that conditions equivalent to those now in force for Public Works officers are entered in their covenants, they may probably find that at the time of their retirement Government will shield itself under Article 7 (*a*) of the Civil Service Regulations (by which it can change the Pension Rules "from time to time at its discretion"), and under Art. 7 (*b*), which states that "the general purport of this Rule 'is inserted by the Secretary of State in all covenants for service 'in India to which conditions relating to pensions are attached." A neat but hardly equitable rule for candidates to find in force on signing their covenants (at which time, of course, they would not understand its purport), and for a Government to require men to agree to in their covenants as a condition of service after they have been caught with the bait "equality of Pensions with the Public Works Officers."

PATER FAMILIAS.

The Quality of quickly grown Teak-wood.

SIR,

I am glad to see that Mr. Lushington has taken up the cudgels in defence of fast grown teak, as I was thinking of writing much to the same effect, though I cannot give such cogent reasons for my opinion as he has done.

Half a century ago Dr. John Lindley was regarded as a great authority on all things sylvicultural and horticultural, and even now his opinions are deserving of respect. In his Theory and Practice of Horticulture, 2nd Edition, pp. 412, writing of thinning and pruning, he says:—

"One of the most important objects to be kept in view in 'timber management, whatever mode of pruning is adopted, is to 'cause timber to be formed rapidly. This is little known, and 'indeed is contrary to the opinion of many wood-men: nevertheless, 'it is susceptible of rigorous demonstration.

'Most people believe that the slowest grown timber is the best. 'We continually hear it said that wood cannot be good because i 'has been grown fast, and we find writers on foresting following 'in the same line of assertion."

The passage is too long for quotation, but after saying so much, Dr. Lindley proceeds to prove that fast grown timber is the strongest.

1st—By explaining the mode of growth of trees.

2nd—By comparing a number of specimens of oak which had been used in the Navy, and were collected in the Admiralty Office. The best specimen showed a growth of one inch in diameter per annum, and the worst · 076 inch.

3rd—By comparing the timber of another set of specimens used in building, the best showing · 78 of an inch growth and the worst · 08.

4th—quoting the opinions of several persons of great experience, one of them being Thomas Andrew Knight, and

5th—By detailing the results of experiments to test the comparative strength of fast and slow grown oak, in which the fast grown was shown to be about half as strong again as the slow grown.

Sir D. Brandis in his Forest Flora, 1st Edition, pp. 362 says 'with reference to Teak :—"The comparative value of rapidly and 'slow grown teak has not yet been determined in a satisfactory 'manner. It is well-known that the rapidly grown oak 'produced on alluvial soil in South and Central Europe is for 'many purposes considered equal, if not superior, in value to 'the slow grown timber of Northern France and Germany or of 'England."

It appears then that in other countries rapidity of growth is not looked on as a disadvantage, but the reverse, and by analogy, so long as our South Indian Teak trees are healthy, the faster they grow the better.

Teak is not an exotic. It has not been introduced from a colder to a more forcing and warmer climate, nor is it grown under unnatural conditions. In many instances the plantations are formed on land containing teak trees of good size which have, of course, to be cut down to make room for the smaller plants. Under such circumstances the better the trees are fed the stronger they should be.

Dr. Nisbet does not make it quite clear if he objects to fast grown timber because of its rapidity of growth, or because the trees he refers to grow on alluvial soil. No doubt much of the alluvial land on the sides of rivers and creeks is badly drained, and the timber of teak trees growing on such land is bad because of the want of drainage, but not because of the rapidity of their growth. Knowing this, we plant up such swampy land and all areas likely to be submerged, with Anjili (*Artocarpus hirsuta*) and thambagom (*Hopea parviflora*) or other moisture-loving species.

After all, superiority and inferiority are comparative terms. In his Memorabilia, Xenophon relates a story of Socrates that when the philosopher Aristippus attempted to confute him by asking him if he knew anything good, intending afterwards to prove that it was sometimes an evil, Socrates refused to answer till he knew to what he referred,—"For," said he, "a thing may be good for fever but of no good for ophthalmia or hunger."

In the same way it may be asked in what way is slow grown teak superior or inferior to fast grown. Let it be granted that the former, which is admittedly heavier and harder, may be more useful for sleepers, or for flooring, or for the knees and keels of ships, (as Mr. Nicholls has shown) where the timber has to be exposed to the weather, and durability is the object, and weight is of no importance, we may, on the other hand, maintain, both from analogy and from such experiments as have been made, that fast grown teak (when the soil is properly drained) is superior, where transverse strength and lightness are required, and where scantlings of great length are needed.

Until the contrary is proved there will always be a demand for such timber, and it will always pay to grow it.

QUILON,
16th July, 1895. } T. F. BOURDILLON

III—OFFICIAL PAPERS & INTELLIGENCE.

Qualification of Forest School Candidates.

The following circular of the Inspector General of Forests may interest our readers :—

"The Director of the Forest School has drawn my attention 'to No. 12 (i) (*e*) of the Forest School Rules, which requires the 'production by a candidate of a certificate to the effect that his 'education appears sufficiently good to give hopes of his passing 'the School entrance-examination. Of the candidates who went 'up for that examination in March last, one obtained only 36 marks 'in English and 30 out of 400 marks in Mathematics, another got 'no marks in Algebra and Mensuration; while a third received 'only 17 marks out of 300 in Algebra, Geometry and Mensuration. 'These examples suffice to show that proper enquiry was not made 'in all cases as to the candidate's educational attainments, and that 'the certificates given under Rule 12 (i) (*e*) were in some instances 'inadequate to prevent the fruitless examination of competitors. 'I have the honour, therefore, to invite your attention to the subject and to suggest that, whenever possible, the fitness of candidates may be personally tested by you or by the Divisional 'Officers in your Circle."

Discussion in the Legislative Council of the N.-W. P. and Oudh on the Forest Budget.

The Provincial Budget for 1895-96 came up for discussion on June 24th. It was brought up by the Hon'ble Mr. W. H. Impey, who said as regards 'Forests':—

"The *receipts* under this head remain fairly constant from year to year: no great increase can be expected. Provincial revenues are credited with half the income. 'In 1895-96 it 'is estimated that Rs. 2,44,000 will be received on account of timber and other produce removed from the forest by Government 'agency and Rs. 5,81,000 for that removed by consumers or purchasers, miscellaneous receipts, such as sale of confiscated drift and 'waif wood, accounting for the remaining Rs. 25,000. Of the total '17 lakhs, the Central Circle contributes Rs. 6,26,000, the Oudh Circle, Rs. 6,68,000 and the School Circle, Rs. 4,06,000. In the Oudh 'Circle the receipts have been largely derived in the past from 'sales of timber in stocks that are now diminishing, and the profit 'in future must be calculated on the normal outturn of the forests. 'In the School Circle unfortunately the income is uncertain, depending to a great extent on sales by public auction in a fluctuating market. The provincial *expenditure* (half the total) amounts 'to Rs. 4,79,000, or Rs. 9,000 in excess of that of the previous year, 'when the expenditure was somewhat below the budget estimate."

1893-94	...	8,55,
1894-95	...	8,50,
1895-96	...	8,50,

In criticising, the Hon'ble Mr. W. E. Cooper said as follows:—

"I notice that forests cost the province something like '10 lakhs and yield an income of about 17 lakhs—a most refreshing item to turn to after plodding through the dreary wastes 'of educational expenditure. There is, however, one noticeable 'feature under this head that I should like to call attention to, and 'that is the announcement of the Financial Member that 'no great 'increase can be expected' in the revenues from this source. This 'comes as a disappointment, as it is thought by many who have 'given some attention to the subject that some of the forests of 'these provinces have only just begun to yield up their products, 'and that they are capable of considerable development under certain conditions. At all events, as the Hon'ble the Financial 'Member has practically admitted that Government does not look 'for any increased income from forests, presumably because it is 'considered that they have been worked to the utmost extent, it 'seems to me a fitting opportunity of trying if private enterprise 'could not work them at a greater profit to the State, particularly 'so as forests is one of the few items in the accounts that might 'be worked on commercial principles. One of the great difficulties

NOTE.—The marginal figures represent throughout the actuals of 1893-94. the revised estimate of 1894-95, and the budget estimate for 1895-96; they are in thousands of rupees, *i. e.*, 900's are omitted.

'the State has to contend with in its capacity of trader is the lack 'of those facilities of touch with its customers which are so essen- 'tial in all commercial transactions, and for this reason I believe 'that private enterprise would have better opportunities than 'Government has of developing the trade in forest products. Run 'railways up alongside of the forests, pierce them with small feeder 'lines so as to bring the material into easy touch with the markets, 'and there would be no difficulty in establishing a large trade 'with timber merchants and other dealers in forest produce; but, 'in the nature of things, to establish and maintain a successful 'trade of this kind lies more within the domains of private enter- 'prise than State administration. If we take the 'Dudwa' forest 'for example; it lies within easy reach of railways and markets; 'it is rich in timber and other valuable products, and were this 'forest leased to a company, a large trade might be opened out, 'and the provincial revenues considerably increased. Such a com- 'pany might get a lease on much the same terms as the 'Bombay- 'Burma Trading Corporation' lease the forests in Burma; and 'apart from the advantage to the State from increased income, the 'trade would give employment to a large number of people, and 'railways would proportionately benefit by the volume of traffic 'over the lines served by the forests being considerably increased. 'We have, as the Hon'ble the Financial Member admits, gradually 'drawn on our balances till we have very little in hand, and shall 'be left at the close of the year with our minimum reserve of 20 'lakhs—not a great sum truly, but I see nothing really alarming 'in all this, as I have the greatest faith in the remarkable elasticity 'of the revenues of the country; yet, at the same time, it would 'perhaps be imprudent to neglect opportunities of adding to the 'revenues of the provinces. Forests, I believe, offer one of these 'opportunities, and I hope Government will take the matter into 'early consideration."

The reply of the Hon'ble Mr. Impey was to the following effect:—

"With respect to the receipts from forests, my hon'ble friend 'Mr. Cooper is of opinion that our income would improve if more 'encouragement were given to private enterprise by leasing the 'forests on the Burma system, one beneficial result of which would 'be the extension of railways alongside and into the forests. I 'submit that our forest officers have nothing to learn from Burma, 'where the lease system inherited from the time of native rule 'tended to the reckless destruction of magnificent forests. A 'similar system is, I believe, in force at present on the Oudh bord- 'er in Nepal. The lease of immense tracts of forest lands may 'bring in an abnormally large income for a few years; but such a 'step can only be justified if it is desired to make an entire clear- 'ing of all valuable timber. No company can profitably undertake 're-afforestation or the preservation of young trees until they are 'fit for felling. In these provinces there has been of late years an

'immense advance in the exploitation of our forests by private 'enterprise to the almost complete exclusion of Government agency 'in the more important part of the work ; and a perfect system of 'railways to tap the provincial forests is in course of construction. 'In 1895-96, as I have already pointed out, more than half the 'entire produce is to be exported from our forests by lessees 'and contractors. The whole policy of the department, as approv-'ed by the Government, is to favour private enterprise. Ten or 'twelve years ago all fellings and export, even deliveries to distant 'markets by rail or water, were carried out by Government agency. 'At the present time it is only in Jaunsar that practically any 'departmental operations exist. The Forest Department would be 'glad if private enterprise would step in there also. The present 'method of procedure in the case of timber is that the *coupe*, or 'felling area of the year, is offered in September to purchasers 'who enter the forests in November and return to their homes in 'the principal cities of the North-Western Provinces and Oudh, 'and the Punjab in March and April after having completed their 'arrangements for export. The Forest Department collects a 'royalty on actual export. The export of fuel has, in the absence 'of private enterprise, been carried out hitherto departmentally, 'but last year the Rohilkhand and Kumaun Railway Company 'was induced to undertake this work in a portion of the Govern-'ment forests, and an example has thus been set, which will, it is 'hoped, be followed by others. With regard to minor forest pro-'duce, unfortunately so much progress has not been made, and 'thousands of tons of grass and bark are annually lost, not for 'want of a market, but for want of enterprise among the traders 'and private firms. Such products are offered free or at a nomi-'nal price for a period of one or two years, in order to encourage 'private enterprise, and in the hope that when a full demand has 'been established, enhanced prices will repay the department for 'their moderation in the first instance.

"As regards railways, there will, it is hoped, be a continuous 'narrow gauge line shortly through the forest districts, from 'Gorakhpur on the south to Kathgodam on the north, with bran-'ches extending into the heart of the forest in Oudh and the Tarai. 'The greater portion of such a line has already been constructed 'by the Bengal and North-Western and the Rohilkhand and 'Kumaun Railway Companies, and has much facilitated the 'removal and transport of forest produce. The line constructed 'by the Bengal and North-Western Railway to Nepalganj taps the 'forests of Bahraich, which will be still better served when the 'extension from Nanpara to Katenia Ghat that has now been taken 'in hand is completed. Between Katenia Ghat and Sonaripur in 'the Kheri district, to which the Rohilkhand and Kumaun Rail-'way Company have carried an extension from Mailani, there will 'be but a short interval. The main line of the Rohilkhand and 'Kumaun Railway Company serves the forests of Tarai and

'Bhabar, while the projected extension of tho Oudh and Rohil-'khand Railway from Rampur to Ramnagar will tap the submon-'tane forests to the west of Naini Tal, and will give a convenient 'outlet to the produce of the hill forests. The Garhwal forests will 'be provided for by an extension from Najibabad to Kotdwara, of 'which a survey is in progress. Further west the water carriage 'is so excellent that railways are not required.

"I trust that this account of the progress that has been made 'will satisfy the Hon'ble Member that we are not behind hand in 'the matter of railways through our forests—a work which, I am 'glad to say, has been chiefly undertaken by private enterprise. 'When remarking that no great increase could be expected from 'this source, I certainly did not mean that the forests had been 'worked out; I had in mind more especially the remark made by 'the Conservator of the Oudh Circle in submitting his budget this 'year to the effect that stock sales, which had formed so large an 'item in the income of the past, were drawing to a close, there 'being little stock in hand, and that the income of this and the 'following years must be calculated on the normal outturn of the 'forests. My remark referred more particularly to the present, 'and I hope that the increased activity in the construction of rail-'ways and the consequent further development of the private 'enterprise will result in a few years' time in improved receipts."

IV.—REVIEWS.

Forestry in the Simla District.

We have received a foolscap volume covering 26 pages of printed matter and bearing the somewhat high-sounding title of a "Manual of Forestry." The title page goes on to tell us that it was prepared for use in the Simla District, and may be purchased for 8 annas. On further examination, the Manual appears to be a collection of notes by a Punjab Forest Officer drawn up some years ago, and now published under the sponsorship of Mr. W. Coldstream, C.S., (Retired), late Superintendent of the Simla Hill States. It is not said whether the Punjab Government consulted their Conservator before passing the book through the Government Press, or whether A. L. M., really approved of its publication. We cannot help thinking that he did not, a perusal of the pages disclose many inaccuracies, contradictions and other defects, which lead us to regret that they should ever have appeared in print at all, without careful revision by the compiler, or being edited by some professional Forester of experience.

The first essentials of a book destined to be useful to native chiefs in the management of their forests would seem to be soundness, accuracy, clearness and simplicity; and one would suppose that the scope of its utility would have been considerably enlarged had it been printed in the vernacular instead of in English. In all these respects, the Manual leaves much to be desired, and the author himself will doubtless be one of the first, when he reads his notes in print, to allow this. We hope that the remarks we propose to make may not seem to be more harsh than necessary, but rather than allow such a work to go forth with the impression that it embodies the accepted principles of the Department and is the outcome of the widest experience, we consider it our duty to risk such charge, and to boldly express our opinion. If they should induce those responsible for the Manual in its present shape, to at once proceed to its revision, and the publication of a vernacular edition, we shall have done good service.

Such curious expressions as '*Cultivations*' and '*Standing Capitals*' at once attract notice, and make us wonder whether the latter has any connection with 'standing type' with which we are so familiar.

In para 6 we are told that "it is better that fallen leaves 'should be removed than that trees should be lopped." We cannot agree with this as a general maxim. The lopping of inferior species like the 'Ban' and 'Moru" oaks of the Himalaya, which are little, if at all required for timber or fuel, is a necessity for the agriculture of the country, or at any rate, is a practice which has to be allowed and provided for, and we think it might often be better for such trees to be judiciously lopped under proper rules, such as are usually in force, than that the cover of dead leaves, which is so valuable to the soil, should be systematically taken away.

We are told in para 8 that "if a tree is sawn up carefully, 'planks or scantlings equal to one-quarter to one-third of the 'total amount of wood it contains are usually obtained." Surely the author must remember the beautifully cylindrical stems of the silver firs in the Vosges, the loss from conversion of which on the contents cubed by ¼ girth squared, is as low as 20 per cent., and he ought to know that 50 per cent. covers the loss on rough and ill-shapen logs, such as are often found in oak, teak and other trees with irregular section. This brings us to the startling conclusions in paragraphs 12—14, *viz.*, that to furnish good planks and scantlings for Simla, a tree should not be less than four-and-a-half or five feet in girth, while if sleepers and scantlings are wanted for the plains, trees should never be cut before they are six feet in girth, and it is better not to cut them before they are seven feet in girth. Surely the exploitable size of a tree cannot be held to vary with the destination of its scantlings, and if that size is 6 or 7 feet, as we believe it is, in the one case, it is the

same in the other, in view to the greatest yield of converted wood. Confusion seems to have crept in through a non-recognition of the percentage of loss by conversion varying with the size of the tree. In the case of a 4 ft. 6 in. tree the loss may be as high as 60 per cent., while with a 6 ft. tree it should invariably be less than 50 per cent. The author might well have refreshed his memory by a reference to Nanquettte's *Debit des bois*, or other work on utilisation.

The qualities of kail (*P. excelsa*) wood as described in para 9 are difficult to grasp, and a Punjab Officer should know the high esteem in which this wood is held in the Murree and Hazara hills. For inside fittings, we should think that 'kail' wood is better than 'kelu' (deodar) as taking a better polish, having no strong smell, and not being liable to get dirty so quickly.

It is only *usually* better to sell by the tree, than by the outturn of converted timber. We know of no exception to this rule, which obviously forces the purchaser to utilize the tree to the utmost and saw it up to the best advantage. It would be interesting to know where the khair (*Acacia Catechu*) forests are, which supply Simla with firewood. We only know of this tree at about 3,000 feet, and doubt its existence in quantity within reach of Simla.

The gratuitous statement that it is best to cut the oak, bán mohru and kharsu, for firewood when they are twenty-five to fifty or sixty years old is calculated to mislead. Our experience is that while ban and mohru may, under suitable conditions, be coppiced on a rotation of 20 years, or even less, it is more than doubtful, whether the kharsu, whose natural, region is in a rigorous climate synonymous with slow growth, and doubtful or slower reproduction, can be coppiced at all with success, or treated otherwise than as high forest with a prolonged rotation.

It would have been better to have told people that 20 per cent of charcoal from a kiln was a good yield, than to have said, it is possible to obtain 25 per cent, the absolute possible in closed retorts.

The paragraphs 18 and 19, describing the nourishment and growth of trees, are open to considerable objection. We should like to patent the process of forming new wood *and bark* with water and carbon dioxide; and trees fed on substances such as lime, sand, phosphorus, sulphur, &c., even in small quantities ought to feel, (if feel they could) rather like snakes fed on stones. Can it be possible that any forest officer thinks that all essential substances which trees take up, and which are returned to the soil of the forest in decaying fruits and leaves, instead of being removed as in cereal crops are lime, sand, etc? Why, we would ask, are those nitrogenous compounds to which plants owe their life and growth, overlooked?

If the author had had in mind his concluding sentence ot paragraph 21, "a large tree contains a very much larger proportion of useful dark-coloured wood than a small tree," he would surely not

have advocated the cutting of 4 ft. 6 in. or even 5 ft trees in paragraph 12. Under natural and artificial reproduction, we naturally look for more detail as to local requirements and experiences than are given in this book for local use. And we are disposed to cavil at the dogmatic statement that seedlings should be planted out in the beginning of the summer rains. That is, in our opinion, about the worst time, and without laying down any hard and fast lines, we can safely say that plants require to be put out for sometime before they are subjected to heavy or continuous rain, in order that their root systems which suffer, and are curtailed in planting out, may become re-established. The winter planting of deodar succeeds well, and, indeed, so does planting in any of the dry months in the hills, provided there is sufficient moisture to keep the plants alive pending the fall of heavy rain. So far as our experience goes, "chil" will die if planted in the rainy season.

The statement that kelu, kail, chil, etc., do not give good coppice shoots, falls short of the truth, which is that they give none at all, or only shoots resembling coppice such as are of no use or value. It is certainly new and opposed to other authorities that khair gives only poor coppice shoots.

It is at least curious that the deterioration in the growth and value of forests, should not be attributed to its chief cause, *viz.*, the over felling or clearing of forest areas. That certainly is the prime cause which prominently stands out in the forest estates of native chiefs. Many a forest has disappeared, suffered extermination, and the process is steadily going on, but the four causes enumerated in paragraph 35, are only adjuncts, subsidiary aids to the axe, which not only lops and wounds, but kills and removes outright, and is in the main answerable.

The paragraphs 36-43 dealing with the injuries to which the forests are liable, are clearly written and to the point, and we have perused them with interest, but owing to some apparent confusion of 'chal' and 'chil' in paragraph 39, are in doubt as to the writer's meaning.

When the author turns to 'natural conditions' inimical to the growth of trees, he appears to us to slip at once out of his depth, and to make but a poor attempt to swim. It is precisely where the natural conditions are least favourable, that good management is most imperative, and the Forester can be best recognised as knowing his business. It is by rearing up a dense growth, and by protecting the soil from direct sunlight and exposure that the Forester utilises, and improves the worst and most ungenerous of soils, counteracts the unsuitability of aspect, guards against windfalls, snowbreaks and the like, in short, clothes the country side with a remunerative crop. Yet A. L. M. would have the Simla Chiefs believe that "very little can be done by good management in these cases." This is most unsound doctrine.

In thinnings, where trees of equal ages are massed together, it is by no means right to say that the less vigorous trees should be

cut. On the contrary, the thinnings should remove those of the more vigorous, which are preventing their equally but not necessarily more vigorous neighbours from taking a lead, and ending their struggle to the suppression of other less vigorous stems. 'Principal fellings' are ill defined in paragraph 51. What is really meant and understood is—the fellings which remove the main crop, and are so ordered as to provide by seed or coppice for its reproduction.

It is new to us that 'high forest' is synonymous with 'seed' as descriptive of fellings in paragraph 53.

Regeneration by means of 'clear fellings' is hopelessly mixed with the well known system of 'successive fellings.' The risk of 'spoiling' the forests by these or any other system, is not inherent to that system, but is measurable only by the skill with which the system is applied.

The author of the notes falls into a by no means uncommon error of admitting thinnings in forests worked by the selection method. The forest, consisting of trees of all ages spread irregularly over the forest, the struggle for existence noticed in even aged crops is not felt in the same way, and the object of thinnings no longer exists.

The growing stock of a forest represents a part of the capital value, the interest on which is represented by the production of wood. This is called, in the book under review, the standing capital. The exploitable age of a tree required for timber is nearer 150 years than 50 or 60 as set forth in para 60.

The sketch of Working Plans and their application contained in Chapter VII is by far the best part of the notes, and this with hints as to the supervision and keeping up of records will doubtless assist owners in working their forests with system. But, from what has been said above, it will be seen that the book, which might have served a most useful and laudable purpose, has been brought out without sufficient care, and though it is not clear who is responsible for the errors, A. L. M., Mr. Coldstream, or the Punjab Government, it would be a pity to let them go uncorrected. The responsibility for the publication seems to rest with Mr. Coldstream, who has rashly assumed in his prefatory remarks, that the note contains "so much of a general nature in the way of a short and 'popular statement of the principles and practice of forest con-'servancy, that they may probably prove extensively useful, out-'side the Simla District."

Forest Administration Reports for 1893-94 for the N. W. P. and Oudh and Punjab.

The N.-W. P. and Oudh reports are interesting for all three Circles, though there is nothing of very great importance to discuss in connection with them. The area of forest under the Department at the close of the year was :—

	Sq. m.
Reserved Forest ...	3,762
Protected „ ...	94
Unclassed „ ...	46
Total ..	3,902

But the chief protected forests, which lie in the Central Circle, are now under settlement as Reserves. And besides this, in the same Circle, a large addition to the protected forests has been made by the application of C. iv. of the Forest Act to the unsecured waste lands of the hill tracts of Kumaun. In regard to the management of these areas, the Local Government's Resolution says :—

"The simple measures of protection thereby applied to these 'extensive Himalayan forests through the agency of the district 'officers will, it is hoped, arrest the further denudation of the hills, 'without curtailing the reasonable exercise of the privileges which 'the villages have immemorially enjoyed in respect of grazing and 'forest produce. The difficulty lies in the numerical weakness of 'the revenue and police establishments at the disposal of the 'Deputy Commissioner of a hill district. These establishments, 'however, are larger than any staff which the Forest Department 'could afford to maintain for the protection of these areas, though 'it may be necessary to give the district officer some trained forest 'subordinates. Both on this account and also because the areas in 'question are often intermixed with village lands, the policy of 'retaining these protected forests under the management of the 'district officer is obviously sound."

We are glad to see that attention has been drawn to the bareness of the hill-slopes at high elevations on which point the same Review says :—

"During a recent tour in the Kumaun hills Sir Charles 'Crosthwaite was struck with the denudation of the hill-sides at 'the higher elevations brought about by the temporary cultivation 'of potatoes and the subsequent abandonment of the land as its 'fertility is exhausted. Steps have been taken to prevent grants 'of land being made from the district forests by the civil authori-'ties for such temporary purposes, especially in localities where the 'forest protects the hill-side from erosion."

Considering that it is on the water-supply of these hills that the Ganges Canal depends for maintaining the necessary amount for the irrigation of the plains below, it is important that something should be done, and we hope that not only in Kumaun and Garhwal, but in the Tehri State also, steps will be taken to diminish denudation and to maintain a more uniform flow of water.

In all these Circles new working plans are in process of preparation, so that before long the whole of the forests of the Province ought to be under regular treatment. The new plans are far more simple and easy to carry out than those which were first made, more of which have already had to be superseded.

On the question of *Breaches of Forest Law*, the following remarks of the Lieutenant-Governor deserve to be carefully read just now, for they show that the Resolution on the forest policy of the Government of India published in 1894 does not fully apply to the North-Western Provinces at any rate. We are glad to see that the Government of India received these remarks with pleasure :—

"On the whole a comparison of the record of offences with 'that of previous years, and with the area of the State property 'protected, bears out the view taken by officers in the Central 'Circle, that in proportion as forest laws and restrictions become 'more generally known to the people, and the latter realize that 'their enforcement is seriously intended, the necessity for pro-'secutions tends to decrease. It is too soon to expect a hearty 'acceptance of the principles of forest protection, even when on 'the most liberal lines, on the part of the people, as their natural 'inclination is to exploit the forests for their immediate necessities 'to the extent of destroying them. But it cannot be said that 'forest administration as pursued in these Provinces has given 'rise to active discontent amongst the agricultural classes, or 'that its restrictions and prohibitions are needlessly harsh and 'oppressive."

Fire Protection work was very troublesome during the year, for the season was an exceptionally unfavorable one, and the percentage of failures was 5·52 as against 2·44 in 1892-93. In the Saharanpur Siwaliks much damage was done by a serious fire near Hardwar to a fine crop of Chir pine seedlings.

The following remarks under *Natural Reproduction* in the Oudh Circle Report, referring to the reproduction of *Asaina* (*Terminalia tomentosa*) will be read with interest :—

"The sal seeded throughout the Circle; but, except in 'Gorakhpur, the crop was much below normal, and little of the 'seed formed matured, being blown from the trees when still 'unripe by the hurricanes which raged through the forests in 'May. The asaina seeded most profusely, in some cases branches 'being broken off with the weight of the fruit. The production 'of this species continues to be excellent; in the Chakia forest it 'threatens in some localities to push out the more valuable sal. 'There is no doubt that owing to the time of the seedfall, forest 'fires have more destructive influence on the reproduction of 'asaina than on that of sal. The former sheds its seed before and 'the latter after the usual fire season, and this may account for 'fact that the asaina is more frequent in wet and clayed soils 'where the fallen seed would naturally escape being consumed. 'In fire protected areas, where the chances of reproduction are 'equal, the asaina soon proves that it is not entirely dependent on 'a damp and stiff soil, which it favours only of necessity, and 'hence the present marked luxuriance of reproduction of this 'species."

From the Central Circle also, it was reported that the sal flowered profusely, but produced little seed.

The following account of the actual financial results of the turpentine works in the School Circle may be interesting to some of our readers :—

"The Conservator has put together the actual results of 4 years' working of the resin operations in the following table :—

Particulars.		1890-91.	1891-92.	1892-93.	1893-94.	Total.
'Number of maunds of crude resin collected		201½	299½	623½	639	1,763½
,, ,, sold locally		22	200	3½	15	240½
,, ,, sent to Dehra		191	328	639	382	1,540
,, ,, colophony sold		118	253½	380½	278	1,030
,, gallons of turpentine sold or used.		45	168	1,168	624	2,005
'Revenue from crude resin	Rs.	46	800	15	68	929
,, ,, colophony	,,	655	1,397	1,888	1,563	5,503
,, ,, turpentine	,,	127	353	2,510	1,306	4,296
'Value of resin and turpentine in stock	,,	...	...	...	2,773	2,773
Total	Rs.	828	2,550	4,413	5,710	13,501
Expenditure.						
'Capital ...	...	305	20	20	...	345
'Working—						
'Cost of collection	...	562	561	942	1,168	3,233
,, carriage ...	...	234	428	766	808	2,236
'Dehra expenses ...	...	95	260	363	432	1,150
'Chakrata ...	...	124	218	471	819	2,866
'Bags, drums, &c,	...	280	365	589		
'Carriage by rail ...	...	89	182	254	163	688
Total	...	1,384	2,014	3,385	3,390	10,173

'The net results consequently are :—

	Rs.	Rs.
'Revenue	...	13,501
'Expenditure, working	... 10,173	
'10 per cent. of capital	... 35	
		10,208
	Profit	3,293

'on 1,763½ maunds of resin collected.

'This is equivalent to very nearly Rs. 1-14-0 per maund profit. In 1891-92 200 maunds were sold in Chakrata at Rs. 4 per maund, which, of course, is much better ; but it is believed that the purchaser lost money over it, and since then there has been very little demand for crude resin. The introduction of a new industry is an important matter, and it is satisfactory to be able to show that the work pays. Were there a road along the Tons valley, the industry might be extended easily so as to supply, not only the present, but a much larger demand ; and now that a new customs tariff taxes the imports of resin and turpentine into India, there is every reason for customers to get their supplies

'from the local industry. At the suggestion of the Inspector-'General, proposals are being prepared for increasing the number 'of stills and building a small shed for the work."

The financial results of the year were :—

Forest year.	Receipts	16,36,725	Financial year.	Receipts	17,09,863
	Expenditure	9,57,595		Expenditure	9,62,994
	Surplus	6,79,130		Surplus	7,46,869

The *Punjab* Report contains many points of interest, and indeed is much better reading than usual. The Report is written by Mr. C. F. Elliott, though the late Mr. Whittall was really in charge during most of the year. The Lieutenant-Governor again pays a tribute to Mr. Whittall's work, and records his appreciation of that officer's desire to do his work up to the very end, from the fact of his having met him in Kulu, though in a precarious state of health.

The area of forests under the Department at the close of the year was 6,968 square miles.

One of the chief points of note in the Report is the ill-success of fire-conservancy operations in the Hazara Division. The Conservator writes on this as follows :—

"In Hazara, in accordance with the orders received in Pun-'jab Government No. 682, dated 9th December, 1894, special 'arrangements were made to protect the forests. Fire lines were 'made in 7 forests, *viz.*, 2 in Kaghan, 1 in Siran and 4 in Khan-'pur Ranges, the area of which aggregated 22,574 acres ; the 'lines extended over 86 miles, costing Rs. 524. The lines were not 'expected in themselves to keep out fire, but to serve as rallying 'lines and for patrol purposes. A special establishment of 3 jama-'dars, 46 guards, and 9 dak runners was entertained at a cost up 'to the end of June last of Rs. 628, but pay for July has to be 'added, and many of the men will have to be kept on till the 'Revenue Assistant has completed his inquiry. It may here be 'mentioned that one guard has already resigned, the day before his 'evidence was to be taken, preferring the loss of his appointment 'to being obliged to give evidence against his neighbours."

"Several reasons combined to decide on entertaining local 'men in preference to outsiders for this fire protection duty, *e.g.*, 'the local men would have more knowledge of the forests and also 'of the people, consequently, if honest, could often be of use where 'a stranger would be useless, their employment, it was hoped, 'would, by putting money into the pockets of the people near the 'forest, interest them in fire protection, and so forth. Mr. Gis-'borne Smith, the Divisional Officer, spent the greater part of the 'cold weather in the Khanpur Range, explaining matters to the 'people, promising them rewards in the shape of cash and of 'opening unburnt forest for grazing, &c., &c. It was given out 'that rewards when earned would be publicly distributed by the 'Commissioner in open Darbar ; in short, every inducement was

'held out to the people to refrain from burning the forests. The 'result shown in the statement below is 11,444 acres burnt, of 'which all but 5 acres were those of which the protection was 'attempted.

"It is impossible to believe that this result is due to accident. 'The facts, that fires when extinguished by the Forest establish- 'ment broke out again in the same, or other parts of the same, 'forest, and that in one or two instances men were actually caught 'spreading fire about in the reserves, prove conclusively that these 'disastrous fires are due to incendiarism only. It follows then that 'all our labour and expenditure are thrown away, as no fire 'lines or fire guards can contend against persons who are determined 'to fire the forest. The statement here given shows with what per- 'sistency the forests have been burnt almost every 2nd year for 'the last 15 years.

Division.	1879-80	1880-81	1881-82	1882-83	1883-84	1884-85	1885-86
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
'Hazara ...	Not given	2,113	108	14,350	3,716	13,827	4,460
'Rawalpindi	1,24,000	15,925	3,000	6,000	2,618	179	265
'Kangra ...	6,630	*1,050	*1,926	2,140	16,158	484	3

Division.	1886-87	1887-88	1888-89	1889-90	1890-91	1891-92	1892-93	1893-94
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
'Hazara ...	27,651	253	1,006	23,451	...	20,299	157	11,444
'Rawalpindi	49,841	289	2,445	35,064	834	6,715	...	38,097
'Kangra ...	1,543	284	39	985	...	1,329	2	4,218

* Inclusive of Kulu unit.

"The cause has often been explained; every 2nd or 3rd year 'the pine needles form a matted surface through which grass 'cannot grow and grazing deteriorates, consequently the people 'burn off the offending leaves. We must acknowledge that our 'efforts so far have failed to put down this abuse, and the recent 'legislation has rather reduced than enhanced the power wielded 'by the Courts, as Section 27 (1), Hazara Regulation No. 6 of '1893, limits the fine which may be imposed on an offending com- 'munity to double its land revenue for a year. However, this is

'not the place to discuss remedies which will be proposed in a 'separate report."

But the orders of the Government on these remarks do not seem as if they were determined to carry out protection as a policy. They say :—

"It is disheartening to find that the special efforts for fire-'protection made in Hazara were not more successful. All that 'can be said is that the area destroyed was much less than in '1886-87, 1889-90, or 1891-92. As Mr. Elliott points out, the 'accumulation of pine needles threatens every second or third 'year to prevent the growth of grass, and in these circumstances 'some zamindar is pretty sure to be found who will face the small 'risk of being detected and sent to jail for applying what seems 'to him the appropriate remedy. The grant of special grazing 'privileges in the case of those forests which escape for several 'years in succession is likely to prove more effectual than the 'fear of punishment. The offer of such privileges is a new policy, 'and comparative failure at first was perhaps to be expected. 'Unless we can make the people believe that our interests in these 'forests are not really incompatible with theirs, we cannot hope 'for their assistance in protecting them. Of the total area in 'charge of the Forest Department 14 per cent. is entirely and 14½ 'per cent. partially closed to grazing. But where grazing is 'prohibited, grass-cutting is usually allowed."

The attention of such of our readers as are interested in 'deodar' may be drawn to the following extracts from para 21 :—

"Mr. McIntire has made a close study of deodar re-'production for several years, and results in Chamba seem 'to show that excessive moisture is the great enemy of the 'deodar seedling. The good seed year of 1892 produced a 'heavy crop of seedlings in 1893, but the early and severe 'rains of that year destroyed large numbers ; outside the sphere 'of the heavy rainfall in drier parts such as Barmaur, the seed-'lings survived. It was noticed too that when seedlings survived 'the heavy rainfall it was chiefly in bare places or where grazing 'had kept down the under-growth. But this effect of heavy rain 'is noticed only in the case of seedlings up to 3 years old, "so that 'from its fourth year onwards the seedling grows better where 'there is a heavy rainfall than in a comparatively dry climate ; 'moreover, seedlings which do manage to establish themselves on 'the comparatively fresh slopes with rich soils grow into much 'better trees than are produced on such situations as crests, ridges, '&c. Consequently the old theory, *viz.*, that deodar prefers dry, 'well drained slopes, is true only to a very limited extent." Mr. 'McIntire also thinks that his observations prove that the theory 'of the covering being the chief obstacle to deodar germination 'is incorrect."

Our own experience is that the worst enemy of young deodar seedlings is—exposure to a hot sun and drying wind. A few weeks

ago we saw slopes in the Koti Forest in Jaunsar which had been roughly hoed in order to encourage reproduction, it having been a fine seed year. Everywhere the reproduction had been magnificent, the seedlings in myriads. Where the aspect was fairly moist, they had survived, and were looking well, though the day of their inspection was one of the very hottest days of the year; but on the Southern and South-Western aspects, hardly one was alive. They were all brown and shrivelled up. Had there been more bush vegetation, probably the results would have been better. We should like to see the subject discussed; and hope some of those who have experience will give an account of it.

The following remarks on an alternation of crops of male and female flower on the deodar also deserve to be discussed :—

"Mr. Fisher notes that in 1891 and 1893 there were very 'heavy crops of male deodar cones and no female ones, while in '1892 and 1894 there have been good crops of female and no male 'cones; this regular alternation does not appear to have been 'observed previously in Kulu or elsewhere. Wherever browsers 'gave it a chance the plentiful crop of seedlings of 1892 has done 'well, but there was no new reproduction in 1893 from want of 'seed."

We see from the notes on *Experiments* that the *Albizzia lophantha* has definitely been given up as a possible species for re-stocking barren slopes. The *Robinia*, as Mr. Hart recently told us in this Journal, has been really successful about Simla, and we have ourselves recently seen some samples of it which do great credit to the energy of its introducer—we believe it was Mr. Ribbentrop.

The following extract on the practice of selection fellings in Chamba will be read with interest :—

"In Chamba the selection of the trees is carried out with a 'view to remove all unsound trees capable of yielding a profit on 'exploitation, trees growing over advance growth or in places 'in which they could be of no use for seed, or where other 'trees were standing close by sufficient to give seed. Several 'trees reckoned by the Working Plan as inaccessible were actual-'ly felled, it being considered better to fell them and risk a 'certain amount of breakage than leave them to stand and decay."

The financial results of the year were :—

Forest year.	Receipts	9,43,789	Financial year.	Receipts	9,13,302
	Expenditure	6,53,456		Expenditure	6,36,429
	Surplus	2,90,333		Surplus	2,76,873

V.—SHIKAR AND TRAVEL.

Elephant Catching Operations.

SIR,

I have waited for some reply from Mr. Hadfield to my letter of the 30th March, which appeared in the *Forester* for May, asking for cases of elephants falling into and escaping from pits. Mr. Bryant wrote to me direct and gave three instances. He writes: "I have known three cases in which an elephant has managed to get out of a pit. In two cases the animal was a very large tusker, and by goring down the earth at the sides, made it sloping enough to get out. In the third case the animal was a huge cow, and by means of knocking down the earth and the assistance of a neighbouring tree, which she could reach with her trunk, she managed to escape. The pits would have been about 9 ft. deep, *i. e.*, from the brush-wood when trampled down to the surface." This is very interesting, but certainly does not prove anything against my theory that the pits we dig and have been ordered to dig, *viz.*, from 10 ft. to 12 ft., are too deep. Always bearing in mind the fact that we do not want to capture any elephant over 7ft., experience having shown that animals over that size pine and die soon after capture, even if they are not seriously or fatally injured in the fall. Since writing the letter referred to above I have caught three more elephants, two cows 7ft. 3in. and 5ft. 9in. respectively, and a calf 3ft. 6in. None of them were injured in the very least by the fall; few slight abrasures caused by ropes, which were well in a week, being the only wounds they had on them when extracted. I still cannot help thinking that, as I have said in my first letter, a depth of 8ft. or 9 ft., bedded for 4 ft. or 5 ft. would be ample for the size of animal we want to capture. If large ones fall in let them get out by themselves, if they can, by all means; and save us the trouble and expense of getting them out. I still hope Mr. Hadfield will, if he can, give us some instances of *elephants less than* 7 ft. making even fairly successful attempts to escape.

MANANTTODDY, J. E. F. M.
23rd August, 1895.

VI.—EXTRACTS, NOTES AND QUERIE.

Obituary. L. A. W. Rind.

We regret to learn of the death in England of another officer of the C. P. who lately had to be invalided home on sick certificate. Mr. L. A. W. Rind, a Deputy Conservator, of the 2nd grade, joined the Department in 1870, and had more than 25

years' service when he died. He obtained his first appointment to the Department in India as a Sub-Assistant Conservator, and served at different times in Oudh, Burma, the N.-W. P., the C.P. the Hyderabad Assigned Districts, and, finally, again in the C. P., where he held charge of the Seoni forests at the time of his last illness, which latter, we believe, was occasioned by fever complicated with liver derangement. Mr. Rind always bore a good reputation as a hard working officer, and during his varied service over the greater portion of the peninsular had doubtless experienced his fair share of exposure under trying climatic conditions.

T. H. Aplin.

We also have to record the death in Burma of another Forest Officer, T. H. Aplin. He was trained at Nancy, and arrived in Burma on the 11th December, 1877. For ten years he served in Lower Burma, the first part of the time in Moulmein and Salween Divisions, and then in the Tharrawaddy Working Plans and Rangoon Divisions. After an interval of a year and nine months' furlough, on his return, he was posted to the Minbu Division, Upper Burmah, in November 1889. When Upper Burmah was divided into two circles, Aplin was chosen to hold charge of the Western Circle, and officiated as Conservator of that Circle from April to October, 1892. He has twice officiated as Conservator since.

Although he had been generally in poor health for some time, his death, which occurred on the 4th July last, was very sudden and unexpected. On the 3rd he had been engaged in office work till 2 p. m., but during the afternoon fever came on, which became violent in the evening, and accompanied with repeated attacks of convulsions, and he died early next morning, having been unconscious for more than six hours.

We have lost in Aplin a very able and conscientious officer whose mature experience and good sense could always be trusted, and whose place will not be quickly filled.

Marram Grass in Australia

Vernacular Names.—"Marram" appears to be the spelling, and to represent the pronunciation of the name of this grass as generally accepted in the colonies, and I have no wish to disturb it. This name follows the spelling given by Sir J. E. Smith in his *English Flora* (1824). In Hooker's *Student's Flora of the British Islands*, the spelling is given as "Marrem," while in that magnificent work, *Sowerby's English Botany*, it is called "Murram"; and it is there stated that, according to Mr. Prior, the name is derived from the Gaelic *Muram*, or the Danish *Marhalm*, sea haulm, or straw. Other names are mat-grass, beach-grass, sea-weed, and sea-mat reed.

Botanical Name.—Psamma arenaria. From the Greek word for sand (*psammos*). *Arenaria*, a Latin adjective signifying "pertaining to sand."

Synonym.—Ammophila arundinacea, Host. (In the *Genera Plantarum* of Bentham and Hooker, *Psamma* is merged in *Ammophila*).

Botanical description.—Genus *Psamma* (Hooker's *Students' Flora of the British Islands*, 2nd edition, p. 462).

Spikelets, in a contracted panicle, much laterally compressed, 1-fid., with sometimes the pedicel of an upper glume.

Empty glumes, two, scarcely exceeding the flowering, rigid, subequal, long, narrow, keeled, subacute.

Flowering glume, rigid, shortly pedicelled, with an oblique callus and a short pencil of silky hairs at the base, four to five-nerved ; awn minute, subterminal.

Palea, equalling the glume, rigid, two-nerved.

Scales, very acuminate.

Stamens, ovary and fruit of *Calamagrostis*.

P. arenaria, R. and S.

Rootstock, widely creeping, binding the sand.

Stems, 2 to 4 feet, smooth or scabrid above.

Leaves, long, rigid, convolute, polished without, scabrid and glaucous within ; sheaths long ; ligule very long, 2-fid. torn.

Panicle, 3 to 6 inches, straight, broadest and sometimes lobed at the base ; branches short.

Spikelets, erect, pedicels scabrid ; empty glumes ⅛ to ¼ inch, acute ; keel scabrid ; flowering glume and palea quite like the empty glumes in colour and texture.

Anthers, ¼ inch, linear, yellow.

Marram Grass as a Sand-binder.—Sir James Smith (*English Flora* i., 171), says (1824) :—"One of the most valuable grasses for binding the sand of the sea-shore, and raising those banks, which in Norfolk, and especially in Holland, are the chief defence of the country against the encroachments of the ocean."

In Sowerby's work the following account is given of Marram Grass, and, with reference to the suggestion at its close, it is to be hoped that it will prove valuable in the saline sand-drifts of the western part of the Colony, for it has proved its value on the coast. The experiment is worth trying, and would not be expensive :—

"Its value as a natural sand-binder cannot be overrated. Many thousand acres on various parts of our coast (England), are preserved from being overwhelmed by the drifting sand by means of its agency. In the latter part of the last century a large district on the eastern side of Scotland, near the Moray Firth, was completely destroyed and rendered in a few years as desert as the Sahara by the advance of the sand from the shore, owing to the wanton destruction of the Marram that grew upon it. This grass, therefore, when found growing on sandy shores, should always be carefully preserved by proprietors of land. Acts of Parliament have been passed to protect it, which are but little attended to ;

and in Holland it is said that its destruction is a penal offence. The strong underground stems, which render it so valuable as a protection against the action of the winds and waves, are capable of being made into ropes ; and people living near the coast often plait them into mats, whence one of the common names of the grass. Professor Buckman says :—' We have exhumed rhizomata of this grass several feet in length, and as these mat and weave together, in the positions indicated, they act as powerful conservators of the coast-line, and we cannot help thinking that the *Psamma* might be cultivated with advantage, with the view of keeping together some of our slippery railway embankments. To this it may be objected that it is a maritime species ; but inasmuch as we have grown it on the sandy clays of the Forest Marble, far remote from the seaside, we have no fear of its success on this account."

Dr. George Vasey quotes the following statement :—" Its long, creeping roots, extending sometimes to the extent of 40 feet, and bearing tubers the size of a pea, interlaced with death-like tenacity of grasp, and form a network beneath the sand which resists the most vehement assaults of the ocean waves."

The following account of Marram Grass (or as it is known in the United States, Beach Grass, Sea-sand Reed, Mat Grass), is taken from Charles L. Flint's *Grasses and Forage Plants* (Boston, U. S. A., 1888), and is of interest as showing how districts almost overwhelmed with moving sand may be brought into subjection through the agency of this sand-binder. It may be noted that, after the grass has done its good work, it itself should be kept in check, or otherwise it may seize upon and render useless agricultural land :—

This grass is very generally diffused on sea-coasts over the world, and is found inland on the shores of Lake Superior. It has also been cultivated by way of experiment, and with success, on the sands at Lowell, Massachusetts, and still further up on the banks of the Merrimack River. Though not cultivated for agricultural purposes, it is of great value in protecting sandy beaches. It is preserved in England and Scotland by Act of Parliament. Flowers in August.

The Town of Provincetown, once called Cape Cod, where the Pilgrims first landed, and its harbour, still called the Harbour of Cape Cod—one of the best and most important in the United States, sufficient in depth to receive ships of the largest size, and in extent to anchor 3,000 vessels at once—owe their preservation to this grass. To an inhabitant of an inland country, it is difficult to conceive the extent and violence with which the sands at the extremity of Cape Cod are thrown up from the depths of the sea and left on the beach in thousands of tons by every driving storm. These sandhills, when dried by the sun, are hurled by the winds into the harbour and upon the town. A correspondent at Provincetown says :—" Beach-grass is said to have been cultivated here as early as 1812. Before that time, when the sand drifted down upon the dwelling-houses—as it did whenever the beach was

broken—to save them from burial the only resort was to wheel it off in barrows. Thus tons were removed every year from places that are now perfectly secure from the drifting of sand. Indeed, were it not for the window-glass in some of the oldest houses in these localities, you would be ready to deny this statement, but the sand has been blown with such force and so long against this glass as to make it perfectly ground.

Congress appropriated, between the years 1826 and 1839, about 28,000 dollars, which amount was expended in setting out beach-grass near the village of Provincetown, for the protection of the harbour. From the seed of this grass it is estimated that nearly as much ground has become planted with it as was covered by the National Government. In 1854, 5,000 dollars were wisely expended by the general Government in adding to the work; and the experience of former years was of great value to the efficiency of this latter effort. The work of fortification or protection is not yet complete. The eastern part of the harbour is much exposed to injury from the sand, which now empties itself by thousands of tons, during every north wind, into it.

"It may be proper to state," says the writer already quoted, "that this town does much in the way of 'beach-grass committee,' whose duty it is to enter any man's enclosure, summer or winter, and set out grass, if the sand is uncovered and movable. By this means we are now rid of sand-storms, which were once the terror of the place, being something like snow-storms, for drifts, which were to be removed. Our streets are now hardened with clay, which has been imported; and, instead of it being buried, as it would once have been in a few days, I notice that the surveyors have to resort to sprinkling it with sand in wet weather, so effectually has the culture of beachgrass answered its end.

"The mode of culture is very simple. The grass is pulled up by the hand and placed in a hole about a foot deep, and the sand pressed down upon it. These holes are dug about one foot and a half apart. The spring is the usual time for planting, though many do this work in the fall or winter. The roots of the grass, from which it soon covers the ground, are very long. I have noticed them 10 feet, and I suppose on high hills they extend down into wet sand.

Many years ago the beach which connects Truro and Provincetown was broken over, and a considerable body of it swept away. Beach-grass was immediately planted, and the beach was thus raised to sufficient height, and in some places into hills. The operation of it is like that of brush or bushes, cut and laid upon the ground, in accumulating snow in a drifting wind. The sand is collected around the grass, and, as the sand rises, the grass also rises to overtop it, and will continue to grow, no matter how high the sand-hill may rise; and this process goes on over the whole surface of the plantation, and thus many acres have been raised far above their original level.

(To be continued.)

VII.—TIMBER & PRODUCE TRADE

Statement of average selling rates of timber and bamboos in Meerut, Cawnpore, Bareilly, Pilibhit, Moradabad and Bulandshahr for the quarter ending 30th of June, 1895.

Description.	Timber Scantlings per score.		Bamboos per 100 scores.		Remarks.
	From	To	From	To.	
MEERUT.	R. A. P.	R. A. P.	R. A. P.	R. A. P.	
Sal 10′ Tors (Poles) ...	10 0 0	20 0 0	...	...	
Sal and Sain, &c., Karies, 12′ × 5″ × 4″	25 0 0	40 0 0			
Sal bed posts, 7′ × 2½″ × 2½″ ...	12 8 0	15 0 0	...	...	
Bamboos of 9′ to 10′, per 100 scores ...	...	...	35 0 0	100 0 0	
CAWNPORE.					
Sal 10′ Tors (Poles) ...	4 8 0	5 4 0	...	...	
Sal & Sain, &c., Karies, 12′ × 5″ × 4″ ...	20 0 0	60 0 0	...	...	
Sal bed posts 7′ × 2½″ × 2½″ ...	10 0 0	12 8 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	30 0 0	60 0 0	
BAREILLY.					
Sal 10′ Tors (Poles) ...	5 0 0	10 0 0			
Sal & Sain, &c., Karies, 12′ × 5″ × 4″	25 0 0 40 0 0	35 0 0 50 0 0 60 0 0			
Sal bed posts 7′ × 2½″ × 2½″ ...	10 0 0	25 0 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	...	...	
PILIBHIT.			50 0 0	137 0 0	
Sal 10′ Tors (Poles) ...	40 0 0	70 0 0	50 0 0	137 0 0	
Sal and Sain, &c., Karies, 12′ × 5″ × 4″ ...	30 0 0	40 0 0	...	...	
Sal bed posts, 7′ × 2½″ × 2½″ ..	5 0 0	6 4 0	..	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	...	...	
MORADABAD.			60 0 0	100 0 0	
Sal 10′ Tors (Poles) ..	20 0 0	25 0 0	60 0 0	100 0 0	
Sal & Sain, &c., Karies 12′ × 5″ × 4″ ...	30 0 0	55 0 0	...	...	
Sal bed posts 7′ × 2½″ × 2½″ ...	0 8 0	0 10 0	..	...	
Bamboos of 9′ to 10′, per 100 score ...	...	..	...	...	
BULANDSHAHR.			50 0 0	75 0 0	
Sal 10′ Tors (Poles) ...	...	...	...	...	
Sal and Sain, &c., Karies 12′ × 5″ × 4″	...	...	...	...	
Sal bed posts 7′ × 2½″ + 2½″ ...	...	...	...	...	
Bamboos of 9′ to 10′ per 100 Score	...	...	50 0 0	55 0 0	

Churchill and Sim's Circular.

5th July, 1895.

EAST INDIA TEAK.—The deliveries for the first six months of this year have amounted to 7,978 loads against 6,051 loads in the corresponding period of 1894. In June this year they have been 1,778 loads against 740 loads in June, 1894. A considerable part of this month's delivery has been on Government account, but a large sale by auction has forced a proportion into consumption through channels hitherto closed to the woods on account of its high price. First class planks have been enquired for, but the demand for floating cargoes is for the moment not perceptible.

ROSEWOOD.—The demand is rather quiet but stock small.

SATINWOOD.—Is selling slowly and stocks are sufficient.

EBONY.—A parcel is just landing, which is the only stock on the market.

PRICE CURRENT.

Indian Teak	per load	£10	to £16.
Rosewood	„ ton	£6	to £9.
Satinwood	„ sup. foot	6d	to 18d.
Ebony	„ ton	£6	to £8.

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, July, 1895.

Cardamoms	per lb.	1s. 3d.	to	2s. 3d.
Croton seeds	per cwt.	28s.	to	31s.
Cutch	„	20s.	to	32s.
Gum Arabic, Madras	„	20s.	to	35s.
Gum Kino	„	£25	to	£30
India Rubber, Assam,	per lb.	1s. 7d.	to	2s.
„ , Burma	„	1s. 5d.	to	2s. 2d.
Myrabolams, Bombay,	per cwt.	7s. 9d.		
„ Jubbulpore	„	6s.	to	7s.
„ Godavari	„	5s. 6d.	to	6s. 6d.
Nux Vomica, good	„	6s.	to	9s.
Oil, Lemon Grass	„	10s.	to	15s.
Orchella, Ceylon	per ton	11s.	to	15s.
Redwood	per ton	£3, 10s.	to	£4
Sandalwood, logs	„	£30	to	£50
„ , chips	„	£4	to	£8
Seed lac	„	30s.	to	90s.
Tamarinds	„	9s.	to	11s.

INDIAN FORESTER.

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The Chemistry and Physiology of Foliage leaves.

*Some valuable information on the formation and translocation of starch in leaves has recently been placed on record. Up to the present it had been known that starch was formed in the day-light in the chloroplasts, and that it disappeared in the dark, that its formation depended on the presence of carbon dioxide in the atmosphere, that it is formed only where an excess of reserve material is present, and that only those rays of sun-light effect its formation, which are absorbed by the green colouring matters of the chloroplasts.

Regarding the mode of its dissolution, which was known to take place in the dark, it had been generally accepted that this was effected by means of diastase or an enzyine closely allied to it. Latterly, however, although some experiments had shown the presence of a diastatic *enzyine* in foliage leaves, a certain amount of doubt had been thrown on the truth of this by Wortmann, who questioned the methods which had been employed by other experimenters, and showed that if the diastatic power of leaves be determined by simply extracting the diastase with water, the majority of leaves would appear to be free from diastase altogether, whilst in the case of those in which he found diastase, it was very small in amount. He therefore came to the conclusion that dissolution of the starch in the leaf is brought about directly by the protoplasm. Referring now to the formation of starch, although it had been generally admitted to be formed during the day time, and that it disappeared more or less during the night, only one experimenter had endeavoured to determine its amount. Sachs in 1884 published the results of some experiments which he had made in this direction. He determined the gain in weight which occurred in the leaves of certain plants during the day time, and assumed that this was starch. The authors of the present communication have, however, determined the weight of both the products of assimilation during the day time and the starch, and whilst, for instance, the leaves of *Tropœolum majus* assimilated

*Abstracts of a paper read by H.F. Brown, Esq. F.R.S., and Dr. S.H. Morris before the London Chem. Soc. *Vide* Vol. LXIII, p. 604—676.

Nallas, and commonly wherever the soil is more stable than usual. In such situations Chal is the predominating species, while a few Khair, Shisham, Amaltas, Dhak, &c., are to be found mixed with the inferior bushes. But over the greater part of the area vegetation is very scanty, indeed, and may be said to be generally confined to scattered stunted bushes of Koraunda and Kuri with a moderate growth of grass.

4. Up to about the end of the year 1885 this range was open to unchecked grazing of all kinds, both of State and of foreign cattle, while the portions in the neighbourhood of Kalka, but more especially Kala Teep, were exposed to indiscrimnate cutting, lopping and even stubbing out roots for charcoal and lime burning, in addition to the ordinary lopping for fuel and fencing carried out by the people. Felling of all kinds was then prohibited, and in 1887 the whole of the Kala Teep hill was closed to grazing, but subsequently in 1891 it was found necessary to again open a small portion of it to provide for the grazing of the neighbouring village cattle. The grazing of foreign cattle has also been stopped throughout the whole range, and, as far as possible, lopping for fodder prohibited, while a few years ago 9,298 acres of the range were demarcated as State Forest.

The forest settlement, carried out by Mr. Minniken, provides that one-third of this area may be closed to grazing, and accordingly taken up, until at the present time there are altogether 14 portions of the forest closed to grazing ; three of these :—Kala Teep 725 acres, Nagaranwali Khol 127 acres, and Khol Khera 775 acres —are closed to grass cutting as well as grazing, the remainder to grazing only. The total area closed, however, has not yet been brought up to the limit allowed by the settlement.

5. The first attempt at any kind of reboisement work was made in the year 1887 when a quantity of Kikar seed was given to the Zamindars who were made responsible for sowing it throughout the Khols. Not much could be expected, of course, from this kind of work, but still there are a fair number of fine young Kikar trees to be found in most of the Khols as the result of these sowings. Then in 1888-89 the State Forest Department carried out successfully Kikar sowings in waste lands along the bank of the Sirsa river at the foot of the Khols, but a good deal of this land has been subsequently carried away by the river.

The main reboisement work, however, is confined to the Nagranwali Khol which, three years ago, was taken in hand with the intention of forming a regular plantation, the objects being, firstly, to control and regulate the small Nallas, and then with the aid of planting and sowing to prevent landslips and the formation of destructive torrents, and finally to transform a useless and indeed a dangerous area into a useful and revenue yielding plantation. For this purpose commencing at the top of the area a series of small bunds are built across the course of the little Nallas; these bunds

are constructed any time between the close of the winter rains and commencement of the rains proper, and made either of loose stone work or of large cuttings of Jhingan, Thor, Pindara or Kharpat bound with Maghan ropes. Their effect is to arrest the loose soil brought down with rain, and so raise the level of the little Nalla bed behind them to the top of the bund which, if not themselves carried away, they generally succeed in doing in the one rainy season.

At the commencement of the next rains the soil so collected is planted up with strong plants raised in the Pinjour forest nurseries, and put out by the method known as "basket planting," while at the same time attempts are made to steady the sides of the small Nallas by putting out quickly growing grasses and strong nursery plants according to the slopes of the hill side as the upper portions of the area are successfully treated, this work will be gradually extended downwards, until at last the whole of this plantation has been dealt with.

At first planting with the species noted at foot* was alone relied on, but during the rains of 1894, a good deal of sowing of Kikar, Shisham, Khair, Siris, Dhak, Bahera, Maghan and Kuri was carried out on the easier slopes of the upper portions of the plantation, while within the past month 500 strong *Robinia pseudacacia* plants, obtained from the Simla nurseries, were put out along the ridge. It is to be noted that during the first hot season after being put into the plantation the plants are watered twice, and thereafter are left alone; many of the transplants, therefore, have now passed through one hot weather without being watered, and without suffering in any way whatever. Work of this kind cannot, of course, be successful all at once, for landslips carry away the bunds and cover up the young plants, but still considering the short time the work has been in progress a marked measure of success has been obtained, quite sufficient, I think, to show that if the work is continued the ultimate reboisement of this Khol is only a matter of a little time and money, for the great majority of the transplants are growing splendidly, while the sowings of the last rainy season have given very good results, and generally the condition of this Nagranwali Khol, after only 3 years' treatment is in striking contrast to that of the unprotected Khols along side it.

In addition to the work in the regular plantation the last two years have seen scattered sowings of Kikar, Khair, Bahera, etc., carried out in a number of the other areas closed to grazing; beyond that it is sincerely to be hoped that they will be continued and extended; they call for no remarks because they have been confined to the "Tappars" or flat places, very probably old cultivation, which are to be found here and there in the Khols above

*Shisham, Khair, Bamboo plants and cuttings, Bahera, Siris, Jaman, Jamoa Mulberry, Maghan, Bhabar Grass, Munj Grass, Khura Grass.

the Nallas, and because as long as grazing is excluded the re-stocking of such areas presents no difficulty.

The whole of the work now under reference, that is to say, the closure to grazing, the plantation and the sowings have been carried out by Pundit Sunder Lal, the State Forest officer, who deserves great credit for the energy and ability he has displayed. He would not have been able to accomplish so much without the aid of the great interest in forestry for which the late Commissioner is well known, but I believe I am right in saying that his reboisement work in the Nagranwali plantation, is the first serious effect that has been made in the province towards reclaiming any of these denuded low Siwalik Hills.

6. For the discussion of this question the forest may be divided into two portions :—

(*a*). The Kala Teep Hill.

This is already well wooded, and so all that is necessary is to keep grazing excluded, or at any rate well restricted. For the purpose of improving the value of the forest, it would be well to put out bamboos in the Nallas, as there is little doubt of their success, and as they would sell well in Kalka.

After a few years more rest, I think that a regular system of working might be started here, coppice with fairly numerous standards would probably be the best.

(*b*). The remainder of the Khols.

The importance of continuing the work of re-afforesting these Khols cannot be over-estimated, for those not yet under treatment are going from bad to worse, and it is a matter of common knowledge that here, just as in Hoshiarpore, the gradual but certain result of leaving them unprotected is the destruction of the cultivated lands at their base, and a consequent loss of revenue.

For this purpose a sufficiently large sum should be set aside by the State every year for the up-keep and extension of those works ; the direct benefit would be by no means inconsiderable, for once plantations, such as in Nagranwali, are formed, there will be a large and sustained yield of wood and grass for which a ready sale would be found, as the Khols are close to Kasauli and Kalka.

I think their treatment should be as follows :—From the area which the settlement allows to be closed as many Khols as possible should be taken up by the State with the view of forming permanent State plantations like Nagranwali, these should be treated in the manner now in force for this plantation, that is, by Gharabandi, (the local name for the construction of the small bunds) planting and sowing. The species used should be much the same as at present, though I believe that bamboos for the sheltered situations, grasses for the very steep bad hill sides, and Khair, Shisham and Kikar in general will be found the least ; it is too soon yet to say anything for certain about the *Robinia*, but if this species succeeds, and I believe that it will, it should be adopted wherever

possible, for, apart from the fact that it would give a very large fuel yield, it is a species with great development of lateral roots, and, being at the same time very prone to throw out root-suckers, it is exactly what is required for binding together loose and friable soil such as that under consideration.

In addition to these plantations the settlement closure limits should then be worked up to so as to pass over all of the other Khols in rotation by which means their condition would be gradually improved. The closure should be for ten years, for the first two of which grass-cutting might be allowed, then in the third year the area should be gone over and blanks sown up with a mixture of Khair, Shisham and Kikar, after which grass cutting should be prohibited for five years; in the ninth and tenth year the grass might again be cut, and in the eleventh year the area thrown open to grazing in exchange for another Khol to be closed in its place.

Forest Soil.

It was Darwin's researches which first called the attention of scientific men to the part played by earth-worms in the formation of soil; but what is less generally known in France is that the English scientist mentions, in the introduction to one of his works, that a correspondant of his, Mr. King, had heard the professor of 'aménagement' at the Nancy Forest School describe to his class the work done by earth-worms as a splendid example of natural culture, the dead leaves being covered year after year by matter brought up from below, the result being a rich humus soil of considerable thickness. It is not without a certain amount of legitimate pride that we thus mention here this testimony to the teaching of our professors.

This point being established, we now feel more at liberty to enter into a description of a new work on the earth-worms from the pen of the indefatigable Director of Forests in Denmark, Dr. Müller.

At the time Ray Lankester was studying the anatomy of worms, Darwin, with the patient genius which characterized him, was studying their habits. He showed that in swallowing portions of humus and assimilating their nutritive principles, worms reduce the earth to a sort of paste, and so contribute to the improvement of the soil which they, at the same time, drain by burrowing through it. It appears, moreover, from these researches that the Oligochœta are the most active agents in covering up with regular layers of earth the remains of ancient buildings and such like on its surface, and that they thus assist in covering the earth with a thick mantle of vegetable soil, of which they increase the richness by the large quantities of leaves and other organic matter which they store up

in their burrows not only for food, but to conceal the entrance. Further, these holes greatly assist the descent of the smaller roots, and these derive their nourishment largely from the humus which covers the sides. Finally, large quantities of seeds owe their germination to the fact of their having been covered up and pressed down by rejected matter, others again buried at a considerable depth under accumulations of such rejected matter remain without germinating until some accident, perhaps, brings them to the surface again.

Dr. Müller, author of "The Natural Forms of humus and 'their influence on the vegetation of the Soil," is, we believe, the first who, returning to the doctrine of Thürmann, has attributed to the physical properties of the soil, so important to the forester, a preponderating influence on the distribution of plant species.

"Formerly," says Dr. Müller, "it was contended more forcibly ‹ than it appears to be at present, that the chemical character of ‹ the soil was the factor which determined the distribution of plants ‹ within the zone of vegetation. Although this view has been ‹ confirmed in certain particulars by recent investigations, the ‹ alleged importance of this factor has been considerably lessened ‹ in other repects, in all cases another more important cause of ‹ distribution, *i.e.*, the common life of organisms which is apparent ‹ in every locality, makes itself felt more forcibly. It is not, ‹ moreover, only groups of these organisms which are of interest, ‹ but also the most varied, acting together, have their influence ‹ on the soil, and also reciprocally limit their own development. ‹ The fact that leaf-eating insects may contribute to limit the ‹ development of a certain plant should be apparent to those who ‹ are acquainted with the conditions of the life of those insects ‹ which are found in masses on the plants on which they feed. ‹ But besides this the most different organisms are able to render ‹ the soil less habitable for certain species and more favourable ‹ for the development of others."

The above will permit those who are interested in questions of geographical botany to estimate the divergence of the views which separate the partisans of the exclusively mineral doctrine, amongst whom should be quoted, in the first place, the name of M. C. H. Contejèan, from the supporters of the influence of the physical properties.

It shows too the great importance which Dr. Müller attaches to living organisms in the influence they have on the physical properties of a soil.

For Ebermayer's classifications of humus deposits into fertile humus, powdery humus, acid humus and astringent humus, Dr. Müller substitutes for beech forests—(1) *Müll* or mild soil, (2) *Torf*, or carbonized humus, each of these formations being distinguished by a distinct fauna and flora.

In the former, animal life is extremely active, the earth being traversed in all directions by the galleries of earth-worms;

the upper layer of a black colour is gritty, friable and permeable. On the surface are found—*Mercurialis perennis*, *Milium effusum*, *Melica uniflora*, *Stellaria nemorum*, *Oxalis acetosella*, *Anemone nemorosa*, *Polytrichum formosum*. It will be noticed that many of the plants mentioned characterize in France also the soil of well kept forests. In "the Torf" of beech, there are neither moles nor earth-worms, the clotted, friable particles of earth denoting the abundance of animal life, and the excrement of insect are absent. Entomologists regard this peaty soil as sterile, and a few small eel-like animals only, which live in the moss and on the mycelium of fungi, are to be noticed here and there. *Aira flexuosa* and *Trientalis Europea*, together with the whortleberry, of which the rootlets, along with those of the beech, enter into the upper matted layer, are characteristic of the vegetable cover.

In addition to these characteristic formations Dr. Müller distinguishes—(1) *Peat-mould* noticeable in the oases scattered about in the midst of peat. Earthworms form, at these points, flourishing colonies, and clumps of brambles and promising beeches break the monotony of the miserable vegetation of the peat formation.

(2) *Insect-mould* is characterized by the absence of any matted superficial layer, and by the presence of a clotted sub-soil, formed by an enormous mass of insect excrement. Here the whortleberry is the predominating plant. The growth of the beech, though not all that could be desired is, nevertheless, better than on the peat.

(3) *Moss-mould.*—Soil compact, cohesive and dark, no matted layer formed by the beech roots, the organic and inorganic debris are bound together by threads of moss thallus. No worms and growth of beech poor.

(4) *Heath-peat* analogous to peat properly so called.

What are the principal causes which have led to the disappearance of mould and brought about the formation of peat? The author distinguishes natural causes and those resulting from the agency of man. The first are due to fires or the prolonged action of wind. The second appear to originate from badly made fellings. Peat is frequently met with in old, abandoned seed-fellings, or where excessive thinnings have been made.

Touching on the question next in its progressive stages, Dr. Müller endeavours to throw light on the future by means of the teachings of the past. Step by step he shows the forest vigorous on mild mould, and even on peat mould deteriorating on the insect mould dying on beech-peat, and finally becoming extinct on heath-peat. But he does not conclude as we should at once do, that all this means the final retreat of tree vegetation The cycle does not close with the heath. A legion of species of *Aira* and other Gramineæ spring up on the waste which, after a time, doubtless considerably long, will succeed in piercing this matted

cover and in re-introducing into the sub-soil that animal life which had disappeared from it, and without which forest growth cannot take place.

Each of these phases which mark the transformation of forest into barren waste is, moreover, characterized by a distinct fauna and flora, and a particular condition of the soil. Coloured illustrations show in a most striking manner the modification which the latter undergoes.

Space prohibits our following Dr. Müller through his description of the formation of the different kinds of humus and his study of the soil, suffice it to say, that these chapters are full of new and interesting facts.

In the second part of his work the author enters on the study of the forms of humus in oak forests, and distinguishes between forests of *Quercus pedunculata*, with an underwood of hazel, and those of *Q. sessiliflora*, with underwood of juniper. The former situated on clayey soil grow vigorously, thanks to the presence of a mild soil formed by the debris of the hazel, constantly improved by the action of earth worms; the latter vegetate slowly and with difficulty on a sandy soil covered with a formation of peat in which animal life is scarce, and the presence of thick cushions of mycelium filaments, binding together the organic debris, is noticeable. The crust of 'alios,' which originates from this peaty formation, rapidly transforms the forest of *Q. sessiliflora* into a waste of heath.

The transition from mould to peat, *viz.*, from forest to waste, is brought about by a succession of plants, such as may be seen under the stunted oak coppices.

"If the canopy of these shrubs commences to open out from 'below, or if the crown begins to dry up, first, the whortleberries, 'then heather and, finally, heath and tufts of Empetrum make their 'appearance, and the plants characteristic of mould withdraw to the 'more shaded parts. To the whortleberries and heath succeeds the 'formation of peat, until the moment when the bush is surrounded 'by sand. The causes of this transformation over small or large 'areas are the extension of a vegetation which forms peat consequent 'on the lessening of the cover and the protection of the soil." These are excellent observations. Otherwise it would have been said that the soil had become exhausted so far as the Oak was concerned; which is obviously not the case.

The form of the humus in the spruce forests of Denmark also presents interesting peculiarities. On good soil a carpet of moss is formed which collects and holds together all the debris of the forest and covers dark coloured mould of a porous and clotted character which bears witness to the activity of earth-worms. On hillocks of poor sand there is a formation of firm compact peat-like humus traversed by a tissue of five needles. The 'alios' begins to show itself. In mixed crops of spruce and oak we may notice

finally a formation of mould under the oak and of peat under the spruce.

From these observations Mr. Müller reasonably concludes that the deterioration of oak forests and their transformation into waste arise chiefly from important changes in the soil which are fatal to forest growth.

One might doubt from all these studies, depending on the magnifying glass and the microscope, whether the author in his practical conclusions had not lost sight of the forest in the mass of of minutiæ under foot ; but this is by no means the case, and his conclusions are worthy of the skilled sylviculturalist, as witness the following page on the management and care of the soil in a beech forest :—

"The freshness and porosity of the soil are obtained by means 'which tend to preserve the leaf canopy. This influence of the 'leaf canopy should be attributed not only to processes of the 'inanimate world, but also to that organic life which inhabits a fresh 'and shaded forest soil. The work of the forester seems to be to 'assist the development of a mass of living organisms which work 'in secret for his advantage.

"Generally, the forester's aim will be to favour the formation 'of good mould and to protect the animal life which contributes so 'largely to its production. He can do this, by keeping the soil of the 'forest always sheltered, in taking care that the outer edges of the 'forest are provided with cover, and by avoiding the opening out 'of the forest too heavily or over too large areas during regenera- 'tion. Too clear seed fellings have a most disturbing effect on the 'character of the area over which these are effected. The soil 'hitherto sheltered, moist, protected from winds and night frosts 'is suddenly exposed to all these influences from which it had been 'previously carefully guarded. If, in addition to this, we have a 'South or East aspect exposed to the full force of the sun and dry 'winds, or even if the soil is exposed to the West winds which 'blow away the dead leaves which hitherto protected the animal 'life in the soil, the transition becomes rapid. Every naturalist, 'who believes in the relation existing between the physical pro- 'perties of a soil, and the animal and plant life in and on it, will 'understand that a seed felling creates a totally different condition 'of affairs favourable to new forms of life and the suppression by 'these of other forms previously predominating. An area where a 'seed felling has been made is a totally different botanical and 'zoological site from a high forest of beech with complete canopy, 'and, if it is admitted that the nature of a humus is influenced in a 'sensible degree by the animal and plant life of the place, there must 'then be some change produced in the form of the humus. In like 'manner an excessively heavy thinning, any incautious clearing of 'the outer protective border of a forest, a badly executed selection 'felling, or other similar causes may lead to the same changes in

'the organic life of the forest soil, and produce the same pheno-
'mena as those which we actually meet with in nature."

Such are measures, applicable everywhere, which Dr. Müller recommends for the prevention of the formation of peat. But if this has already made its appearance over large areas, if the heath already shows signs of spreading vigorously, and if the forest under the combined influence of the various and numerous factors concerned gives indications of its total disappearance, more decided measures must be taken to restore artificially the conditions necessary for tree growth. Such works would include the spreading of branches on the soil to prevent the removal of the dead leaves from the edges of the forest where insufficiently protected from wind and sun ; the breaking up by means of the hoe or plough of the felted surface of the peat in order to induce the reappearance of the more favourable forms of animal and plant life ; finally, in crops excessively deteriorated the seed bearers, the natural disappearance of which is only a matter of time, might be removed and suitable species planted after a thorough cultivation of the soil : for example, oak and Scots Pine ; taking care to maintain a proper mixture of light-demanding and shade-enduring species, and avoiding those, such as the spruce and beech, which have a tendency to induce the formation of peat.

We now come to Dr Müller's new work which constitutes a sequel to his researches regarding the natural forms of humus, and treats of the influence of earth worms on the growth of plants with rhizomes, especially in beech forests. Dr. Müller first treats of the descent of plants into the soil. Hitherto the three principal causes, which have been given for this sinking down, are :—

1st.—The contraction of the roots.

2nd.—The positive geotropic curving of organs.

3rd.—The law of a fixed level.

Without going into these separately it will suffice to say that Dr. Müller denies more or less the influence of all three, at any rate as regards herbaceous plants, and attributes the process chiefly to the earthing up by worms assisted by certain other purely mechanical influences.

Taking the plants which grow in beech forests, he divides them into several groups according to the place their rhizomes occupy in the soil.

First come the plants which, like *Asperula odorata*, *Oxalis acetosella*, &c., have rhizomes which develope between the dead leaves and the granular surface of the soil. "These plants are 'formed in such numbers that one might imagine that in spite of 'the frailty of their tissues they would at length form a sort of 'mat over the soil. This is, however, not the case ; the stems of these 'plants gradually disappear from the surface, being slowly covered 'up by the matter ejected by earth worms. On the few points 'where this heaping up of earth by worms does not take place, the 'space comprised between the leaves and the soil is so interlaced

'with the small rootlets of trees, mycelia and root fibres of mosses, 'that a compact mass is formed into which the rhizomes do not 'penetrate. The heaping up of earth by worms is therefore necess- 'ary in this case to stimulate the developement of these plants."

Secondly, we have those plants whose rhizomes grow either between the layer of dead leaves and the soil, or in the upper layer of the soil itself. All these plants sink gradually down into the ground under the accumulations formed by worms. If this action becomes reduced, or fails altogether from any cause, either a less active growth and production of flowers is the result, as with *Convallaria majalis*, or the roots dry up, as with *Epilobium montanum*.

Next come the plants with oblique or vertical rhizomes, and here again direct observation shows the earthing up of the roots by worms, and their consequent sinking below the surface, in the case of such plants as *Primula elatior*, *Anemone hepatica*, &c., &c. *Plantago major* often hides under its spreading leaves the entrance to numerous galleries of worms, which cover up its surface roots.

Other instances and examples are given, and the author then proceeds to the general study of the change of vegetation according to the alterations the nature of the soil undergoes, consequent on the disappearance of the layers of dead leaves, the continuous action of atmostpheric agents and the diminution of animal life.

"In these transformations from the sheltered and well covered 'soil of the interior of a forest to the borders exposed to the wind 'and sun, each step is distinguished by a special flora of herbaceous 'plants. As soon as the leaves are blown away by the wind and 'the surface of the soil becomes hard, the plants with rhizomes, 'which grow on protected soil, disappear, and in a few years are 'replaced by a growth of plants with bushy, tufted roots, such as '*Luzula pilosa*, *Dactylis glomerata*, *Veronica officinalis*, *Poa nemo-* '*ralis*, *Aira caespitosa*, *Agrostes vulgaris*, *Holeus lanatus*; more- 'over by several plants which do not form tufts and have not either 'any under-ground stem: such as *Lampsana communis*, *Lactuca* '*muralis* and *Hieraceum murorum*. If for a considerable number 'of years the area in question remains exposed to sun and wind, as 'may happen in the case of the borders of a forest, even this last 'mentioned abundant and often luxuriant vegetation also dis- 'appears, and is succeeded by a feeble, often miserable, vegetation 'even on rich soil."

All these facts, and others also which we have not been able to quote, permit of the conclusion that if, as the author shows in his first memorandum, natural humus varies considerably according to the activity of earthworms, and if each of the different forms of humus is tenanted by a special flora of herbaceous plants, it is clear from his last researches that the influence of earthworms on the character of the local flora is much more direct than would previously have been supposed.

"It is not really necessary that in a given place a totally 'different type of humus should be developed, in order that the 'vegetation may change completely; it is sufficient that the num- 'ber of worms and the product of their labour become appreciably 'reduced for other forms of plants to invade the ground, and the 'biology of the vegetation to be essentially modified. The ac- 'cumulation and elaboration of the friable and fertile soil derived 'from a clay are the result of the action of earthworms on it. In 'its original state it is a stiff compact soil, not habitable by the 'great majority of under-ground stems, but worms bring it into a 'condition especially suitable for plants with rhizomes, by reducing 'the upper layer of such stiff soils to that thoroughly friable con- 'dition, as is met with in light soils whether of sand or lime and in 'swampy ground. When one thinks of the enormous extent of 'clay soils, and bearing in mind the fact that the greater part of 'the herbaceous plants which inhabit the northern and temperate 'zones are rhizome plants, one is able to understand the great 'influence the work of worms has on the flora of districts where 'such soils prevail.

'By earthing up the plant worms modify directly its biology, 'but they influence equally the nature of the outward form of 'metamorphosed subterranean stems. It has long been recogniz- 'ed that the immediate influence of the surroundings on plants is 'considerable, and to this should be attributed the great divergence 'existing between aerial and subterranean stems. Among these 'influences that of worms occupies an important place.

'In many cases the existence of under-ground stems is a 'proof of the great influence which the fauna of the earth has 'exerted, and is constantly exerting, on the vegetation; it contri- 'butes to the development of forms, to the well-being of individ- 'uals, to the constitution and to the biology of the local flora."

Such are the outlines of the original work of Dr. Müller. Based on the study of nature it throws light on certain parts of vegetable biology hitherto obscure, and shows that all that takes place on and below the surface of the soil has its effects on tree growth. Modifications, almost insignificant, in the soil produce important effects on the forest, and may even lead to its disappearance.—(*Translated from "Revue des Eaux et Forêts," by A. F. G.*)

II.—CORRESPONDENCE.

Thinnings in Forests.

SIR,

In "*The Forester*" for August you have an article on some notes on "Forestry in the Simla Hills," in which you say—"In thinnings where trees of equal ages are massed together it is by no

means right to say that the less vigorous trees should be cut. On the contrary, etc., etc." I confess that I don't understand this. The idea of making thinnings originated in the fact that experience showed that, in a regular high forest certain trees were either badly grown, or were killed off naturally, by reason of their being dominated by other trees. Such dead or damaged trees had to be removed from the forest, and the obvious development of this practice followed. This was that it would be better to remove them before they died, in order that a better price might be realised for them. Later on this again expanded into numerous systems differing from one another, according to the composition and circumstances of the forest to be treated, which, while not neglecting the original object of the operation, also aimed at improving the growth of the trees intended to produce the main revenue of the forest. But the essential foundation of the practice of periodic thinnings, speaking, of course, of its application to trees in one and the same storey, is, I have hitherto understood, the removal of dominated trees. It therefore seems to me that your statement, as it stands, is likely to mislead your non-professional readers. I believe I am right in saying that it would not, for instance, be applicable in the case of an unmixed regular high forest of *Pinus sylvestris*, treated by the successive regeneration fellings method ; an essential part of whose application would be the removal, in thinnings, of the dominated trees in order to completely disengage the dominating ones, the trees of the future.

Again, in the same article, you say—"The author of the notes falls into the by no means uncommon error of admitting thinnings in forests worked by the selection method. The forest consisting, etc., etc." I have been under the impression that the difference between "jardinage composé" and "jardinage simple" consisted, in principle, in the former being "jardinage simple" *plus* thinnings. I thought too that thinnings were made in a selection-worked forest of *Larix Europea* mixed with pines, and intended to be maintained as a mixed forest. I do not say that thinnings are necessary in all selection-worked irregular high forests, but in some of them, and therefore it seems to me that your statement on this point is rather too sweeping. If I am unorthodox in this point, at least I am so in distinguished company, for I have Vol. III of Dr. Schlich's manual with me, and in page 337 of it I find :—"On the area thus fixed (the cutting-area in a selection-worked forest) all mature trees are cut, and the necessary thinnings in the younger age classes are made."

Perhaps your dicta are intended to apply to the working of Himalayan forests only. If this is the case I venture to ask that you should let us know the reasons which have led you to form your opinions, for, in this event, I think that, as is usually the case, there may be two sides to the question.

C. P. FISHER.

Camp Kulu, 5th Sept., 1895.

SIR,

Your correspondent, Mr. C. P. Fisher, has raised an interesting question in the preceding letter (which the Editor has courteously allowed me to see), and with your permission I should like to make some remarks thereon.

The subject of thinnings is one that does not appear to be generally understood in India, at least that is my experience. The idea seems to be that cutting out suppressed, or dominated trees constitutes a thinning, but this is not so. The removal of dominated trees has nothing whatever to do with a thinning; it is merely the utilization of produce which should, as a rule, only be made if the material to be removed is saleable, and which does not improve the growth and vegetation of the crop one iota. Let me quote the best French authorities in support of this statement. What is a thinning? A thinning is an operation which consists in giving sufficient growing space to the more promising individuals in the region of their crown. If the crop has grown up as the result of an artificial plantation, the trees are more or less all of the same vigour and height, and to select the more promising individuals is a matter of some difficulty, but it has to be done, and trees are selected, arbitrarily, to be the trees of the future, and more growing space is given to them by the removal of one or more of their possibly less vigorous neighbours. But in a crop, which results from natural sowing, the trees are never of exactly the same age or of the same vigour, and at an early stage in the proceedings they begin to differentiate themselves—here the selection of the more promising trees is somewhat easier.

But there is no question here of removing dominated trees. On the contrary, the strict conservation of intermediate storeys and all shrubby growth is the fundemental basis of all thinnings.* Their reservation is counselled because they make the crop denser, enrich the soil and assist in natural pruning. Moreover in the case of a shade-enduring species, as silver fir, if any gap is made in the upper storey a tree hitherto dominated, even suppressed, which I take as a stage lower, will, by virtue of its recuperative power, take advantage of the light thus let in, and will rapidly fill up the hole.

Again Broilliard† says that the only means of being able to remove what is necessary in the upper storey is to preserve dominated trees in a thinning, and this is the sole means whereby we can cause woods, which have been subjected to thinnings to grow into fine forests.

But it may after all be only a question of terms, and what your correspondent calls a dominated tree may be merely one which has suffered in the struggle, and is becoming less vigorous. He admits that they are in the same storey, and this is *primâ facie*

*Boppe: Traité de Sylviculture, p. 176.
†Traitement des bois, ed. 1894. p, 268.

indicative of their being neither dominated nor suppressed as understood by others. There are unfortunately not many forests in India where this subject can be illustrated on the ground. So many of our crops have been neglected in past time that it is difficult to find a fairly uniform crop more or less of the same age; however, in some of the deodar and fir forests, in the N.-W. Himalaya, cases do occur in the younger crops where a thinning would be most advantageous.

I have no doubt that the reviewer of "Forestry in the Simla District," when advocating the removal of some of the more vigorous trees (*Indian Forester* Volume XXI, page 317) was thinking of this upper storey, the only one with which we are concerned in making a thinning; in this storey of more vigorous trees, he would remove some of those which are crowding up their neighbours, that is to say, he would give sufficient growing space to the crowns of the more promising individuals, by removing one or more of those hemming them in; sometimes the tree removed would present a narrow and compressed crown, at other times its crown would be as ample as the those of the trees left. If a forester contented himself with marking only those trees which had a narrowed confined crown, he would have to come round again rather soon, as the small space he had created would rapidly fill up. The removal of trees fairly dominated would not have the slightest effect on the crop, and in most cases in India would not be justified.

In this connection I may be allowed to quote from "A Tour in Jaunsar," published in your journal, Volume XIX, page 245. Talking of a small patch of pure oak in the hills, the writer says:—

"The old nurseries from which these plants were taken, con-
'tain trees which have been allowed to grow on undisturbed, only
'suppressed trees having been removed. Although on a small
'scale, they form a good example of an artificial pure crop of even
'age, 20 years old, and now about 20 feet high. The leaf canopy
'is complete, the lower branches have died off long since, and a
'thinning could now be made with advantage. The object of such
'a thinning would be to liberate the crowns of the future trees, *i.e.*,
'to give lateral place to the crowns of the dominant trees. Being
'a pure crop of even age, the real dominant trees are at first sight
'hard to distinguish. Still, here and there, one tree has a wider
'crown than its neighbours, and a thicker stem. More room
'should be given to such a tree by removing one or more of those
'which are hemming it in. In other cases, the trees are so exact-
'ly equal, that the only thing to do is to create a dominant tree
'artificially, as it were, *i. e.*, to select one and to remove one or more
'equal trees on either side. In any case, the leaf canopy should
'be kept as close as possible.

"The removal of the trees really suppressed in this case does
'not do much harm. As we are not dealing with a timber tree,

'the formation of a long clean bole free from branches is not im-
'portant; moreover, the suppressed trees are saleable to make
'tool handles. But it should be remembered that in most cases
'the removal of suppressed trees is indefensible, *e.g.*, in the deodar
'thicket at Bodyar."

In the treatment of Scotch pine one of the authors quoted above admits that it is useless to preserve dominated trees, as they would very quickly die under the cover of their neighbours. This treatment would probably hold good in the case of Chir pine and blue pine in the Himalayas, but it would never be adopted in forests of deodar or the two firs.

The second point mentioned by your correspondent is that of thinning in forests worked by the selection method. I must confess that I never heard of "jardinage composé," nor does it appear to be mentioned in the leading French works on this subject. It is possible that some confusion may have resulted from the resemblance which is claimed in Schlich's manual on the very page quoted by your correspondent of the 'selection forest' to the 'coppice with standards' known as '*taillis composé*.' It is true, however, that Loventz and Parade in their "Cours de Culture," page 326, advocate the removal in the selection felling of dominated trees which would have been marked in making a regular thinning in a high forest; but later writers are not in favour of this plan. Bagneris* says distinctly that no thinning is to be made. Broilliard (op. cit., page 310) in dealing with a silver fir forest counsels one to avoid opening out the fir poles as would be done in a thinning. Boppe (op. cit., page 216) is of the same opinion. The very definition of the selection method at once shows that thinnings are not contemplated. In regular *even aged* forests of larch or pine, thinnings are advisable; but frequently these species are found growing under such circumstances in the mountains that the selection method alone is applicable, and regular thinnings cannot be made, (Broilliard op. cit. page 356), although some of the poles of pine should be thinned out, as this species requires much light.

For the N.-W. Himalayas, however, and that includes the area dealt with in "Forestry in the Simla District," wherever we have to apply the strict selection method, it may safely be said that thinnings would be a mistake. Such are the fir, pine and oak forests above 8,000 feet in altitude.

Those who are interested in the subject of marking trees in a thinning, should read the excellent advice given on pages 267-270 of Broilliard's work quoted above, and in practice should bear in mind, in treating forests by the selection method, what Boppe so tersely describes as *l'etat jardiné*, a condition under which the forest presents generally an intimate mixture of all uneven ages from the seedling to the mature tree.

A. SMYTHIES.

*Manuel de Sylviculture, page 129.

Pyinkado Sleepeers.

SIR,

In the last *Forester* you were making enquiries as to the durability of Pyinkado sleepers. It is now pretty well recognized that there are two sorts of Pyinkado, one of which cuts very much *redder* than the other. The Burman says he can distinguish the two trees by the following :—The *leaf* of the redder kind is slightly larger, but this is only distinguishable after careful scrutiny; the *bark* is redder, the difference being apparent at a distance ; the *flower* is distinctly yellow, and is easily distinguishable from the blossoms of the other sort. The redder wood cuts harder, and is supposed to be more lasting.

It is known that a certain quantity of cutch-dyed sleepers of other inferior woods have been palmed off on India as Pyinkado, and it is to be feared that this grand wood will get a bad name. It is practically certain that there are two qualities of the wood, one of which lasts much better than the other, but nobody is in a position to say wherein lies the great difference. It may be in the seasoning or in the tree itself.

I was last year talking to a Permanent Way Inspector on the Burma State Railway, who was kindly giving me a lift on his trolly, and in course of conversation he told me that he had lately been renewing some Pyinkado sleepers that from his own personal knowledge had not been down for more than 5 or 6 years, but that in pulling up the line he had found Pyinkado sleepers as sound as a bell that had been down since the line was laid in 1878.

When the line was first put down sample lengths were laid with numbered sleepers of different sorts for future reference, but no reports are ever published by the B. S. R., and I hear that no account is now kept of the numbered sleepers and the date of their being replaced. It is a thousand pities that this should be allowed on a State Railway. If any one will take the trouble to test them I am willing to forward one or two sleepers of each colour as they leave the mill, and if desirable, I will have sleepers cut from selected trees *in situ* and forward them. The subject is well worthy of investigation.

THARRAWADDY.
12th July, 1895 } H. S.

Injurious Insect in Jodhpur.

SIR,

I beg to send copy of correspondence regarding an insect, in the hope that you, or some of your readers, will kindly furnish me with suggestions as to means for its destruction.

I wrote to the Deputy Superintendent, Entomological Department, Indian Museum, Calcutta :—

"I have the honor to forward by Railway some specimens 'of a locust-like insect for favor of identification. They have 'appeared at Jodhpur in a mango and Jaman plantation of one 'year old. They were perceived only a week ago when they 'began to eat leaves and bark of mango plants. They have not 'touched the Jaman plants. During the day-time they remain 'attached to the dry branches of a shrub locally called Siniya or 'Sangtra (probably one of the Leguminosæ) and damage mango 'plants at night. I am also sending part of a mango plant, the bark 'and leaves of which have been eaten by it.

"I have burnt the dry shrubs, but in doing this plants are 'damaged. In conclusion, I respectfully beg that you will kindly 'suggest any known means of their destruction.

His reply was as follows :—

"I have the honor to acknowledge the receipt of your letter 'No. 28, dated 24th ultimo, forwarding specimens of a locust-like 'insect which have safely arrived. The specimens prove to belong 'to the family Acrididae, of the genus *Pylotropidius* and species '*didymus*. This insect has not previously been reported as des-'tructive to agriculture."

About two acres of the plantation were burnt by me and the ashes sprinkled all over the mango plants. Strange to say, no more damage has been done by the insects. They are still to be found here and there, and the ashes sprinkled over the plants have been washed away by hand-watering, but the plants have not been damaged as yet.

P.S.—Since writing the above, the insect has again commenced its ravages, having stripped nine plants completely of all their leaves.

JODHPUR,
June, 11*th* 1895. } GOKAL DAS.

Meaning of the word "Siwalik."

DEAR SIR,

I trust you will permit me, through your esteemed paper, to raise the question as to the meaning of word and name "Siwaliks or "Siwalik Hills" as applied to the range of low Hills to the south of Dehra Dun ; separating the Dehra Dun from the plains. I am also informed that the same name is given to the range or ranges of lower hills which extend in continuation of this range on both sides, *viz.*, to the east beyond the Ganges into Oudh or Nepal, and westward beyond the Jamna into the Punjab.

SUNDER LALL PATHAK.

[We should be glad if any of our readers could tell us the derivation of this word.—HON. ED.]

III—OFFICIAL PAPERS & INTELLIGENCE

The following Circulars have been issued by the Government of India :—

Classification of Forest growth and Soils.

"It has been observed that, in all forest surveys conducted in 'the Central Provinces by the Survey of India Department, the 'nature of the forest-growth and of the soil is classified and 'recorded in addition to the topographical features. The Govern- 'ment of India approve this system, and I am directed to request 'that you will be good enough to issue instructions for the prepa- 'ration, in future, of a similar record for all areas surveyed by '"forest" parties of the Survey of India Department.

"2. The details required are naturally subject to modifications 'according to the different conditions of forests to be surveyed, 'and should in each case be previously settled in consultation with 'the Conservator of Forests acting under the control of the Local 'Government to which he is subordinate.

"3. Apart from the value which such classification of forest- 'growth and soils has for the preparation of working-plans, it is 'considered desirable that the Government should be in possession 'of reliable information as regards the existence and extent of 'areas included in the forest reserves which, owing to their con- 'figuration and the depth and richness of the soil, may be suitable 'for permanent cultivation. Such areas should be marked by a 'distinct coloured boundary-line."

Memorandum on the system adopted in No. 14 Party (Hoshangabad) for the classification of forest-growths and soils.

To carry out the wishes of the Chief Commissioner and Forest Officers, Central Provinces, and after consultations with them, a system of classification of forests and soils was adopted and carried on at the same time as the original detail survey was made : the former by the *colours* of lines used for shading, and the latter by the *direction* of the lines. The classification was shown on tracing cloth by symbols as follows :—

The forests were divided into 5 classes, *viz.* :—

1.	Forest where teak abounds without bamboo ...	... *Carmine.*
2.	Ditto with do. ...	... *Blue.*
3.	Miscellaneous forest	... *Brown.*
4.	Grass lands	... *Green.*
5.	Cultivation	.. *Yellow.*

Soils were divided into 4 classes, *viz.* :—

1.	Very good and rich ...	... *Lines drawn vertically*
2.	Medium ...	... *Do. horizontally.*
3.	Very dry... ...	... *Do. diagonally from N. W. to S. E.*
4.	Unproductive ...	... *Do. do. from N. E. to S. W.*

Each sub-surveyor kept an outline trace of his daily work on a piece of tracing cloth, and also made notes of the soil and class of forests that he met with. At the end of a few days, when sufficient detail survey had been completed, he coloured up the portions and marked them with lines according to the fixed symbols. This trace

the sub-surveyor kept going until his work was done, and it was examined at the same time as the topographical detail. Some differences of opinion were found at the adjoining edges as regards nature of soil, more especially between the "medium" and "very dry"; but these were reconciled.

On compiling the different plane-table sections into standard sheets, was found that laying colour on to the tracing cloth spoilt it and rendered it opaque. The plan of drawing in the lines in their proper colour and direction was then adopted, and was found to answer all purposes, whilst the tracing cloth was kept clear and smooth.

The extra cost entailed can only be arrived at approximately. For the field work I have allowed that over an area surveyed of 4 miles square, or 16 square miles, a delay equivalent to the time occupied in surveying half a square mile was entailed, owing to the time spent in classification.

The season's outturn having been 353 square miles, at a rate of Rs. 180 per square mile, the loss entailed is equivalent to the cost of surveying 11 square miles = Rs. 1,980. The estimate for the mapping and compiling into standard sheets can be made more accurately, and it has been found to amount to Rs. 390. This with the cost of supervision, *viz.*, Rs. 100, makes a total of Rs. 2,740, or Rs. 7 per square mile.

The fair trace is made over to the forest officers.

The classification of the forests and soils was arranged by Mr. Thomas, Deputy Conservator of Forests, Hoshangabad, and it applies to the forest of Hoshangabad and Betul only. A different classification would probably be required by other forest survey parties, and could be arranged for by the respective forest officers according to their requirements. But the system of classifying by means of colours and directions of lines might probably be adopted with advantage.

Preparation of Forest Estimates.

"The attention of the Government of India has been drawn 'to the tendency that exists to over-estimate the expenditure, and 'in some cases to under-estimate the receipts, in the budget esti- 'mates of the Forest Department, as shown in the appended tables. 'This tendency, though general, is much more marked in some 'Provinces than in others; and appears, though in a less degree, 'in the revised estimates also. It seems to be partly due to a dis- 'position on the part of Conservators and Local Governments to 'accept the figures of the Divisional Officers, without due conside- 'ration of the actuals of previous years for the Circle or Province 'as a whole.

"2. The Government of India are fully aware that the con- 'ditions of working the forests are dependent on circumstances, 'such as varying demands and variable seasons, which are beyond 'control; but they consider that a careful review of the actuals 'over a number of years might lead to a closer approximation,

'especially in estimating expenditure, than is at present attained.

"3. They are, however, disposed to think that the discrepancy under consideration is often due to a not unnatural desire on 'the part of the Forest Officer to provide for all the expenditure 'that may be required should the year be favourable, and at the 'same time not to commit himself to a higher estimate of receipts 'than will probably be realised should the year be unfavourable. 'This is clearly wrong from a financial point of view, as the estimates of both revenue and expenditure should be based upon one 'common hypothesis. It is desirable to correct this tendency; 'and it appears, moreover, to the Government of India that in a 'quasi-commercial organisation such as the Forest Department, 'greater facilities for the prompt provision of funds to meet charges 'directly productive of revenue would probably develop the utilization of timber and produce, and so materially increase the Forest 'receipts.

"4. The Governor-General in Council is therefore pleased to 'empower Local Governments and Administrations to sanction 'grants for expenditure in the Forest Department, in addition 'to the budget provision, whenever it is anticipated that such 'grants are necessary to earn, and will probably earn, additional 'revenue of a more than equivalent amount. Section 127 of the 'Forest Department Code will therefore be recast as follows:—

"(1) Whenever a proposed additional grant will be more 'than covered, by a corresponding increase of revenue, to earn 'which the grant is required, the Local Government may sanction 'the grant and the corresponding addition to the estimates of 'revenue without previous reference to the Government of India, 'reporting the amounts and the circumstances to the Government 'of India.

"(2) In all other circumstances the previous sanction of the 'Government of India is necessary. It will not be given except 'under very special circumstances, and the necessity for expenditure in excess of the grant already sanctioned must be fully explained and justified in detail. The mere inclusion in the revised 'estimate of particulars of anticipated additional expenditure is not 'sufficient for the purpose of this section.

"(3) Applications for grants clause (2) must be accompanied 'by the re-appropriation statement prescribed in paragraph 2 of 'the resolution of the Government of India in the Department of 'Finance and Commerce, No. 1360-A., dated 21st March, 1895. 'If a re-appropriation within the sanctioned budget grant for 'forest expenditure is not feasible, a re-appropriation should, if 'possible, be proposed from the sanctioned grants under other 'major heads of expenditure controlled by the Local Government."

"5. The orders contained in sections 125 and 127 of the 'Forest Department Code, and in Circular No. 5-F. of 21st March 'last, will apply *mutatis mutandis* to applications for additional 'grants submitted by Conservators to Local Governments for sanction under the authority now conveyed."

Forest Revenue, in thousands of Rx.

Provinces	1889-90			1890-91			1891-92			1892-93			1893-94			Total		
	Budget	Actuals	Difference	Budget	Actuals	Difference	Budget	Actuals	Difference	Budget	Actuals	Difference	Budget	Actuals	Difference	Budget	Actuals	Difference
Central Provinces	119	115	— 4	121	121	..	130	136	+ 6	127	123	— 4	140	118	— 27	657	608	— 29
Burma ..	345	494	+149	395	432	+ 37	425	419	— 6	467	566	+ 99	485	579	+ 94	2,117	2,490	+373
Assam ..	27	38	+ 11	30	33	+ 3	38	34	— 4	35	38	+ 3	37	49	+ 12	167	192	+ 25
Bengal ..	69	77	+ 8	77	73	— 4	78	79	+ 1	83	75	— 8	78	80	+ 2	385	384	— 1
N.-W. P. & Oudh	141	171	+ 30	154	164	× 10	171	173	+ 2	172	165	— 7	165	171	+ 6	803	844	+ 41
Punjab ..	90	92	+ 2	103	83	— 20	95	102	+ 7	95	81	— 14	90	91	+ 1	473	449	- 24
Madras ..	153	156	+ 3	158	180	+ 22	180	169	— 11	190	158	— 32	190	195	+ 5	871	858	— 13
Bombay ..	301	314	+ 13	344	329	— 15	350	328	— 22	352	327	— 25	351	379	+ 28	1,698	1,677	— 21
Total ..	1,245	1,457	+212	1,382	1,415	+ 33	1,467	1,440	— 27	1,521	1,533	+ 12	1,536	1,657	+121	7.151	7,502	+351

Forest Expenditure, in thousands of Rx.

Provinces	1889-90			1890-91			1891-92			1892-93			1893-94			Total		
	Budget	Actuals	Difference	Budget	Actuals	Difference	Budget	Actuals	Difference	Budget	Actuals	Difference	Budget	Actuals	Difference	Budget	Actuals	Difference
Central Provinces	78	70	— 8	80	73	— 7	92	80	— 12	93	85	— 8	100	92	— 8	443	400	— 43
Burma ..	153	160	+ 7	153	139	— 14	174	167	— 7	185	180	— 5	198	185	— 13	863	831	— 32
Assam ..	24	25	+ 1	26	27	+ 1	29	27	— 2	33	26	— 7	31	27	— 4	143	132	— 11
Bengal ..	43	40	— 3	46	41	— 5	47	42	— 5	48	38	— 10	40	40	— 8	232	201	— 31
N.-W. P. & Oudh	88	96	+ 8	96	91	— 5	106	95	— 11	105	92	— 13	100	96	— 4	495	470	— 25
Punjab ..	66	64	— 2	80	65	— 15	72	64	— 9	71	66	— 5	68	64	— 4	358	323	— 35
Madras ..	128	115	— 13	128	124	— 4	134	131	— 3	161	132	— 29	162	136	— 26	713	638	— 75
Bombay ..	189	177	— 12	203	186	— 17	203	193	— 10	224	190	— 34	225	206	— 19	1,044	952	— 92
Total ..	769	747	— 22	812	746	— 66	858	799	— 59	920	809	—111	932	846	— 86	4,291	3,947	—344

Planting at Naini Tal

The stability and security of Government House at Naini Tal have recently formed the subject for much searching of heart and anxious discussion on the part of Engineers and geologists. We are glad to see that tree-planting is recognised as a factor in the case, for we read in a recent resolution as follows :—

"Intimately connected with the subject of tree-planting and 'covering the slopes with grass and shrubs are those of the preven-'tion of grass-cutting, grazing, and the formation of by-paths across 'the hills as short cuts from one part to another. The Municipal 'Committee wisely framed bye-laws dealing with these subjects, and 'directing that the acts referred to should be deemed to be public 'nuisances ; but unfortunately they have neglected to insist upon 'the observance of these rules and to punish offenders against them. 'The hillsides are again scored with tracks improperly made, and 'grazing on private estates had increased to such an extent that the 'Commissioner in October, 1894, actually suggested the recognition 'of the existing practice and the relaxation of the rules. He was 'requested, in reply to the communication made by him, to see that 'the rules were rigorously and impartially enforced, but with this 'order he has failed to comply. His Honor regrets to observe that 'cases of infringement of the rules came under his personal notice 'during the current season, rendering it necessary to again insist 'that efficient measures should be taken for the patrol of the hill-'sides and for the detection of offenders.

"The Government is willing to assist the Committee in the 'matter, and will ask the Forest Department to undertake the duty 'of planting the hillsides so far as may be required,—a matter 'which appears to be beyond the power of the local authorities. The 'Conservator of Forests, Central Circle, will be requested to arrange 'for the planting of trees, and, where necessary, of shrubs and grass, 'on the bare slopes within the catchment area of the lake. The 'choice of trees and of the localities for planting will be left to the 'Forest Department. The operations will extend, in the interests of 'the settlement at large, both to public and private land : if any 'questions arise with reference to the latter, they should be referred 'through the Commissioner to the Municipal Committee, which has 'power under its bye-laws to take such measures as may be neces-'sary for the safety of the place. The Municipal Committee will 'be expected on their part to effectually close, and to keep closed, 'all superfluous paths on Sher-ka-danda, to prevent all grazing 'and grass-cutting within the prescribed limits, and to fence the 'public roads traversing the bare slopes to the eastern extremity 'of Sher-ka-danda."

India Rubber in Upper Burma

The following report on the rubber tracts in the Minbu District, by Mr. W. F. T. McHarg, Assistant Conservator of Forests, is interesting from the fact that until a couple of years ago it was not known that the *Ficus elastica* was found in such low latitudes in Burmah, and when it was discovered that rubber came from the hills west of *Minbu* it was understood that it was collected from a creeper. It now proves to be the *Ficus elastica*, the specimens which Mr. McHarg sent down having been identified by Dr. King of the Royal Botanic Gardens, Calcutta, to be those of the *F. elastica*

The locality described by Mr. McHarg is just below the 20th parallel of north latitude, east longitude, 94° 36'. So far the tree has not been found between this and the Manipur hills in latitude 24°, longitude 94° 10, though on further exploration of the Chin hills it may be found.

The discovery although interesting botanically is not likely to prove important from a revenue or industrial point of view, as the number of trees is small, and we do not see our way to increase the number by planting at present.

F. B. D.

The road up to the rubber forests starts from Zinbyun close to Dahatgon on the Man. The ascent begins at once on passing Gokwa, and at about the 8th mile from Zinbyun hill evergreen forest is entered at an elevation of about 3,000 feet. The summit of the "Nat-yegan" (Devil's Pool) hill, about 4,000 feet high is reached at roughly the 10th mile. On the top are open grass patches, and during the cold weather a small pool, whence the name.

Linde, Chin village, is about 4 miles down the other side, situated on the Pani headwaters at an elevation of 2,000 feet.

On the 16th April I marched from Linde to Maton, Chin village, first descending about 1,000 feet to the Pani stream, from whence I made Valuation survey No. 1 up that stream; thence crossed a ridge of about 3,500 feet height, the top of which was quite wet with the morning mist, down to the Maton stream at about 1,000 feet height, and there ascended about 1,000 feet to the village.

On the 17th I made Valuation survey No. II of the rubber trees up the Maton stream.

On the 18th I marched back to Linde, making Valuation survey No. III down the Kyaungtha stream to its junction with the Pani.

West of the "Nat-yegan" hill, with the exception of the ponzôs, practically the whole forest is evergreen. These pônzos (taungya grounds) are found on every spur rising from the streams to about 3,000 feet elevation.

The country being thickly populated they are worked very

heavily, the rotation being often as low as four to five years, all the taungyas cut in any year being lumped together on the same spurs. The people are very careful to make fire-lines all round the burnt area, so as not only to prevent fire spreading into their other pônzos, but also into evergreen forest above. They explain the latter by saying the "nats" would be angry, but possibly may also understand the influence of the evergreen forest on the water-supply.

First, as regards the rubber tree itself, I have little doubt but that the tree found is the true *Ficus elastica*, the same as is found in the forests north-west of Mogaung. These latter I have not visited, but I have seen cultivated trees in the Bhamo district, notably at Shwegu. The tree here found apparently agrees with those, as with the description of the tree given in Kurz's Flora and again in Mr. O'Bryen's report. In this part it is always found near water, the roots forming a regular lace-work over the bank and running down into the bed of the stream. It always starts by the seeds germinating on the top of some high tree and deriving its nourishment from that till it is strong enough to send down aerial roots. Trees which grow on a bank almost always hang over towards the stream; a very great quantity of roots are thus thrown out, and, reaching the ground, grow into so many stems. One of the largest trees seen by me had 38 of these root-stems:—

Over 6 feet girth	6
From 3 to 6 feet girth	12
Under 3 feet girth	20
Total ...	38

The same tree had a girth of 60 feet all round, one diameter being 20 feet and another at right angles to it 16 feet across.

Secondly, as regards the *extent* to which the tree is found, the information I picked up and the number seen by myself would indicate it to be very scarce.

On examining the Lindè, Matôn, and Meinseing thugyis, in whose jurisdiction alone almost all the rubber trees are found, they said that roughly the following number of trees existed:—

	Trees.	
In Lindè	30	20 big. 10 small.
In Matôn	60	20 big. 20 middling. 20 small.
In Meinseing	50	30 big. 20 small.
In other parts, principally Shwehen say	10	10
Total ...		150

The valuation survey made by me gave the following results, and these I would point out were made in the richest localities only :—

Number of live trees.

Name of stream.	Big.	Small.	Total.	Dead trees.	Area.	Acreage.
					Chalans,	
1. Pani stream	6	2	8	1	4 × 60	24
2. Matôn stream	12	5	17	...	4 × 125	50
3. Kyaungtha stream ...	4	1	5	...	4 × 80	32
Total ...	22	8	30	1	...	106

or 3½ acres to each tree, and that only in the best parts.

The tree is only found in about half-a-dozen valleys as shown on the attached map. I made many inquiries as to whether it occurred west of the Matôn valley on the Arakan side, and was told that the nearest villages on that side were Minbaw and Salutaung, where there were said to be police guards, but that no rubber trees had ever been found in that jurisdiction.

Neither is it said to exist at the headwaters of the Man, but only at those of the Pani and Matôn. I was told, however, both by the thugyis themselves and also by the Ngapè Myoôk, that Lindè, Matôn, and Meinseing and Shwehen all lie within the Minbu district. Of course it is very possible that the three thugyis may not have liked to give a full account of all their trees and that 200 or 300 may be nearer the real number.

Thirdly, regarding the history of the trade and the amount of rubber yielded, the thugyis own to having tapped their trees four different times only.

Ten years ago a Chinaman came up to them from Thayetmyo and showed them how the trees could be tapped to yield rubber, or more probably he was the first to let them know that they could make money by selling the rubber to him. Anyhow the amount reported to have been then yielded is as follows :—

	Trees.	Viss.
Lindè	30	300
Matôn	60	400
Meinseing	50	130
Total ...		830

They state that in this the first year they began by selling to the Chinaman at Rs. 40 per 100 viss rising to Re. 1 per viss.

The year after, *i. e.*, nine years ago :—

	Trees	Viss.
Lindé's	... 30 gave	200
Matôn's	... 60 ,,	300
Meinseing's	... 60 ,,	70
Total	...	570

This also appears to have been sold to the Chinaman at about Re. 1 per viss, presumably delivered to him at Nyaungnwe as he came up from that side. So that considering the Rangoon prices must have been quite Rs. 3 per viss, that Chinaman must have made a big profit.

After this it is stated that no rubber was tapped for about six or seven years. Probably they gave the trees a rest for one or two years, and do not like to confess having tapped them afterwards in the British time without any license. There *was* one case in which the Tabuywagaung got run in by the Thayetmyo authorities for tapping rubber. However, the third tapping was done two years ago with the following results :—

	Trees.	Viss.
Lindè's	... 30 yielded	200
Matôn's	... 60 ,,	300
Meinseing's ...	... 50 ,,	60
Total	...	560

and the fourth tapping last year :—

	Trees.	Viss.
Lindè's	... 30 yielding	100
Matôn's	... 60 ,,	150
Meinseing's ...	... 50 ,,	50
Total	...	300

During these last two years the rubber has been sold to Maung Nida of Minbu and his partner Maung Tha of Zinbyun at Rs. 2 per viss delivered at Zinbyun.

The revenue made from rubber by this division in past years has been as follows :—

Year.		Rs.
1890-91 ...	One license at Rs. 2 ...	2
1891-92 ...	Eight licenses at Rs. 2 ...	16
1892-93 ...	Six licenses at Rs. 2 ...	12
	Total ..	30

In anticipation of licenses being issued as in former years a few trees have been tapped this year. Thus :—

	Viss.
Lindè has got about	... 5
Matôn about	... 60

still stored in the village from this year's tapping.

The Meinseing thugyi explains his small yield of rubber as shown above from the fact that only about two or three of his villages understand the work. Possibly, too, most of his trees are smaller than those of Lindè and Meinseing.

One very satisfactory point is that they all thoroughly understand that a tree cannot be tapped year after year without its yield being greatly diminished, and that excessive tapping in any year will either kill some of the stems or even the whole tree altogether. They quite see that the two first years' tapping was too heavy; then their cuts, as still seen on the scarred stems, were about 1 foot apart, 1 foot long, and probably about 3 to 4 inches wide, so chipping out a piece of the bark and reaching into the wood.

Many stems so tapped dry up and get attacked by insects and die off.

Now, although their cuts are quite as close together, it is done with *one* stroke only slightly bending the bark over, and it is only about 6 inches long or less. I made particular inquiries as to whether the rubber juice oozed out as well from so small a cut and they seemed to think it did.

The big trees are said to have first yielded from 7 to 8 viss per tree, but now only about 4 to 5 viss. The small trees at first about 1 viss, and now little or nothing. The trees are tapped in the cold weather *only* as then the yield is best. There are only a few men who are expert enough in climbing to do the work. They tap the large branches, every aerial root that is large enough to bear a cut, and also all the larger roots that appear above ground. I explained to them that, if tapping were allowed, they would not be able to tap aerial roots of less than 3 feet girth nor below 3 inches height from the ground. The profits are divided amongst the particular men who work the trees and possibly also the thugyi.

Fourthly, as to the plan on which the trees should be worked in future. The usual price at which Burmans buy the rubber from the Chins is Rs 2 per viss delivered at the end of the cart-road. The Rangoon price being Rs. 4 per viss and above, I think there is no reason why we should not levy a duty of 12 annas per viss as at Bhamo and Kindat.

Similarly proper rubber licenses at Rs. 10 should be issued instead of those formerly at Rs. 2.

It is much preferable that *one* man only be allowed in any one year. I would therefore sell one license only by public auction at an upset price of Rs. 10 ; not, however, that I expect that

this will fetch much. It is possible that no man may come forward, seeing the increase in the duty to be paid. This need not concern us as the trees will thereby get a rest.

Since there is still a certain amount of rubber in the Chin villages which they cannot bring out owing to there being no licenses, I would allow the trees to be worked this next cold weather of 1894-95. The year after the trees should have a perfect rest or even a rest of two years as advised by Mr. Mann, Conservator of Forests, Assam.

[NOTE. A Viss=3-6 lbs.]

IV.—REVIEWS

Annual Forest administration Report for Travancore for 1893-94.

Last year in our December number we reviewed the first Travancore Report on Forest Conservancy. We have now received, by the courtesy of the Conservator, Mr. T. F. Bourdillon, extracts from the report for the year ending August 15th, 1894. The first point of noticeable importance is that the Travancore Forest Act came into force during the year.

The area of reserved forests now amounts to 1,488½ square miles, but the demarcation of this area is still somewhat backward. Three forest divisions have been formed, the Conservator himself looking after the central one, with Deputies in the Northern and Southern, and what seems on paper to be a rather large staff of forest rangers, foresters, and forest guards. Fire-protection has not yet regularly commenced, but it is badly wanted for the deciduous forests, in which most of the best timbers get regularly burnt.

We extract the following regarding natural reproduction :—

"The climate of Travancore is, on the whole, so favorable to 'growth of vegetation that there are not many parts of the count-'ry where the jungle would not assert itself if fires were prevented 'It is only in the extreme south of the State on the arid hills about 'Panagudi and Aramboly that the vegetation is xerophilous, and 'the natural reproduction is bad, and it is specially on such 'places that protection is most required. So far as is known no 'observations have been made as to the frequency of good or bad 'years of seeding, the general idea being that there is never any 'difficulty in procuring the seeds of forest trees in abundance, but 'a closer enquiry would probably elicit the fact that forest trees 'as well as mangoes and other cultivated species have their good 'and bad seasons.

"Of the most important forest trees teak (*Tectona grandis*) 'reproduces itself freely by the agency of seed; blackwood (*Dal-'bergia latifolia*) by root suckers as well as by seed and venga '(*Pterocarpus Marsupium*) also seeds well, but the annual fires that 'sweep through the grass burn the small plants to the ground 'season after season, and though the deciduous forests may be said 'to be almost carpeted with seedings of these trees they seldom 'raise their head above the long grass. Thambagom (*Hopea 'parviflora*) is a denizen of the evergreen forests, and seeds pro-'fusely. Millions of small thambagom plants may be found on the 'banks of almost every stream in the moist forests, but the tree 'requires a good deal of light, and in the dense shade of large trees 'the plants after reaching a certain height languish, unless a gap 'is created in the canopy over head. In abandoned coffee estates 'at suitable elevations thambagom reproduces itself freely, and in 'such places may be found forming almost pure groves of this 'handsome tree. Irul (*Xylia dolabriformis*) is a strong growing 'tree thriving well in abandoned land. It is not found in South 'Travancore. Venteak (*Lagerstræmia lanceolata*) seeds well, as also 'does thambavu (*Terminalia tomentosa*), but the grass fires destroy 'vast quantities of young plants which do not seem to be as hard 'as those of blackwood and venga. White cedar (*Dysoxylum 'malabaricum*) flowers abundantly, but its large seeds are not easily 'transported by wind or rain and germinate badly. This beautiful 'tree is being rapidly exterminated. Angili (*Artocarpus hirsuta*) 'is so much in demand that the tree is rarely met with, but it is 'largely planted in the low country.

"The lesson to be learnt from the above is that the reproduc-'tion of our valuable trees requires to be assisted by the work of 'man. Keep out fires from the grass of the deciduous forests, and 'in a few years the young plants of teak, blackwood, venga, tham-'bavu and venteak will overtop the grass, and in turn suppress it, 'but allow the fires to go on burning the young plants year after 'year, and they will ere long give up the struggle, so that the for-'ests will eventually become denuded of trees. In the evergreen 'forests improvement fellings are needed to allow the young plants 'of the valuable species to develop and expand. On the only 'block of land where fire and wood cutters have been excluded (at 'Mukkunnimale) the improvement in the character of the forest is 'most encouraging, scrub taking the place of grass, and large trees 'gradually rising above the scrub. In a few years this should be-'come a valuable property.

"The common bamboo (*Bambusa arundinacea*) seeded in 'South Travancore at the latter end of the sixties, and the thirty 'years usually allowed for the life of the species will soon expire. 'Within the next 5 or 6 years we may expect all the Bamboo from 'Punalur to the extreme South to die out. The Bamboos over 'the Northern half of Travancore died about 1880-82 and for-'tunately we shall have them to fall back on when this useful

'product is unobtainable in the South. The thornless hill Bamboo '(*Oxytenanthera Bourdillonii*), which inhabits the higher elevations 'died down in 1887-89, and its culms have now attained a good 'length.

The financial results of the year were :—

Revenue	...	... Rs.	4,96,347
Expenditure	...	... „	2,58,730
Surplus	...	„	2,37,617

Showing a considerable decrease on last year. But in the first year of a new Department such fluctuations are quite natural. We will conclude by quoting the following account of the forest herbariums recently started by Mr. Bourdillon whose enthusiasm as a forest botanist is well known. We do so with pleasure, as we so fully sympathize with Mr. Bourdillon, and believe ourselves that the cry that a good forest officer ought not to be a specialist as a botanist or zoologist is one of the most mistaken one that ever was raised. The importance of natural science as a means of developing those powers of observation which every good forest officer ought to possess cannot be over-rated. The incentive to outdoor life and forest tours, which is given by the pursuit of some private study or interest (be it only Shikar) in addition to the work is obviously good as inducing officers to pass their lives out of doors instead of finding excuses to remain in stuffy offices. In forests like those of Travancore, the officer, whose knowledge of trees is limited to 2 or 3 of the chief species only, must be very much 'out of it' in grasping the sylvicultural phenomena upon which working is based, and in recognizing the species a knowledge of which leads to the better utilization of produce and the better maintenance of the revenue. Everyone, of course, cannot be a botanist or an entomologist or a geologist, or other—ologist, but most forest officers may be one or the other, and take sufficient interest in the other branches to be able to notice and record, some at any rate, of the interesting and almost unrecorded facts which an observant man may see any day in these Indian forests which teem with points of interest as yet unknown and undescribed.

"*Herbarium.* By the liberality of H. H. the Maharaja, the 'sum of Rs. 1,000 was sanctioned in 1067 for the formation of a 'Herbarium and a collection of woods for the Trevandrum Museum 'and the Quilon Office. Of this sum Rs. 55 were spent in 1067, 'Rs. 135 in 1068, and Rs. 431 in 1069, making a total of Rs. 621 odd. 'The chief items of this year's expenditure were drying and mounting 'paper, an almirah for the specimens of flowers, and a set of 'shelves for the blocks of wood, and the cost of cutting and trans-'porting the large blocks of timber to Quilon.

"It may be well here to state the objects aimed at in creating 'a Herbarium, and forming a collection of woods. The forests of

'Travancore are at present very little known, and so far from our 'having any acquaintance with the timber of many of the species, 'the species themselves have not all been described or named. 'Whereas in Great Britain the total number of species of forest 'trees by the most liberal computation does not much exceed 50, 'in Travancore the number is certainly not less than 500 and 'probably is not far off 600. All these species have not an equal 'value. The timbers of some are hard, durable and easily worked, 'of others they are soft and decay rapidly. Some trees yield 'resins, others medicinal products, and not a few of them useful 'oils. Some grow in the deciduous forests of the plains and spread 'over wide tracts, others are found in the evergreen forests of the 'hills and are confined to a limited area. To make the most of 'the land given us for forest preservation we must endeavour to 'eliminate the worthless species, and encourage the more valuable. 'In order to carry out this selection we must know the properties 'and uses of the trees we find before us, and to obtain this know-'ledge, that we may profit by the observation of others, we must 'be able to identify the trees accurately and know their scientific 'names.

'Thus the identification of the species lies at the foundation 'of all forest work.

'Unfortunately we have not in Travancore any book which 'enables a forest officer to identify trees easily. Beddome's *Flora 'Sylvatica* written for Ceylon and the whole Southern Peninsula 'of India is too cumbersome and costly for general adoption. 'Hooker's *Flora Indica* is expensive, and covers too large a field. 'In the forest report of the State lately published, there is given 'a list of the trees found in Travancore, but there is no description 'of the trees attached, and the identification of the species depends 'upon the accuracy of the native names, which vary in different 'parts of the country, and thus often prove a fallacious guide. Thus 'there is hardly an officer in the Department who could accurately 'identify in the field and scientifically name above 20 or 30 of our 'forest trees.

"It is to remedy this defect that the Herbarium is being form-'ed, for while we are waiting for the settlement of our Reserves 'our time cannot be better employed than in studying the *Flora* 'of our forests.

'Most trees flower in the hot weather between November 'and March inclusive, and ripen their fruit at the beginning of the 'rains, but there are some which flower or fruit in the other months. 'The method adopted is for the Conservator to proceed to some 'convenient locality and collect the flowers and fruit of the trees 'chiefly, but also of any plants that are worthy of preservation. The 'services of the hillmen are called in to climb the trees for the 'specimens, to give the vernacular names for them, to mention the 'uses and the peculiarities of the trees observed, and to describe 'their habit and distribution. The specimens are then dried and

labelled, and duplicates are sent to Kew or to the Government 'Botanist at Ootacamund where they are named. The correspond-'ing specimens are then named and filed in order in the Herba-'rium.

'So far for the identification of the species, but side by side 'with this have been carried out experiments to test the weight 'and strength of various timbers. The method adopted is to cut 'specimens of different trees and convey pieces about 3 feet long 'cut from the butts of the trees to Quilon. There they are 'first thrown into water for a month. They are then taken out and 'sawn into rough planks, 2¼ inches thick, their ends are plugged 'with mud to prevent their splitting, and they are stacked to season. 'After a couple of months they are worked up into scantlings 'two inches thick and four inches wide, and again stacked to season 'still longer, and battens 2 feet long by 1 in. by 1 in. are sawn off to 'ascertain their relative strength. When the battens are 6 months 'seasoned the breaking strength is found by the usual formmla by 'supporting the battens at the ends and hanging weights to the 'middle of them till they give way. The experiments point to 'very interesting results, but as they have been carried out chiefly 'since the close of the year under review, the results must be com-'municated at a later date.

'The work of collecting specimens and carrying out experi-'ments occupies much time, and the results attained may seem dis-'proportionate to the labour employed on them, but this is due to the 'fact that very little assistance can be obtained from subordinates. 'Mr. Thomas, Assistant Conservator, took a great interest in the 'work, and for some time collected specimens of flowers, and also 'prepared a large number of samples of woods, but they were all 'named in the vernacular, and as the native names vary in different 'localities it was found advisable to ask him not to collect any more, 'inasmuch as any information that is at all doubtful and any 'specimens not exactly identified are worse than useless. The work 'of numbering the specimens of woods when they are cut and, 'after they have been sawn and again worked up, needs special 'attention, for peons have a habit of writing 59 for 95, 63 for 39, 'or 36 which leads to great confusion."

With the exception of the deputation of Dr. J. L. Stewart, and Mr. Thompson to collect materials for the forest flora of North West and Central India, and of Mr. S. Kurz to do the same for Burma, almost all the forest botanical survey work done in India has been done by a few workers as a labour of love. That, so far, very little has been done in the great department of zoology, and, especially on the subject of injurious insects, is a great pity, and we certainly think that the authorities should do more to encourage investigation, for, as it is, many a forest officer may be perhaps deterred from taking an interest in science by the idea that the superior officers of Government and the Heads of his Department will put him down as being only a naturalist.

Forest Administration in the Andamans, 1893-94.

The area of reserved forest in the Andamans is 24 square miles, and that of unclassed forests 1,832 square miles, and during the year no change was made from the latter class to the former; but measures to reserve certain areas for a supply of fuel are in progress.

Valuation surveys, carried out over a length of 72 miles, disclosed the fact that padouk is found in greater quantities at lower elevations on better soils, and that on one square mile the quantity of padouk is as follows :—

Poles	...	...	...	26
Trees 11 inches	to 18 inches	diameter	...	31
„ 18 „	„ 24 „	„	...	53
„ 24 „	„ 30 „	„	...	105
„ over 30 inches	in diameter		...	516

On a rich area of forest in the Militilek Valley the following trees were found on every ten acres as an average :—

"Average of all classes of Padouk	(*Pterocarpus indicus*)	= 36
„ „	Pyimma (*Lagerstœmia hypoleuca*)	= 8
„ „	Thitmin (*Podocarpus bracteata*)	= 6
„ „	Marblewood (*Diospyros Kurzii*)	= 3½
„ „	Chuglam (black) (*Terminalia bialata*)	= 4
„ „	Koko (*Albizzia Lebbek*)	= 5½

"The area of forest through which the above lines passed is 'estimated to be 6,290 acres. If forests of this description are 'found in other parts of the Andamans, the future working, both 'from the point of view of extraction of timber and regeneration, 'will be greatly facilitated.

'The whole of this particular area, as far as it has been gone 'over, consists chiefly of low undulating hills, sloping down to 'large creeks, the western portion rising to a high range of hills. 'The higher slopes of this range of hills may he said to contain 'no padouk.

"The chief facts to be noted in this area are: first, the 'deciduous nature of the forests; second, the large proportion of 'valuable trees found as compared with other areas. These trees 'are padouk (*Pterocarpus indicus*), koko (*Albizzia Lebbek*), pyimma '(*Lugerstrœmia hypoleuca*), marblewood (*Diospyros Kurzii*), chug-'lam (black) (*Terminalia bialata*), thitmin *Podocarpus bracteata*)."

We notice that there are about 7½ miles of tramway line, and that they are declared to be indispensable "to the efficient 'and economical extraction of timber from the forests. The 'success which at present attends the working out of timber 'could not be attained without the help of tramway lines, and 'great credit is due to the Deputy Conservator and his assistant 'for the skill with which the tramways have been aligned through 'difficult country covered with thick jungle, and their construc-'tion has been carried through to completion with convict labour."

With regard to natural reproduction we are told that :—

"Two hundred and twenty-eight padouk seed-bearers were 'cleared round during the year at a cost of Rs. 126.

"In a large number of cases, padouk seedlings were found 'under these seed-bearers, so that clearing the jungle growth 'will give them a good start. In one case it may be mentioned '196 padouk seedlings were counted under one seed-bearer.

"These seed-bearers were very much scattered in the forests; 'and the checking of the work was found very difficult, and the 'expense high.

"The Deputy Conservator is of opinion that the natural 'regeneration of padouk is far more plentiful, and easier, than was 'formerly recognized.

"From the present Deputy Conservator's experience it is 'concluded that padouk seedlings are overlooked owing to the 'dense nature and tangled undergrowth of the forests, which has 'round Port Blair been intensified by the late cyclone."

"If labour was more plentiful, the natural reproduction of 'padouk and other valuable species in the deciduous forests would 'not be a difficult operation.

"In the forests in the Andamans, which have been inspected, 'the natural reproduction can, it is considered, be depended on 'for the regeneration of the forests where the conditions are 'favourable; but no doubt artificial help in clearing undergrowth 'would greatly expedite matters."

The financial results for the year, which are held to be satisfactory, compare as follows with those of 1892-93 :—

Year.		Receipts.	Charges.	Surplus.	Proportion of Surplus to gross Revenue.
		Rs.	Rs.	Rs.	Per cent.
Forest year 1893-94 ...		3,37,460	2,44,497	92,963	27·55
Financial year	1893-94	4,41,788	2,44,547	1,97,241	44·64
	1892-93	3,60,486	2,31,206	1,29,280	35·86
	Increase in 1893-94	81,302	13,341	67,961	8·78
	Average for the five years ending 1892-93	2,11,885	1,38,688	73,197	34·55

The Government of India anticipate that these results will be well maintained if a steady sale in England of 2,000 tons of padouk a year at fair prices can be arranged for. The Deputy Conservator, however, says that "the outlook for this year is very 'gloomy. America has stopped purchasing padouk, owing, it is 'believed, to the silver question, and the Agents report they find it 'impossible to get rid of the cargoes even at 2 shillings the cubic 'foot. Unless the market improves, the profits in this Division 'this year will be small."

No girdling of padouk trees was done during the year as labour was not available and this is regarded with disappointment by the Government of India as the advantages of lightening the wood for transport and placing only thoroughly seasoned wood on the marked are well known.

The sales of padouk during the year in London were 2,122 tons, and the amount realized for this was Rs. 1,83,547. There was a large increase in the sales all round, and the average price realized in the London market was £8 15*s* a ton, a slight rise on the price of the previous year; but it is pointed out that these prices cannot be kept up, and for the succeeding year no bids had hitherto been made.

Durability of Wooden Sleepers.

In November last year we published the results of the experiments which are being tried on certain state railways to test the durability of various kinds of wooden sleepers, as far as they had gone, to the end of 1892. We are now enabled to give the results to the end of 1893.

On the Ajmere-Khandwa section of the Rajputana-Malwa Railway there is no change in the experiment of 1876, *i.e.*, after 17 years the following percentage of sleepers are still sound :—

Deodar 95; Anjan 41; Creosoted pine 33; Sal 33; *Term. Arjuna* 32; teak 29.

On another section of this line, out of 13,042 creosoted pine sleepers laid down in 1880, only about 5 per cent. are now sound, *i. e.*, after 13 years, and the average duration of those removed was only 8 years.

On the Rewari-Ferozepur section, out of 11,943 deodar laid down in 1883, 231 have so far been removed, leaving a percentage of 98 as sound at the end of 9 years.

On the North-Western Railway, out of 1,416 deodar sleepers laid down in 1877, it was found that 70 per cent were still sound at the end of 16 years.

In another experiment on this line, however, 910 deodar laid down in 1879 had all been removed at the end of 12 years; and another experiment shows that in 9 years the greater portion had

been removed. It is to be hoped that these sleepers really were deodar, as the number of Chir pine sleepers that go down the Jumna is not inconsiderable, and it is possible they may sometimes get mixed up.

On the Eastern Bengal Railway, Northern section, in the experiment of 1877, we find 58 per cent. Sal sleepers sound after 16 years, whereas out of 1,923 creosoted pine laid down at the same time, only 168 or 9 per cent still remain ; but it is somewhat remarkable that no pine sleepers have been removed during the last 5 years.

In another portion of the same line 73 per cent of Sal have lasted 14 years.

Comparing Sal in Bengal with Deodar in Rajputana we find that in two of the above experiments, if all the remaining sleepers were removed by the end of 1894, the average life of the Deodar sleeper would be 17 years, and that of the Sal 14.

A. S.

Tree-Planting, 1893

This is the title of a valuable pamphlet * of some sixty pages, by D. E. Hutchins, Conservator of Forests, Cape Colony. It is a descriptive catalogue of the best tree to plant in that colony, with brief instructions for planting. The latter are eminently practical, and we especially commend to our Indian readers what Mr. Hutchins has to say about close planting :—

" Inexperienced persons usually plant fruit trees too close, and 'forest trees too far apart. The standard distance for forest trees 'is one yard apart, the tree being put in square, one yard apart 'between the lines, and one yard apart in the lines. This gives '4,840 trees to the acre. This distance, within narrow limits, is 'the custom in all those countries in Europe where forestry is 'understood and practised as an exact science, *vide* my 'Journal 'of a Forest Tour.' It is doubtless surprising at first to reflect 'that a cabbage and a pine tree should be planted at the same dis-'tance apart ; but, ignorance of this fact has prevented, more 'than anything else, the growth of good timber in Cape Colony. 'Planting as close as this will appear extravagant to many, but it 'is the cheapest in the end. To the weeds and bushy growth of 'the trees in sparse planting is added in South Africa the danger 'from fire. Even in the case of parks and avenues the trees, 'wherever possible, should be planted dense at first and thinned 'out afterwards. The natural home of the forest tree is the 'crowded forest where the tree has to struggle upwards to the 'light. If perfect trees (and not gardener's bushes) are wanted 'the only plan is to imitate Nature by planting dense at first and

* Cape Town: W. A. Richards & Sons, Government Printers.

'thinning out afterwards. The advantages of dense planting may 'be summarized thus :—

"(1) Shelter from wind, the tree's greatest enemy ; from 'too much sun ; from drought ; and from frost :—

"(2) A clean bole with natural pruning of side branches, 'and clear timber free from knots.

"(3) A straight gradually tapering bole, instead of a short, 'ill-shaped, and conical bole.

"(4) An early closing of the crowns and killing down of the 'ground herbage. Till this point is reached, the weeds must either 'be continually removed at great expense, or the plantation left in 'imminent danger of burning. A strong growth of weeds will stunt 'the growth of the trees and frequently end by killing them.

"(5) Not only does the clean soil of a close plantation mini-'mize the danger from fire, but the absence of wind in a close 'plantation renders easily controllable such small fires as they may 'occur.

"(6) A slow, steady growth and good fine-grained timber, 'instead of a rapid growth and bad coarse timber.

"(7) Early formation of the rich forest soil.

"(8) Successive thinnings leave the mature forest formed of 'the finest "picked" trees only ; thus, imitating nature, where 'the mature forest is formed of the tallest and strongest stems, 'the survival of the fittest."

It is to the neglect of these simple rules that failures in many of our plantations may be attributed. If twenty years ago we had gone in for close planting in Jaunsar we should have much more to show for the money expended than is now the case. The only really good examples of planting in that district are a small patch of deodar put out 5 feet by 5 feet and two or three old nurseries where some of the plants were allowed to grow up three or four feet apart (oak and deodar). In all these cases the lower side branches are dead, and the canopy has closed up some time ago. However, this is thoroughly understood now, and any extensions will be in the direction indicated by Mr. Hutchins.

The list of trees to plant is very complete, and the kind of climate suitable in various cases is generally given.

VI.—EXTRACTS, NOTES AND QUERIES

Prize-day at Coopers Hill.

The following Forest Students gained prizes:—

Appointed Fellows of Cooper's Hill

W. Mayes and C. M. McCrie,

Prize in	Forestry	W. Mayes,
,,	Forest Law	Do.
,,	Forest Management	... G. E. S. Cubitt,
,,	Entomology	... D. O. Witt,
,,	Botany ...	... R. S. Hall, and R. S. Troup.
,,	Sylviculture ...	... R. S. Troup.

The following students passed out as Assistant Conservators, Forest Department :—

Mayes. W.	Spencer, H. H.	Doveton, C. W.	Fischer, C. E. C.
McCrie, C. M.	Dodgson, J.	Kose, A. E.	Arbuthnot, H. F.
Kenny, L. S.	Dicks, A. R.	Edie, A. G.	

And they should arrive in India during the ensuing cold weather.

Siam Gamboge.

The tree yielding Siam Gamboge (*Garcinia Hanburyi*, Hook. f.) is closely related to *G. Morella*, Desrouss, of Ceylon and Southern India. The former is a moderately large tree. The flowers are diœcious, the petals, in both male and female flowers are fleshy and yellow. The fruit is the size of a crab-apple, yellowish-green when ripe. The tree is found on islands on the east coast of the Gulf of Siam, as well as on the mainlands of Cambodia and Cochin-China. It is from these localities that practically the whole of the Gamboge of commerce is obtained. Gamboge is a gum resin yielded by the bark of the two species above mentioned. It is a powerful cathartic medicine, but its principal use is in a pigment in water-colour painting. It is also used to give colour to lacquer varnish for brass work, etc. The most recent account of Siam Gamboge is contained in a report on the trade of the year 1893, published by the Foreign office (Annual Reports, 1895) No. 1520. Mr. de Bunsen, Her Majesty's *Chargé d'Affaires* at Bangkok, was good enough to communicate to Kew specimens of the leaves of the gamboge trees collected on the spot by Mr. Beckett, and although the material is not quite complete, there is little doubt they belong to *Garcinia Hanburyi*, Hook. f. The extract from the report is as follows:—*Gamboge* is, next to gum-benjamin, perhaps, the most interesting of Siamese products. Whilst gum-benjamin is peculiar to a small belt of land in the north, gamboge is a resinous product indigenous only in the islands and the sea coast of the Gulf of Siam lying between the 10 and 12 degrees of north latitude. * I recently had the opportunity of paying a visit to this part of Siam, and it may be of interest to describe the character of the tree and the mode of extracting the resin. The tree is known locally as "Ton Rong." It is found only in the islands of Koh Chang, Koh Kong

* The heavy rainfall of this coast seems necessary to the existance of the tree.

and Koh Rong, and the main land of the Indo-Chinese Peninsula opposite these islands. The trees grow to the height of some 50 feet and are straight-stemmed with no lower branches, owing probably to the dense shade of the forest in which they grow. None of those I saw had a diameter of more than 12 inches. Ten years' growth is said to be required before the tree is ready for tapping. This is carried on by the Cambodian and Siamese islanders in the rainy months from June to October, when sap is vigorous, by cutting a spiral line round the trunk from a height of some 10 feet downwards to the ground. Down these grooves the resin wells out of the bark and trickles in a viscous stream into hollow bamboos placed at the base of the tree, and from these it is decanted into smaller bamboos, where it is left for about one month to solidify. To remove the gamboge the bamboo is placed over a red-hot fire, and the bamboo husk cracking off, there is left the article known as "pipe" gamboge. The trees can be tapped two or three times during one season, and at the end of the season their trunks present a curious network of interesting spirals. Care must be taken to prevent the rain-water mixing with the resin in the grooves, as any mixture of water causes honey-combing and black discolouration, and a consequent depreciation of from 20 to 30 ticals (£2) per pical in value. The most valuable gamboge is that which is the least honey-combed or discoloured, and is all the more difficult to obtain considering the period of heavy rains during which the resin is extracted. The bamboos contain on an average rather less than 1lb. of gamboge or about 170 bamboos to the pical. The price asked by the pickers themselves is at the rate of 2 ticals (3s.) for five bamboos full, and the local price is at the rate of 2 ticals (3s) for three, or 65 ticals (4l. 18s.) per hundred, or about 8l. 7s. per pical. The whole output is sold to local Chinese traders and taken by sailing boat to Bangkok. (*Kew Bulletin, June and July, 1896.*)

"Schlich's Manual of Forestry."

The fourth volume of this thoroughly exhaustive and useful work, entitled *Forest Protection*, comes from the facile pen of that well-known advocate of reafforesting, Professor Fisher. Like the previous parts, the present volume savours much of the foreigner and scientist, and will unquestionably rank high in the forest literature of our Indian dependencies and European countries generally. The chapters on "Protection of the Forest against Animals," "Protection against Atmospheric Influences," and "Injurious Forest Insects" are thoroughly exhaustive and practical, although we could have wished that such insects as have been found dread enemies to many of our British forest trees had received a greater share of attention and remedial measures and been more exhaustively

considered. Hand-picking and shaking may do well enough for a few individual trees, but with an infested forest area such means of combating the pests are utterly expensive and ineffective. Considering how plentiful the goat moth (*Cossus ligniperda*) is in and around London, it might have been useful to many had the most successful known means of destroying the larvæ been given, *viz.*, by filling up the entrance to the tunnels with a preparation of soot and lime, chloride of potassium, or common tar, all of which have been used with telling effect on the trees in the London parks. A thoroughly exhaustive paper is that on "Fixing Shifting Sands," and much good has been done in that way on the coast of France and elsewhere on the Continent—less so in this country, though greatly modified rules to those given by the author have worked wonders on the Norfolk Broads and around the Cambrian coast. "Damage to Trees by Acid Fumes"—a subject that has received but little attention in this country—concludes what will be found, on perusal, to be a valuable volume to the owners of extensive tracts of woodlands, and Professor Fisher is to be congratulated on the appearance of so useful a section of "Schlich's Manual of Forestry."—*(Timber Trades Journal.)*

India and Australia.

Mr. B. Ribbentrop, C. I. E., Inspector-General of Forests to the Government of India, has been visiting Sydney. The trip is part of an eighteen months' holiday. Mr. Ribbentrop, who has been in the Indian service for twenty-seven years, has just been through some of the forest country and reservations in Victoria. It seems to him that, while much good work has been accomplished by the department there, political influence on the one hand and want of adequate supervision and systematic work on the other, have been obstacles to the preservation of the timber and the development of the industry. He thinks that a royalty system as regards cutters should be established, and that the industry might be made by this means to furnish better returns. The extension of the hardwood export trade from Australia he has watched with considerable interest. The trade itself, he says, has been pushed more vigorously than is generally supposed. The value of the ironbark for street paving and railway sleeper purposes is becoming recognised in England and elsewhere, and with careful nursing and the coincident attention to the forests in the colony should ultimately prove an important factor in Australian exportations. His observations in Victoria led him to think that light woods might be imported and cultivated here to great advantage. In India the timber industry has grown to such proportions that now it yields an annual revenue of £1,800,000. There are some thousands of persons connected with the department:—*(Timber Trades Journal.)*

VII—TIMBER AND PRODUCE TRADE.

East Indies (Calcutta, Bombay, and Madras).

The following are the London Current Prices of the Trade and Productions of this Division, comprising, beside the various large Ports of Bengal—Bombay, Madras, and Calcutta, other Ports in India, as well as in Ceylon and Burmah, and the trade of Northern India shipped *via* Kurrachee or Calcutta.

Hides—Bengal, Ox and Cow, in original bales, Patnas, arsenic cured, 4½ to 7 lbs., 6½ and 7⅞ lbs. slaughtered, 5 to 7 lbs. 5*d*. at 6*d*., dead. Kuttack or Dacca, 14 lbs., 4½*d*., 7 to 7 lbs., 6¼*d*. at 8¼*d*. lb.; mixed 4*d*. at 5¾*d* Durbungah, slaughtered, 5½*d*. at 7*d*.; rejections, 4¾*d*. at 5½*d*. lb.; do. and Ceylon Buffalo, about 26 lbs., 2*d*. at 2½*d*. lb, Rangoon, 3*d*. at 5*d*. lb.

Skins—Goat, 11*s*. at 19*s*. doz. Kid, 4*s*. 6*d*. at 5*s*. 6*d*. doz. Deer, 7*d*. at 1*s*. 1*d*. lb.

Kips—Drysalted, 3*d*. at 8*d*.; brined, 4*d* at 9*d*.; dry, 4*d*. at 8½*d*.; tanned, 4*d*. at 14*d*.

Ivory—Elephants' Teeth. See under East Africa.

Tanned Skins—Goat or sheep, good to prime, 2*s*. 4*d*. at 4*s*. 4*d*. doz.: common to fair, 1*s*. 6*d*. at 2*s*. 9*d*. doz.

Tanned Kips—Bombay, 4*d*. at 1*s*. 2*d*.; Rangoon, 2½*d*. at 5*d*. lb.

Bone Meal or Crushed Bones—90*s*. at 95*s*. ton.

Horns—India and Ceylon Buffalo, 4*s*. at 35*s*. cwt.; Tips, 10*s*. at 121*s*. cwt.; Deer 28*s*. at 270*s*. cwt,

Bristles—Calcutta, etc., white, 2*s*. 6*d*. at 8*s*.: black, 1*s*. 8*d*. at 7*s*. 6*d*. lb.

Terra Japonica—Gambier, bales, 17*s*. 3*d*. at 17*s*. 9*d*. cwt.; cubes, 28*s*. at 31*s*. cwt. Cutch, 25*s*. at 31*s* cwt. for good block to tablet.

Myrabolanes—Bombay, pale, 10*s*. at 11*s*.; fair, 7*s*. at 8*s*. 6*d*.; Madras, 7*s*. at 9*s*.; Bengal, 8*s*. at 10*s*.

Elk Hides—Ceylon, 7*d*. at 7¼*d*.; thirds, 4*d*. at 4⅞*d*.

Cocoa Nut Oil—Cochin, £29; Ceylon, £24 at £25; Mauritius, £24 ton.

Copra—Ceylon, £24.

Tallow—23*s*. 6*d*. at 25*s*. 6*d*. cwt.

Turmeric—Bengal, 12*s*. at 12*s*. 6*d*. cwt. Madras fingers, 20*s*. at 25*s*. 6*d*.; bulbs, 12*s*. at 15*s*.

Red Sanders Wood—£3 at £4 ton, very dull.

Mother o' Pearl Shells—Bombay, A's generally bold, 70*s*. at 80*s*.; B's, 80*s*. at 90*s*.; C's 85*s*. at 95*s*.; small, 70*s*. at 77*s*. 6*d*.

Lingah Shells—Ceylon, good stout, 16*s*. 6*d*. at 18*s*. Thin, 7*s*. 6*d*. at 13*s*. Kurrachee, 4*s*. 6*d*. at 5*s*. Japan, 6*s*. cwt.

Mussel Shells—Ceylon, bold med., 45*s.* at 47*s.* Chicken, 30*s.* at 37*s.* 6*d* ; small, 22*s.* at 25*s.* cwt.

Sharks' Skins—Please send us a sample, and quote lowest prices, we can open a large trade.

Mica—Ruby, uncut, 1*s.* at 10*s.* Ceylon, Amber, uncut, 1*s.* at 5*s.* Small, 2*d.* at 6*d.* lb.

Cinchona Bark—East India Crown, renewed, 4½*d.* at 6½*d.* ; stem 3*d.* at 4*d.* ; red, 2¼*d.* at 2½*d.*

Do., Ceylon, Crown, root, 4¼*d.* ; stem, 1¾*d*, at 2*d.* ; renewed 2*d.* at 6*d.* ; red, 1¾*d.* at 4*d.* Hybrid 2¼*d.* at 4¾*d.* Ledgeriana, 5*d.* at 6*d.*

Safflower—Bengal good to fine, 95*s.* at 110*s.* Middling, 87*s.* 6*d.* ; inferior 80*s.*

Shellac—Good to fine orange, £6. 5*s.* at £7 ; second orange, £5 10*s.* at £6 ; garnet, £5 cwt. ; button, 1st., £4 10*s.* at £7.

Sticklac, good 55*s.* at 60*s.*

Tortoiseshell—Bombay, med. to bold, 18*s.* at 25*s.* ; pickings 7*s.* at 10*s.* lb.

Aloes—Socotrine, good to fine, 45*s.* at 95*s.* ; other grades, 20*s.* at 40*s.* ; dark and nondescript, 8*s.* at 10*s.* cwt.

Cardamoms—Mangalore, med. to good, 2*s.* at 3*s.* Mysore, fair to fine, 1*s.* 9*d.* at 4*s.* Tillichery, fair to fine, 1*s.* 8*d.* at 2*s.* 9*d.* Madras, 1*s.* 4*d.* at 3*s.* 4*d.* Ceylon fine, 1*s.* 8*d.* at 3*s.* 9*d.* ; long wild, 1*s.* 2*d.* at 1*s.* 8*d.* Aleppy, 1*s.* 3*d.* at 1*s.* 6*d.*

Capsicums—Fair red, 20*s.* at 30*s.* cwt., dull, 12*s.* at 17*s.*

Castor Oil—Pale firsts, 2⅜*d.* at 3*d.* ; seconds 2¼*d.* at 2¾*d.* lb.

Senna—Tinnevelly, fine, 5*d.* at 1*s.*, good fair, 3*d.* at 5*d.* ; ordinary, ½*d.* at 2*d.* lb. ; medium, 2*d.* at 4*d.*

Senna Pods—Are scarce and are asked for.

Bees, Wax—Fine white, £8 at £8 10*s.* ; good to fine yellow £5 at £6 12*s.* 6*d.*

Ginger—Cochin, cut good to fine bold, 70*s.* at 75*s.* ; medium 60*s.* at 72*s.* 6*d.* cwt. ; rough, 45*s.* at 52*s.* 6*d.* East India, small to bold bright, 45*s.* at 62*s.* 6*d.* Cuttings, 42*s.* 6*d.*

Mace—East India, fine, 1*s.* 1*d.* at 2*s.* ; ordinary, 1*s.* at 1*s.* 4*d.* ; wild, Bombay, fair reddish, 5*d.* at 1*s.* lb.

Pepper Black—Malabar, 2⅜*d.* lb. Aleppy, 2⅛*d.* lb.

Cocoa—Ceylon, fine bold 80*s.* at 87*s.* ; medium, 65*s.* at 78*s.* ; triage 45*s.* at 62*s.* 6*d.*

Coffee—Ceylon Plantation, bold to fine bold coloury, 114*s.* at 118*s.* ; middling. 100*s.* at 113*s.* small 97*s.* at 103*s.* ; native, 83*s.* at 95*s.* Liberian, small to bold, 83*s.* at 98*s.* ; peaberry, 102*s.* at 113*s.* East Indian, fine bold, 103*s.* at 115*s.* ; med. to fine, 97*s.* at 102*s.* 6*d* ; small, 92*s.* at 36*s.* There is a firm market at good prices for both Ceylon and Indian Coffees.

Chillies—Slight stalky, 29*s.* 6*d.* cwt.

Cutch, 3*s.* at 34*s.* cwt.

Coir Rope—Ceylon or Cochin, ordinary to good pale, £11 at £18 ton, 2½ to 6 in.

Coir Fibre—Fine, long, straight, £13 at £23 ; ordinary, £12 at £16 ; stuffing £5 at £6 ton. Ceylon, £5 10*s.* at £9 10*s.*

Coir Yarn—Ceylon, £13 at £26 10*s.* Cochin, £10 at £30.

Ditto., roping, £9 at £15.

Coir Rope—Ceylon, from 1 to 2 in. to 6 in. ; £11 at £18.

Areca Nuts—Lower, sales at 11*s.* cwt.

Aloe Fibre—Bombay, 4*s.* at 10*s.* 6*d.* cwt.

Kitool Fibre—10*d.* for quality 0, to 1¾*d.* at 2*d.* for quality 3.

Jute—Indian, good white, £18 5*s.* at £19 5*s.* ; medium, £14 to £16 ; common, £12 at £13 10*s.* ; cuttings, £5 at £7.

Bristle Fibre—Fine would realise, £28 at £30 ton.

Palmyra Fibre—£18 10*s.* at £40 ton.

Hemp—Bombay, 10*s.* at 19*s.* cwt.

Mirzapore Carpets—2*s.* 6*d.* at 8*s.* sq. yard.

Myrabolanes—Dark to fine, 2*s.* 6*d.* at 6*s.* 6*d.* nominal.

Raw Silk—Surdah, 11*s.* 9*d* at 12*s.* 3*d.* Rose Filature, 12*s.*, Ramnugger, 11*s.* 9*d.*

Indigo—Bengal and Behar, middling to good, 5*s.* 4*d.* at 5*s.* 9*d.* ; consuming, 4*s.* 6*d.* at 5*s.* 6*d.* Oudes, 2*s.* 10*d.* at 5*s.* 3*d.* Madras, Vellore, 3*s.* 8*d.* at 4*s.* 2*d.* ; middling, 3*s.* at 3*s.* 8*d.* ; ordinary, 10*d.* at 2*s.* 9*d.* Kurpah good, 4*s.* 1*d.* at 4*s.* 8*d.* ; lower qualities, 10*d.* at 3*s.* 6*d.*

Rice—Patna, fine to finest, 16*s* at 20*s.* ; broken to good, 11*s.* at 15*s.* ; white Bengal, good, 8*s.* 9*d.* at 10*s.* mid. to good, 7*s.* 9*d.* ; Rangoon, 11*s.* at 12*s.* cleaned, 7*s.* 6*d.* at 11*s.* common, feeding, 5*s.* 6*d.* at 5*s.* 9*d.* Bassein, Moulmein, or Necrausie, 6*s* at 7*s.* Japan, cleaned, 10*s.* at 13*s.* cwt.

Isinglass—Bombay, low to fair pale, 10½*d.* at 2*s.* 1*d.* ; various quotations from pickings, 4*d.* at 6½*d.*, up to 1*s.* 5*d.* Bladder pipe, fine 2*s.* 3*d.* at 2*s.* 6*d.* ; small, 1*s.* 3*d.* Kurrachee leaf, 1*s.* 3*d.* at 2*s.* 5*d.* ; red, 1*s.* 5*d.* at 1*s.* 11*d.* lb.

Cinnamon—Ceylon, worked, firsts, superior, 8*d.* at 1*s.* 4*d.* ; good, 6½*d.* at 1*s.* ; lower qualities from 5*d.* ; unworked, 4½*d.* at 7*d.* Chipping and cuttings, 4*d.* at 5*d.* Chips, 2*d.*

Cinnamon Oil, 4*d*, at 1*s.* 1*d.* oz.

Gum Ammoniacum—Drop, 20*s.* at 75*s.* cwt.

Gum Animi—Bombay sorts, 75*s* at 142*s.* 6*d.* cwt.

Gum Arabic—Market quiet. Kurrachee, 35*s.* at 50*s.* Siftings, 27*s.* at 32*s.* Pickings, 20*s.* 24*s.* Bombay sorts, fair to good, 24*s.* at 35s. cwt. Red and inferior, 15s. at 22*s.*

Gum Arabic—Madras, 15*s.* at 30*s.*

Gum Assafœtida, 15*s.* at 120*s.* cwt,

Gum Kino—Bombay, fair to fine bright, £18 at £20 cwt.

Gum Olibanum—Bombay, reddish to fine white drop, 22*s.* to 62*s.* 6*d.* ; garblings and siftings, 10*s.* at 17*s.* 6*d.* cwt.

Nux Vomica—7*s.* to 8*s.* 6*d.* cwt. Supplies large.

Oils—Cocoanut, Ceylon, spot pipes, 22*s.* 3*d.* at 24*s.* 6*d.* Cinnamon Bark, fine, 1*s.* at 1*s.* 3*d.* ; common, 7½*d.* at 10*d.* *Citronelle Glass*—11½*d.* lb. is quoted.

Plumbago—Ceylon, fine bright, 15*s.* at 21*s.* ; good small, 14*s* at 13*s.* ; chips, 6*s.* at 12*s*, ; dust, 3*s.* 3*d.* at 5*s.* 6*d.* cwt.

Sapan Wood—Ceylon, good average, £5 to £7.

Sandal Wood—Logs, £20 at £50 ; chips £10 to £18.

Seedlac—Ordinary to good bright, 70*s.* at 95*s.*

Colombo Root, 7*s.* 6*d* at 24*s.* cwt.

Orchella Weed—Ceylon, 10*s.* at 20*s.* negelected.

Satin Wood—East Indian, £5 at £10 ton.

Rosewood—East Indian, £5 at £8 ton.

Ebony—East Indian, £6 at £8; Ceylon, £6 at £15.

Teak—East Indian, £10 at £16 load.

Cotton—Madras and district, fair to good fair, 3⅝*d.* at 4⅝*d.* ; good to fine, 4½*d.* at 5⅛*d.* Surat, good to fine, 4*d* at 4½*d.* ; good to fine, 4½*d.* at 5⅝*d.* Scinde, Bengal and Rangoon, fair to good, 3½*d.* at 3¾*d.* ; good to fine, 4⅛*d.* at 4½*d.* lb. Tinnevelly, fair to good, 4¾*d.* at 5⅞*d.* Western do., 4⅛*d.* at 4½. Coconada, 4½*d.* at 4⅝*d.* Bengal, fine, 4⅛*d.* at 4½*d.* ; middling uplands, 5⅛*d.* lb. Business in East India Cotton is very much hindered by the struggle in Lancashire.

Tea—Indian. A strong demand continues for all grades except common, which passed flatly in buyers' favour. Good liquoring Pekoes and Broken Pekoes over 11*d.* per lb. sold at dearer rates, owing to their scarcity. Some shipments of new crop from the Doom Dooma Co.'s Estates, consisting of Pekoes and Orange Pekoes, realised full prices, ranging from 9*d.* to 1*s.* 6¾*d.* per lb. Quality was above the average, and the leaf was well made and more tippy than is usually the case with early pluckings. The South India Teas, chiefly from Travancore, were of useful character, and showed further improvement in flavour.

For 6,200 packages, representing garden invoices, the average is 8¼*d.* per lb.

The following table shows the prices obtained by each District during the past two seasons.

Average price of Indian Tea during the Seasons ending 31st May, 1894 and 1893 :—1893-94, 909,804 packages, average 8¾ ; 1892-93, 789,514 packages, average 10½.

	1893-4.		1892-3.	
	PKGS.	PRICE	PKGS	PRICE.
Assam	429,114	9¾	380,310	11¼
Cachar and Sylhet ...	261,844	7½	206,036	9¼
Chittagong... ...	8,353	7½	3,968	9½
Chota Nagpur ...	2,270	5½	784	6¾
Darjeeling	51,508	11¼	56,952	1/0¾
Dooars	102,471	7½	99,308	9½
Neilgherry	4,611	7	3,998	8½
Terai	16,803	7¼	9,988	8¼
Travancore	27,320	7¼	23,606	8
Kangra Valley, Kumaon, Dehra Doon ...	5,510	8¼	4,564	9¼

Ceylon.—Trade generally is quiet. Competition has recently concentrated on Teas with special point, but those drawing thin infusions—of which there was a large proportion—ruled lower, lately to the extent of ¼*d.* to ½*d.* per lb., partly due to inferior quality.

The average is 8*d.* per lb., this year against 8¾*d.* in 1893.

We give the comparative prices of Ceylon Tea in London in 1893 and 1894.

Pekoe Soug., ordinary leaf; fair liquor, 1894, 5¾*d*; 1893, 6¾*d.* Pekoe, ordinary leaf, little twist; fair liquor, 1894, 7¼*d.*; 1893, 7¼*d.* Pekoe Soug., rather bold leaf; indifferent liquor, 1894 5*d.*; 1893, 6¼*d.* Pekoe, somewhat bold leaf; indifferent liquor, 1895, 5¼*d.*; 1893, 6½*d.*

Tea growing has become an increasing industry in India and Ceylon. The Indian crop last year was the largest ever produced, exceeding by twelve million pounds that of the preceding year. The total crop of Ceylon was larger by eight million pounds than that of 1892. The combined crops last year represented an increase of 20 million pounds over any previous crop.

Musk— Pod 20*s.* at 30*s.*; grain, 15*s.* at 40*s.*

Nutmegs—65's at 81's, 2*s.* at 11*d.* 90's at 125's, 4*d.* at 2*s.*

Sugar—Bengal, fine yellow, 12*s.* at 14*s.*; Madras Jaggery, 6*s.* 9*d.* at 8*s.* 6*d*; Manilla, 8*s.* at 10*s.*; Muscovade, 10*s.* 9*d* at 11*s.* 7*d.*

Tamarinds—Mid to fine, 12*s.* at 14*s.*: inferior, 7*s.* at 8*s.*

Croton Seed—Ceylon, 20*s.* at 25*s.*

Tobacco—E. Indian, 1½*d.* at 3*d*; Ceylon, 3*d.* at 8*d.* per lb.

Linseed—Calcutta, 36*s.* at 43*s.*; Bombay, 42*s.* at 45*s.*

Poppy Seed—Calcutta or Bombay, 34*s.* at 35*s.*

Rape Seed—Calcutta or Cawnpore, 41*s.* at 42*s.*; Yellow Guzerat, 44s. 6*d.* at 46*s.*; Scinde, 42*s.* at 43*s.*

Oil Cake—East India Rape, 77*s.* 6*d.* at 82*s.* 5*d.*

Wheat—496 lb; Calcutta, 21*s.* 6*d.* at 22*s.*

Peas—504 lb., 24*s.* at 25*s.*

Silk—Bengal, Surdah, 12*s.* 3*d.* at 13*s.* 6*d.* Cossimbazar, 12*s.* 3*d.* at 13*s.* 9*d.*

India Rubber—Rangoon, 1*s.* 3*d.* at 1*s.* 9*d.*; Assam 1*s.* at 2*s.*;
do. red, fine, 3*s.* 2*d.* at 3*s.* 10*d.*; ordinary, 2*s.* at 2*s* 10*d.*;
do, brown, fair to good, 1*s.* 4*d.* at 1*s.* 6*d.*

Osprey Feathers—Long, 12*s.* at 35*s*; medium, 30*s.* at 35*s.*; short, 40*s.* at 50*s.*; short selected, 59*s.* at 82*s.* 6*d.*; red, 3*s.* 6*d.* at 14*s.* 6*d.* oz.

Paddy White Feathers—Fair, 8*s* at 24*s.* 6*d.*; do. grey do., ordinary, 9*s.* 6*d.* at 17*s* 6*d.*; good, 27*s* 6*d.*

Heron Feathers—Black, short to long, 5*s.* at 8*s.* 6*d.*; mixed, 9½*d.* at 1*s.* 4*d.*; ash colour, fine, 32*s.* 6*d.*

Peacock Skins—Gold, 15*s* at 18*s.*; neck blues, 1*s.* at 2*s.* 4*d.* lb. do. quills, med., 2¾*d.* at 4½*d.*; long, 5½*d.* at 8½*d.* 100.

Pheasant Skins—4*s.* 6*d.* at 5*s.* 6*d.* each.

Osprey Skins—With cross feathers, 4*s.* 6*d.* at 5*s.* 6*d.*; long, 2*s.* each skin.

Paradise Skins—Round female, 12*s.* 6*d.* at 14*s.* 3*d.* each.

Humming bird Skin.—Ruby breasted, 2½*d.* at 3¼*d.*; emerald, 1⅝*d.* each.

Pigeon Skins—Japan crested, 4*s.* at 8*s.* 6*d.*

Tin—£69 2*s.* 6*d.* at £71 15*s.*

Hemp— East India, £22 at £23 ton, for "fair current."

Cutch—Fair to fine, 17*s.* at 32*s.* quiet.

Saltpetre—Bengal, 5 to 2 % 18*s.* at 18*s.* 6*d.*; Bombay, 60 at 30 %, 10*s.* at 13*s.* cwt.

Tamarinds—Mid. to fine, 10*s.* at 72*s.*; inferior, 5*s.* at 7*s.*

Tincal—Calcutta, 21*s.* 6*d.* at 22*s.*

Turmeric—Bengal, fair to good, 12*s.* 6*d*, at 14*s.*

Chillies—30*s.* at 40*s.*

Galls—Blue, 50*s.* at 57*s.* 6*d.*; green, 45*s.* at 50*s.*; white, 40*s.* at 47s. 6*d.*

Ginger—Cochin cut or rough, fine, 65*s.* at 85*s.*; small, 45*s.* at 65*s.*; Bengal, rough, 50*s.* nominal,

Orchids—Burmah. There is always a demand here for orchids, and we shall be pleased to take charge of consignments. New or rare plants fetch good prices.

(*John Haddon & Co.'s List.*)

Churchill and Sim's Circular.

5th September, 1895.

East India Teak.—The deliveries from the Docks for the first eight months of this year amount to 11,431 loads as compared with 7,754 loads for the same period of 1894. For the August just past the fine delivery of 2,185 loads has taken place, which compares well with the 817 loads delivered in the August of last year. The market, nevertheless, remains in a heavy and lifeless condition, oppressed with fears of a large floating supply to be dealt with presently. As this supply become available, however, sales, mainly to foreign ports, have been effected from time to time, and looking to the prospects of the European demand there seems little cause for alarm.

Rosewood.—East India.—Is quiet, stock small but sufficient.

Satinwood.—East India—Is in moderate demand at fair prices.

Ebony.—Small lots of good logs would find ready buyers.

PRICE CURRENT.

Indian Teak	per load	£10	to £16.
Rosewood	„ ton	£6	to £9.
Satinwood	„ sup. foot.	6d	to 12d.
Ebony	„ ton	£6	to £8.

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, September, 1895.

Cardamoms	per lb.	1s. 8d.	to	2s. 3d.
Croton seeds	per cwt.	30s.	to	40s.
Cutch	„	20s.	to	32s.
Gum Arabic, Madras	„	20s.	to	33s. 6d.
Gum Kino	„	£25	to	£30.
India Rubber, Assam,	„	1s. 7d.	to	2s.
„ Burma	„	1s. 6d.	to	2s. 2d.
Myrabolams, Bombay,	„	7s. 9d.		
„ Jubbulpore	„	6s.	to	7s.
„ Godavari	„	5s. 6d.	to	6s. 6d.
Nux Vomica, good	„	6s.	to	9s.
Oil, Lemon Grass	per lb.	1⅝d.		
Orchella, Ceylon	per ton	11s.	to	15s.
Redwood	per ton	£3, 10s.	to	£4
Sandalwood, logs	„	£30	to	£50
„ chips	„	£4	to	£8
Seed lac	„	50s.	to	100s.
Tamarind	„	9s.	to	11s.

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The Treatment of Casuarina on Sand-dunes.

Mr. E. McA. Moir's interesting remarks on the treatment of sand-dunes in France in the *Indian Forester* for the month of June, and especially his remarks in connection with the growth of the small pines near the sea-shore though entirely "sheltered from wind" being stunted, as compared with those half a mile distant exposed to the "full force of the western gales," instigate me to record a few notes on the Casuarina under somewhat similar circumstances on the sea-shore near Bulsar in the Surat District.

Efforts have been made to establish the *Casuarina equisitifolia* on the sea-shore at this spot for some time past, and last year I managed to raise at least 25,000 transplants at a nursery established for the purpose in the vicinity. Unfortunately, just about the time when the final planting operations were to take place I was transferred to another Division. But, nevertheless, I gained sufficient experience from the existing plants to justify the presumption that without some special method of treatment it would be impossible to rear the plant successfully. While trees at a distance of half a mile inland on private property were doing well, those on the sea-shore itself were stunted and unhealthy even when fairly well sheltered from the strong sea breeze. I came to precisely the same conclusion as to the cause of this as did Mr. Moir in the case of the pines on the coast of France; but whereas he seems to express some doubt, there is no occasion to entertain any, so far as the Casuarina are concerned. The sand deposit on the minute needles and on the bark and twigs was easily perceptible to the naked eye, and could be rubbed off with the finger. Under a powerful magnifying glass the appearance of the deposit was appalling and quite sufficient to suspend the physiological functions of any plant. These microscopic particles of sand, moreover, appear to travel with considerable force, penetrating the cortical depressions and irregularities and filling up the stomata of the leaf system. The dunes I refer to are partially covered by that valuable creeper the *Ipomœa biloba*, and in treating the Casuarina for this evil two courses seem to be open to us—(1) to greatly add to the quantity of this or any other creeper, a grass that may be induced to grow, thereby reducing

the surface area of sand exposed to the wind, and (2) to occasionally wipe or syringe the plants free of the deposit that forms on them. The second course might, at first sight, strike one as being impracticable, but as the formation of this deposit is very gradual plants need not be subjected to such treatment very often. I cannot help wondering how the Madras Officers have got over this difficulty, for surely they cannot have been free of it, and I think it would be of considerable interest if one of them were to give us his experience in the *Indian Forester*.

GODHRA, *Panchmahals.* } W. A. WALLINGER.

[NOTE.—So far as our experience goes, the difficulty has not occurred in the Nellore plantations.—HON. ED.]

The Shifting Sands of Gascony: an Historical error.

In Number 13 of the "*Revue des Eaux et Forêts*," dated 10th July, there is an interesting article on the true history of the celebrated work of fixing the moving sands of Gascony. It has generally been supposed, and the various text books from Bigneris to Boppe have lent their support to this idea, that the credit of this great enterprise is due to an engineer who lived at the end of last century, Nicolas Thomas Brémontier. It appears, however, that this is not quite the case.

In 1734 Alain de Rust planted or sowed pines and oaks on the sandy dunes near Buch, and the work was continued by his grandson in 1779. Incendiary fires, however, destroyed the plants that came up, and the sowing was not successful.

During the latter half of the eighteenth century the onward progress of these moving sands attracted universal attention, and means for arresting them were sought for. The chief idea at this time was not so much to fix the sands as to make canals to lead off the superfluous water and to turn the waste into culturable land.

This was the leading idea in a petition presented to the King by the Comte de Montausier in 1773, but the scheme came to nothing because the Public Works Department of that day declared that it was absolutely impossible to fix the moving sand hills, and, be it remarked, it was the sub-engineer, Brémontier, who first gave utterance to this unfavourable opinion. Numerous projects for rendering the dunes culturable by draining off the water were then set on foot, but they all collapsed because their authors had neglected the one primary condition of success. Among those were two brothers, named Desbiey, who were interested in protecting their own property by sowing pine seed, and one of whom wrote a paper on the subject which was rewarded by the Bordeanx Academy of Science and printed in 1776.

In 1778 an engineer, named Baron de Villers, was sent by Louis XVI. to study the question of the dunes generally, and more especially the formation of a harbour in the bay of Arcachon. De Villers remained four years and wrote several able reports on the subject, in one of which he clearly laid down the axiom that in order to prevent the onward march of the sand, it would be necessary to sow pine seed; and to make this a success it would be essential to fix the seed on the ground by some means or other, and thus prevent its being blown away or buried in sand. He also recommended sowing the very seeds which are used at the present day, and which are quite at home in pine sand; and he gave his reasons for the proposal. In conclusion, he solicited that a trial of his system should be made for two years. The Government of that day listened to his request, and in 1784 sent Brémontier to carry out this work. Since the days of Montausier his opinions had changed, chiefly owing to the reports of De Villers, and he set to work at la Teste, aided by a land-owner, named Peychon.

Peychon had previously made several successful attempts in sowing the sand-hills, and covered his seed with branches to prevent its being blown away. Whether he discovered this process for himself, or got the idea from De Villers, or from the works of General Claussen in Zealand is not known; anyhow he was the man Brémontier wanted, and he was attached to the enterpise as inspector of works. They commenced their labours in 1787, but Brémontier refused to employ a covering of branches, contrary to the advice of Peychon; the wind swept away all the seed, and the work was stopped not to be resumed again, owing to the troublous times, till 1802, when the colossal enterprise of fixing 3,00,000 acres of the sands of Gascony really commenced.

During these years of inaction numerous pamphlets appeared shewing the feasibility of re-wooding the dunes, and the advantages that would ensue to the country all around, and to the State itself. The most important of these brochures was one by Brémontier himself, in which he utterly ignored the previous suggestion of Rust, the Desbieys, and De Villers. However, he is not the only man who has endeavoured, with more or less success, to take to himself unjustly all the honour and glory of a grand undertaking, and though it is clear that he did not originate the system, there is still due to him the honour of having, by practice and by precept, convinced the world that the work was feasible, and of having satisfied the Government, so that funds were forthcoming. But the credit that is due to Brémontier is over-shadowed by the manner in which he entirely ignored the writing of his predecessors even while quoting their figures, and by giving no credit to the discovery of Peychon, who died without being able to show what share he had taken in the work. The honour was, however, justly apportioned by the Conservator of Forests at Bordeaux in 1812 in a report addressed to the Commission of the Dunes.

A. S.

Influence of the Season of felling on the production of Stool-shoots in the Oak.

(According to MM. Bartet and Hartig).

Hartig's investigations appear to have been the first made in Germany on this subject; at any rate the author concludes his article by saying, that it would be desirable to make similar experiments with a simple coppice or coppice with standards with a view to determine the results of a felling out of season on the shoot-producing capacity and on the vigour of the shoots produced. He evidently ignores the fact that this question has already been studied in France by M. Bartet with that scrupulous exactitude and thoroughness which characterizes all his work.

Although much less complete than the observations made at their experimental station of the Ecole forestière, as they only refer to one species, the oak, represented by a single type of stems, the results obtained by the celebrated Munich professor are deserving of notice in these pages for several reasons. The experiments made at Nancy were restricted to the stumps and reserves of different ages in a coppice with standards as was naturally indicated, since it is chiefly this method of treatment, depending as it does on the aptitude of our leafy species to produce stool-shoots, which is likely to benefit by the results of these experiments. The Munich experiments were only made in a high forest crop in the absence of any coppice in the neighbourhood of the town, for the rest the author's principal object in felling trees every fifteen days from the 2nd May to the 6th December was the study not of the production of stool-shoots, but other physiological points, such as the movement of the reserve material, the duration of the formation of wood, &c. The trees experimented on at the two stations differ not only in their origin, but the conditions of soil and climate in which they were grown differ, and, as M. Bartet justly observes, these two factors are most important in a matter of this kind. It will be interesting to notice the extent of their influence.

The following is a *resumé* of the results obtained by Dr. Hartig:—

The trees were chosen in a high forest crop which was thinned some years previously, and were 50 to 60 years old, with an average diameter of 0·14 m. at breast height. They were cut with the saw 0·07 m. above the ground, the usual precautions being taken to guide the fall of the tree and avoid jamming the saw. In the same year (1893) numerous shoots were produced on the stools of the stems felled on the 2nd and 17th May, the 6th and 21st June and the 4th July. The shoots attained a height, on the first two series of stumps, of about 0·30 m., on the two next 0 20 m. and on the last 0·10 m.

The stools cut on the 29th July produced well formed buds in the autumn but no shoots. As to those of the 5th and 19th and 30th September and the 6th December they remained inert during the year.

In the spring of 1894 the shoots of the first three series had not suffered during the winter, but those of the stools of the 21st June and 4th July had been frozen down to the base.

In September 1894 the shoots of the first five series of stools (*i.e.*, from 2nd May to 4th July, 1893) were about one metre in height, just the same as those of the two last series (30th September and 6th December) which had been formed during the year. The shoots from the fellings of 20th July and 19th August were smaller, about 0·07 m. high, and none were formed at all in the stools of the 5th August and 5th September.

From this Hartig concludes that it is only on the stools of trees felled up to the middle of June that shoots sufficiently developed to resist the frost are produced. From the middle of June to the middle of July the stools produce shoots in the same year, but their tops are frozen in the winter. Stools cut later than this either remain unproductive or furnish shoots in the following year only.

If these results are compared with those published four years previously by M. Bartet, a striking similarity will be noticed in spite of the important differences already referred to in the character of the experiments. The oaks of the high forest of Spessart grown on a deep, fresh soil from the variegated sandstone at a greater elevation and in a colder climate than that of Nancy have behaved in a very similar manner to the oaks of the Haye coppice grown in a shallow dry limestone soil of the Lower Oolite.

While the stools of the oaks cut on the 20th July at Munich produced no shoots in the same year, about four-fifth of those cut at Nancy on the same date did give shoots, and about half of the shoots of the 15th August were still productive. It was only the stools cut at the end of August that produced nothing. At Munich this result would be obtained at least a month earlier. To legitimately attribute this difference to the factors of soil and climate, however, the experiments on the two places should have been made the same year with identically similar trees, which was not the case, since the Nancy experiment was made with stems of 35, 60 and 85 years old, cut as close to the ground as possible from a coppice with standards crop; whereas the Munich experiments, as we have just seen, were made under totally different conditions, so that it is impossible to state with certainty the cause of the difference noted. As regards atmospheric influence the shoots behaved in very much the same way in both places. Hartig states that those which arose from the stools cut on the 21st June and 4th July were frozen down to the base in the next

spring. It was in these two months also, according to M. Bartet, that the percentage of stools rendered unproductive by the total loss of their shoots reached its maximum (11 %), and from observations made on the ground it appears that the oak shoots were killed by early autumn frosts.

As regards the height of the shoots, too, both obtained the same results, *viz.*, an average height of about one metre for the dominant shoots of two years' growth from the stools cut May to July; and in both places a noticeable diminution took place in those of about the middle of August, again a considerable increase from the end of that month. Instead of an average height of 0·59 m. for the dominant shoots of two years on the stools cut on the 15th August, one metre was measured at Nancy for the fellings of the end of August, and 1·05 m. for those of 15th September and at Munich one metre for fellings of 30th September and 6th December. These shoots produced during the year are therefore about the same height as those of two years growth, a fact attributed by M. Bartet to the following causes. First, the influence of early frosts on the young imperfectly matured shoots; secondly, the variation in the quantity of food materials contained in the shoots (including root system) at the different periods of vegetation. Whether one takes into consideration the shoots produced during the year of felling, or those which date from the following spring, it is noticeable that the advantage lies with the areas exploited from end of August to middle of September (or later presumably) from which there is a justifiable presumption that the stools in these areas supply more abundant nutriment to the shoots than the others do. And judging from the height of the dominant shoots, it is during the first half of August that the stools of the oak are most deficient in food material.

I am inclined to ascribe greater preponderance to the second cause because in both localities the shoots arising from fellings of 15th March, 15th April, and 2nd May, which were sufficiently well matured not to suffer from frost, did not attain a greater height in two years than the one year shoots from the stools of the last four months of the year.

This comparison appears to demonstrate the existence of a physiological law which preponderates over external influences, and that the conclusions to be drawn from M. Bartet's experiments remain true for trees grown under other conditions of vegetation. In any case it would be a good thing to have the results of similar observations made in the oak coppices of the south of France to completely elucidate this question which is one of undeniable interest, whether it refers to a coppice, a high forest, or a coppice undergoing conversion. (By E. Henry in the *Revue des Eaux and Forêts*).

A. F. G.

II.—CORRESPONDENCE.

Dripping of Water from trees.

SIR,

Your article on the dripping of water from forest trees reminds me of a curious phenomenon I observed in April last in the Nallamalais. I was superintending the felling of a large Inumaddi (*Terminalia tomentosa*); the bole girthed 6 feet at 20 feet from the ground, and was 40 ft. in length to the first branch; a straight, sound, well grown tree. When the cut was about 10 inches deep, a jet of watery fluid was tapped; the water rushed out as if there were considerable pressure behind it; it was impossible to measure the quantity as no vessels were at hand in which to catch it, but I estimated it at not less than three gallons.

When the tree was felled, I looked for the hole which I expected to find, but it did not exist. There was an almost imperceptible crack about six inches long, and so narrow that not even a sheet of paper could be inserted; the crack followed an annual ring in the heart-wood about half way between the centre and the back of the tree.

I searched the forks of the branches, and found no hollow, and when the tree was cut into logs it was sound throughout.

Fires in past years may account for the crack, but hardly for the fluid in it. The wood-cutters say that this phenomenon is not uncommon.

F. A. L.

The Word 'Siwalik'

SIR,

In the *Forester* for October you have raised a question as regards the meaning of the word Siwalik.

The word Siwalik is quite unknown to the Punjabi hillmen, and I am one of them. No such word as Siwalik is found in the different dialects spoken of in the hilly districts of Jummoo, Chamba, Kangra, Kulu, Hushiarpur, Bashahr, Simla, Rawalpindi and Hazara.

This word Siwalik, or, as the natives of the N.-W. Provinces pronounce it, *Shiwalak* is, I believe, a corruption of the compound Sanscrit word Shiva-lok—which means the country of the great Shiva.

We all know that the sacred Ganges is the beloved river of Shiva. We also know the imaginary source from which, the Hindoo Purans tell us, the river takes its rise. Consequently, the country drained by the Ganges was considered to belong to that Deity. The name Shiva-lok or Siwalik as it is now called in English, was therefore given to all lower hills lying in the basin of the Ganges. All such hills were and are up to the present day generally resorted to by the followers of the above great Deity. Such are the Rikhikesh hills, the Tapoban hills, the lower hills on way to Badrinath and Kadarnath (the last two are other names of Shiva), and all other hills which the sacred Ganges drains. It was to such hills that the name Shiva-lok (Shiva's country) was once given, which name is now applied to all lower hills in the country.

KAHUTA (RAWALPINDI)
1*st November*, 1895 } MIAN MOTI SINGH.

III—OFFICIAL PAPERS & INTELLIGENCE

Powers of Conservators in regard to Working Plans.

We have received the following Circular from the Inspector General of Forests :—

I have the honour to invite your attention to this Office Circular No. 12 W.-P., dated the 29th October, 1894, regarding powers of Conservators in the matter of deviations from the orders contained in working-plans in connection with works of forest improvement.

The remarks in paragraph 3 of that Circular were intended to suggest that Conservators should themselves exercise, with the general approval of the Local Government or Administration concerned, the powers described in paragraph 2 of the Circular in respect of all existing plans sanctioned under the procedure prescribed in the Forest Department Code, and not that Conservators should apply for power in the case of each such plan.

So far as I am aware, general sanction of the kind has only been accorded in the case of the Conservator of the School Circle, North-Western Provinces. I shall, therefore, be glad to learn whether similar orders have been issued in your circle, and, if so, to be furnished with a copy of them. Should no such general sanction have been conveyed, I would ask whether you propose to take any action in the matter.

The Forests of Victoria.

SIR,

I have at the outset to convey to you my best thanks for the facilities offered to me by the Victorian Government for visiting the forests of the Colony.

Mr. George Perrin, the Conservator, accompanied me during my tours, and though I regret that owing to the want of time on the part of that officer I could not make as exhaustive an examination of the forest resources of the Colony as I should have desired. I have reason to believe that, owing to efficient guidance, I have obtained a sufficiently comprehensive view of the main characteristics of the forests and their treatment to venture an expression of the opinion that you were kind enough to invite.

It would be useless on my part to give a general description of the forests of the Colony as they are sufficiently well known, not merely to the authorities invested with their control, but to a considerable portion of the general public. I gathered this from numerous conversations I had on the subject during my stay in Victoria. I also found that the importance of the forests and their maintenance was generally well understood, and that it was widely acknowledged that the permanent conservation of a sufficient forest area was, and always would be, an important factor in the welfare and prosperity of the Colony. In many countries where education (at the time forest conservancy was under consideration) was less widely spread than in the Australian Colonies, the above facts were frequently not so well understood, nor so generally acknowledged, and it became advisable to convince the public (especially the rural portion) before seriously introducing practical forest conservancy, of the direct and indirect advantages a country derives from the existence of properly managed forest areas, and, in some cases, it became necessary to override public opinion for the good of the community.

Happily for the Colonies, neither is necessary ; the knowledge exists, but in spite of this widely-spread knowledge of the advantages of permanent and effective forest conservancy, yea, even of the necessity thereof, State forest conservancy and management are in an extraordinarily backward state as may be seen from the following facts :—

(*a*). The forest laws of the country are inadequate, nevertheless they contain some important practical points which might be applied with considerable advantage if such were the serious intention of the Government.

They have, however, been allowed to lie fallow, and have sometimes even been superseded by contradictory and mischievous circulars and orders.

(*b*). The area of inalienable State forest has not been increased since Mr. Vincent's report of 1887 was written.

(*c*). No doubt additions have been made to the area of the *timber reserves*, but other forests of this kind were again thrown open, thus proving the inadequacy of permanent conservancy.

(*d*). The *protection* of the forests against fire has never even been attempted, and neglect and waste in their treatment are now as rampant as in the days when Mr. Vincent framed his indictment against this management in an able report to His Excellency the Governor, which should be wider known than is the case.

(*e*). The income from the forests is ridiculously small, and quite out of proportion to the large supplies drawn from them, and the money spent on their protection, maintenance and improvement is entirely inadequate.

The reasons for the self-evident mis-management of the forest property of the country are well-known, and were in fact first pointed out to me by independent Colonials; they are political, and centre in the disregard of the general public weal, where this clashes with the monetary profits of individuals or classes, who can exert a direct parliamentary influence. The smallness of individual interest raises no special defenders in the cause of the conservancy of State forest property, and the onus of moving in the right direction rests, to a great extent, on the shoulders of the Government. If the country will support the Government and remove once for all the management of the State forests out of the whirlpool of party politics, the Victorian forests will doubtless prove now, and even more so in the future, of great benefit and value to the country, whereas if the existing system of management is allowed to continue, the re-construction of the ruined forests will sooner or later become necessary, at the cost of enormous sums which might be more usefully spent than in correcting the effects of mismanagement and neglect on the part of the present generation. Without the support of the country the Government is powerless. It may carry on forest conservancy as an empty shadow, but no *real* progress can be made so long as it remains the watchword that the extraction and conversion of forest produce for private benefit is tantamount to an industry by which the national wealth of the country is increased, and that for this reason the Government should not merely be satisfied with nominal prices for the material removed, but also suffer without complaint any amount of mismanagement and waste in the extraction of the prodnce. But so it is at present. "Little Jack Horner" must not be disturbed in his development of the Christmas pie, even if it should otherwise suffer by his method of extracting the plums. The cases are identical; in both instances it is Jack who reaps the sole benefit.

This seems wrong. The forests of a country must be looked upon as a capital left in trust for the whole community, and though it may be quite right to divert a superfluity of the capital into other, and probably more profitable, channels, a sufficiency of the original investment must be maintained, and of this, the interest alone

should be consumed. When a country which lies within the *forest zone* of the Globe, or in other words, where the necessary degree of humidity and heat exists to favour arbori-vegetation, it is, when first occupied and settled, more or less densely covered with forest growth. It is evident that civilization, which in every instance is primarily founded on agriculture, cannot advance without the removal of the forest cover from the greater portion of the surface of the country. At the outset, when labour and demand are scarce, and when the produce is of comparatively little value, the most wasteful and wholesale destruction by ring-barking and fire takes place, and is under these circumstances not only excusable but frequently advisable. It is, however, equally easy of proof, both by historical evidence gathered from all parts of the globe and by the results of modern scientific enquiries, that a certain proportion of a country must be maintained under forest cover, in order to secure the permanency of national progress and prosperity. The percentage of forests which it is necessary to maintain varies considerably with local conditions, but the fact remains that it is easier to disforest the superfluity of forest land, than to re-create forests where they have been devastated and are found wanting. It is consequently a matter of great importance that the Government of a new country should make up its mind as early as possible, both with regard to the extent of permanent forest reserves and their final situation, that the areas selected should be made inalienable; safe for serious special reasons of State, and that they should be treated for the one purpose of permanent retention under forest cover. This action is certain to pay its way sooner or later, even in a direct manner, and the indirect advantages of judicious conservancy are incalculable. To judge from Mr. Vincent's report and from conversations I had on the subject, which are supported to some extent by my own personal observations, the opportunity of securing the most advantageously situated and best adapted forest areas has in many cases already been missed, and is almost everywhere in the Colony of Victoria a question of urgency and importance. The present forest laws of the country seem to me to be sufficient for the primary selection of the areas required, but they do not adequately protect the forest chosen either from alienation, the growth of adverse rights or against other interference by men, and I would consider it advisable if the laws were improved in this respect It is evident to me that the protective clauses were, even in the latest Bills, never seriously considered, and the fact that the penalty for fraudulently altering the marks on timber, (which is an offence tantamount to theft of an aggravated kind) has been met by a mere trivial fine, seems sufficient proof of this assertion. The alteration of a boundary line of a State forest, the firing of a forest, etc., become offences only when the Governor in Council has exercised his powers for making regulations to that effect.

On the other hand, mere executive and management rules form integral portions of the existing law, or of the Bills under consideration. In my opinion, it would be advisable to revise the Bills thoroughly, and if I might venture to do so, I would suggest the Upper Burmah Forest Regulation as a pattern for the general lines of a Forest Bill. The Upper Burmah Act is the most practical of Indian Forest laws, and is, so to say, the outcome of the experience gained during nearly thirty years of forest legislation in the different provinces of the Empire. It will be understood that I recommend the adoption of the above Act as a pattern only in a very wide sense, as the circumstances, especially those connected with the extraction and transit of forest produce, vary enormously.

The whole of Burmah is intersected by water-ways and the most valuable species of timbers and all bamboos are sufficiently light to float, and thus the creeks and rivers form innumerable export lines for timber in the log, and allow the establishment of large central saw mills near the seat of consumption which frequently draw their material for conversion from forests, many hundreds of miles distant. In Victoria, no water-ways of any importance exist. The most valuable timbers are of high specific gravity, and there are no bamboos by which the heavy logs could be buoyed up. The consequence is that conversion must take place in or near the centres of production. The saw-mill owner can, under such conditions, establish a mill of any importance only where permanency of supply can be guaranteed, a monopoly, so to say, of the forest produce of a certain area. Circumstances render this unavoidable, and the fact must therefore be accepted, but it would seem to me to be a matter more conveniently settled by an executive contract, than by rules prescribed on the authority of "His Excellency the Governor—" rules that are not likely to fit every individual case. In my opinion it will be quite sufficient if the enactment gives power to the Government :—~~First~~ (1) to declare any area belonging to the State a State forest, alienable only under the authority of Parliament ; (2) ~~Second~~ to demarcate such State forests and to prevent within them the springing up of private rights adverse to the State ; (3) ~~Third~~ to provide for the proper protection of such State forests from fire or unbounded interference by men (4) ~~Fourth~~ to provide for their systematic management ; (5) ~~Fifth~~ to provide for the protection of forest produce in the forests and in transit ; (6) ~~Sixth~~ to provide for the adequate punishment of persons breaking the forest laws or regulations framed under its provisions. I hardly think it will be necessary to provide for the protection and management of Government forest property which is not declared State forest, provided the work of constituting such inalienable areas is started at once in the right direction and proceeded with seriously, energetically and systematically.

If this, however, is considered impossible under existing circumstances, an intermediary protection must be provided. It

would be a pity, because this choice of measures leads but too easily to delay in the real work of permanent reservation, and tends to create two separate classes of forests which is most undesirable. The time has hardly as yet arrived when it becomes necessary to provide for the preservation of private or communal forests. I have pointed out on a previous page that the existing forest law, if seriously and honestly used, would suffice for the creation of State forests, progress in this respect should in no wise be delayed pending the enactment of a more comprehensive forest law, because a simple clause in the new Act can give legal effect to selections made under former enactments. When permanent State forests have been created and have been placed in trust of the Government, it will, in my opinion, be advisable that they should be worked rationally and systematically. There can be no two opinions that this is quite impossible under the present license system which does not allow of such control as it is necessary to exercise, in order to keep the annual or periodical utilization within the possibility of of the forest, *i.e.*, within its productive power. To ensure that this is being done it will be necessary to frame a pre-considered working plan for each forest unit. Such a plan must be based on the conditions of each such unit, and be framed with regard to the main purpose which the forest is intended to serve, for, to give an example, it would be useless to treat a forest as a high timber forest when mine props are chiefly in demand. In framing a working plan, both the conditions and the purpose should be shortly recorded in one chapter, and the proposals for the future working should be laid down as concisely as possible in the second. When the facts are taken into consideration that forest trees take generations to grow to a workable age, and that the forests themselves form a living organism which is constantly producing, growing and ripening, according to fixed laws of Nature, and that consequently a constant harvest can be gathered from them, it needs no argument that a plan is necessary which respects such laws of Nature, and that any haphazard and irrational utilization will usually result in the ruin of the forests.

In India it has been found advisable, chiefly in order to facilitate control, to stereotype the arrangements of working plans. *A resumé* of the requirements which, in the whole or in part, will be found suitable for any purpose may be seen in the last edition of the Indian Forest Department Code. A working plan once framed should be carefully considered by competent authority and formally sanctioned. When this has been done no major deviations should be permitted without an enquiry of at least as searching a character as that on which the original plan was based. In regard to this I would again invite reference to the Indian Forest Department Code, the last edition of which contains the outcome of our experience in this respect. Working plans in India were first introduced and framed by Sir Dietrich Brandis, the real founder of scientific forestry in that empire. These plans extend-

ed mostly over large areas and served their purpose brilliantly, but they were naturally very general in their scope, too much so to make them of permanent utility. Hereafter we went, owing to the arrival in the country of officers of high theoretical training, through periods of over-elaborated plans which cost too much money and time, and offered difficulties in regard to control. It was only when practice had mellowed our theory that the happy medium was struck. I have no doubt that the Colony might considerably profit from our Indian experience in the preparation of working plans by deputing an officer to work for a year or two with some of the best working plans officers in that country. I perfectly understand that it is quite impossible to introduce working plans all at once over the length and breadth of the Victorian forests. It will take decades, or perhaps generations, to do so, nor is it necessary that such very rapid progress should be made, for in many instances the single word *rest* will comprise the whole of the working scheme, and in comparison with the present population and the present demand, the aggregate forest area of the Colony is still very large. The beginning, however, should be made in those forests where an active demand already exists, or can easily be created by providing roads and other means of communication.

My visit to the Colony has given me many opportunities of observing how necessary permanent working plans are in certain localities, and I may be permitted to give a few of the many instances I have seen. The State forests, between Creswick and Ballarat were years ago thoroughly ruined by entirely un-controlled fellings on the part of the mining population ; trees and poles were cut at all heights from the ground, which prevented the springing up of a healthy coppice which, to a certain extent, would have grown on a self established root system. An unsatisfactory pollard growth infested the ground. The mining industry collapsed, but luckily a limited demand remained for small timber. Mr. Perrin had at this period the well-conceived idea of taking a severe improvement felling through the forests, removing all diseased, badly grown and pollard trees. He had to open out the forests to what I should, without Colonial experience, have considered a risky degree, more especially on a soil not naturally vigorous.

The recuperative power of the Eucalyptus, however, in its natural habitat, is something extraordinary, and the results of the operations have been thoroughly satisfactory. Near the "White Horse," however, we came to several areas through which Mr. Perrin had taken a very radical improvement felling, leaving only the best and most promising stems on the ground. These, it is almost incredible, the miners had appropriated, felled most recklessly, and partially removed, under cover of Sir John Mc'Intyre's Miner's Circular, which was shown to me on my expressing doubt as to its existence. I saw a repetition of the same vandalism in the Linton and Scarsdale forests. Now, nothing would be easier than to frame straight away a rational

plan for the working of these forests, and they would pay more than their expenses from the very outset.

On the "Black Spur" at the head waters of the Yen river, I saw selections on which a splendid crop of matured timber had been ring-barked some six or seven years ago, apparently without any fixed purpose beyond securing the land for some future use, for the young forest had been allowed to come up unchecked, and already forms impenetrable thickets. I also visited the Welbourne Water Supply area. It would be difficult to imagine greater desolation than meets the eye in this specially selected forest, everywhere but in the self-protected moist gullies at a high elevation. The ground is covered with dead trees and other vegetable debris in all stages of decomposition, and other dead and dying trees are ready to replace the fallen giants as fire and rot consume them.

To me it seems inconceivable that this valuable area, nearly 140,000 acres in extent, and favourably situated for the Melbourne market should not be systematically protected and worked. I am convinced that if this forest was put into order and rationally worked, it might eventually be made to yield 100 cubic feet of converted material per acre per annum, and could at the same time be kept under permanent canopy, which is certainly not the case at present. Near Wandong I visited some forests which serve a couple of sawmills owned by the "Australian Seasoned Timber Co." Here again the work is carried on, so far as the forest is concerned, without any pre-considered plan. The State has no security that the forest will not be over-worked and finally ruined, and the Company none as regards the permanency of supply. The present license system which permits a scramble for the forest produce so long as it can be found anywhere, is at the bottom of much of the disorder which exists. It must disappear when a regulated utilization of the forest is introduced: but otherwise, when once the possibility of a given forest area has been fixed and the exploitation has been arranged accordingly, it is a matter of no great consequence as regards forestry in what manner the forest produce is disposed of, so long as the possibility is not exceeded. This question of disposal becomes purely a financial one. The trees may be sold singly, or in blocks, or compartments at a fixed royalty, or by auction or they may be given away if the State thinks fit. A lease for a number of years is especially adapted for saw-mill industry, but a fixed royalty does in such cases frequently not represent the real value of the standing produce. This value is greatly influenced by the situation of the forests, its nearness to the market and other conditions, and a competitive tender with minimum rate per 100 cubic feet will probably be the best gauge of the actual market value. I have met no instance myself, but have been credibly informed, that many well established saw-mills had to be abandoned because the supply of timber gave out

unexpectedly. This, of course, could not have happened if sufficient area of forest had been set apart for them under a pre-considered plan. Permanent saw-mills create a constant demand on the forests, and may be relied on to pay a constant and considerable income on their output. Their establishment should consequently be encouraged, not by special or low rates, but by certain security of finding a permanent supply of raw produce within a reasonable distance. This is of much greater importance to the industry than favourable rates. In my opinion sawmills should be established only in or near sufficiently large and well situated forest areas from which a constant supply may be expected under the provisions of pre-considered and formally sanctioned working plans, the Government guaranteeing to the owners that such plans shall not be altered or deviated from during the time for which they have been sanctioned, without the consent of the interested parties.

Government should, however, never guarantee the actual permanency of the supply, as the best considered working plan may have flaws or may be upset by unforeseen accidents. It is frequently argued that the forests of the Colony are inexhaustible or will at least meet the demand for hundreds of years to come. It is true that as yet no general scarcity is felt in the timber supply of the country, but it cannot be gainsaid that the red gum forests on the left bank of the Murray have practically disappeared within late years, and that the local demand for timber can in many instances not be so readily met as in former years. At present the fuel markets of Melbourne and other big towns, and of many agricultural districts, are, to a considerable extent, supplied from ring-barked trees, the remnants of former forests. I grant that there are enormous supplies of this timber, but it is, after all, dead material, and the wood that has not been consumed within the next 20 years or so will have probably rotted away. When this has happened the living forests will have to meet the whole of the demand which during the same period must have grown considerably. It needs no great foresight to predict that with a growing population, even the remoter forests will gradually be indented upon and become valuable in their turn. I have as yet written only of the treatment of the natural forest areas, and in this the chief efforts of the State must centre. Planting on a large scale is costly, and it will be found that if an accurate ledger is kept of the original outlay and its incidental expenses, artificial forest cultivation will repay the money and time spent on it only under exceptional circumstances ; and it is only in such circumstances that I would recommend the planting of indigenous trees.

It is different with regard to the introduction of exotics. There are no light wood trees in Victoria of any value, and the cedar of New South Wales and other trees having similar qualities are reported to disappear rapidly owing to large demand and

uncontrolled working. To what extent the light wood forests of New Zealand are protected is beyond my ken, but under any circumstances it is undoubtedly a step in the right direction to introduce woods into Victoria, which have qualities not found in the indigenous timber, for that a demand exists for material of this kind is proved by the large annual imports. The choice of trees to be introduced should be made with the greatest care and circumspection, and if decided upon, rapidly and systematically pushed. The introduction of oak is excusable only for reasons of sentiment or for the improvement of the landscape, for as regards the technical qualities of the timber it is like "carrying coals to Newcastle." The broadcast introduction of *Pinus insignis*, has no excuse whatever, for though it is doubtless one of the fastest growing pines, its wood is of a low character. I have great sympathy with the plantations which have been established with a view to the broadcast distribution of useful exotic plants, and I have taken steps to secure for them, for some time to come, an annual supply of seed from India of such trees as I think may be useful. These central plantations have been established by the "Victorian Forest Department," and are worked with great success, upwards of 150,000 trees per annum being distributed free of charge. I cannot speak too highly of the officers in charge. They are men who have gained their experience in practical work, and know their business thoroughly. I have often been asked my opinion as regards the prospects of an export of timber from the Colonies, and I have given considerable thought to the subject, which has been for years in my mind with reference to our Indian heavy woods. We have in India a considerable number of timbers which do not compare unfavourably with the best of the Eucalypti. I need only mention *Fagraea fragrans*, *Shorea robusta*, *Mesua ferrea*, *Xylia dolabriformis* and *Pterocarpus indicus*, but there are many others. We have, however, succeeded only in establishing an export trade in *Pterocarpus indicus*, and that, not on account of its exceptional strength, but for its richness of colour and capacity for taking a high polish. It is used for panelling, parqueting, stair-cases, *etc.* In the same way I think an export trade might be established in Australian blackwood. There is in my opinion, no hope of placing any of the Australian or Indian heavy timbers on the European or American market for purposes of superstructure or ship-building. Their use as paving blocks is all we can expect as regards those which are not sufficiently handsome in design or colour for parquet, veneering, or other decorative purposes. The demand, however, for paving blocks may at any moment assume gigantic proportions. I cannot conclude this letter without paying a tribute to your eminent scientist, Baron Ferdinand von Müller, who as far back as 1871, and probably earlier, recommended the rational treatment of the Victorian forests.

B. RIBBENTROP.

IV.—REVIEWS.

The 'Ceylon Forester.'

We have received four more numbers of the *Ceylon Forester*. They contain some interesting notes on the Trincomalee district, botanical and economic information about several of their important trees, notes on the woods used for the boxes in the Sabaragamawa province, and the beginnings of a paper on the birds of Ceylon, besides other matter locally interesting,

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The Teak Trade in Siam.

An interesting report on the teak trade of Siam is published as No. 357 of the Miscellaneous Foreign Office series from Her Majesty's representative at Bangkok.

The teak bearing forests of Siam lie in the north, and the most productive region at present may be included in a circle which, drawn round Chiengmai and Phree, encompasses all the head waters of the Me-Ping, Me-Wang (Lakou River) and Me-Yom. The right bank of the Me-Ping from the Me-Layan, down to Klong-Kong below Kampeng, is also a very productive district. Both sides of the range of hills here are scattered over with teak forests; the timber on the west side being floated down the streams to the Thoungyengh, and thence into the Salween, and that on the eastside into the Me-Ping, and finally to Bangkok. The nearest teak forest to Bangkok is situated on the head waters of the Mewong (Sa Kay Krang River). The majority of the posts and small timber used in local consumption comes from the Nam Pat above Utaradit. A quantity of teak is derived from Naw, but no reliable statistics are as yet forthcoming in regard to this district.

The report is accompanied by an excellent sketch map showing the tracts already worked, and those reported as bearing teak but not yet worked. They lie roughly between latitude 11 degree and 20 degree N.

The logs are brought down in rafts which are arranged in tiers or rows, and the logs are fastened together by stout rattan ropes, fastened to holes cut in the ends of the logs. On the Me-Ping the rafts contain, on an average, 150 logs, whereas the Sawankaloke rafts are smaller, averaging only 130 logs. The Me-Ping rafts have generally 10 logs in the first tier, which increases in the other tiers to 16, and then tapers off to 10 again at the end. An outside row of logs serves as a fender, which can be cut adrift when the logs collides with the bank, or when there is danger of stranding at the side. This preserves the whole raft from being broken up. The Sawankaloke rafts are longer and narrower,

beginning with a tier of 6 logs and increasing to 10. For a fender the outside rows slide endways into each other, and the whole raft is looser in arrangement than on the other river. The different character of the streams account for the difference in arrangement of the rafts. The Me-Ping is broad and shallow ; the Me-Yom is deep, narrow and tortuous.

The Sawankaloke rafts are fitted up with three large paddles as steering gear, but on the Me-Ping the rafters have to remain in the water the whole day to steer the raft. Their gear consists of two stout rattan ropes, 40 fathoms long perhaps, each fastened to a bamboo stake. To move the raft right or left one rafter sticks his bamboo stake into the soft sandy bottom and hangs on to it up to his neck in water till the proper adjustment of the course takes place. Steering gear by means of paddles is put on at Paknampoh. A raft takes 10 or 15 days to come down from Raheng to Paknampoh, and during that time the rafters are practically in the water the whole day. In another three or four days the raft reaches Cheinat, the duty station, where the up-country rafters stop and return. There are usually three rafters on a raft, and they get 7 salungs (2*s*) a log from Raheng to Cheinat. From Cheinat to Bangkok, covered in from eight to ten days, rafting costs another 2 salungs a log. A raft comes down from Sawankaloke to Paknampoh in about ten days, and the rates for rafters are about the same as on the other river.

The rafting season begins in June with the rising water, and timber floats down plentifully in July and August. For sometime after that date the rush of water is too violent to float rafts in safety, and sometimes the water is so high that the beds of the streams are unrecognisable.

There is danger then that a whole raft may float out into the rice fields, where it will remain stranded high and dry, an easy prey for timber thieves. In October, November and December, when the water is subsiding again, the greater portion of the timber is floated down.

A large quantity of timber is stolen every year, and the British merchants are anxious to have some regulations issued by proper authority to check this ; and there is an enormous loss to the revenue and the country in general by the indiscriminate destruction of valuable young trees. It is estimated that Siam loses every year in this manner a sum which may amount to £1,50,000.

Report on Canal Plantatons, N.-W. P. and Oudh, 1893-94.

The total area of the plantations amounts to 32,639 acres, and the net revenue for the year was Rs. 3·46 per acre. In our review last year the area was stated to be 36,407 acres, so that there has

been a decrease of 3,768 acres, or nearly six square miles. This is totally unaccounted for in the report. We may say generally that the report, from a forester's point of view, is meagre and disappointing in the extreme. There is not one word of sylviculture from beginning to end, and we find merely a mass of statistical tables. The plantations are evidently regarded as a commercial transaction, and we read a lot about capital outlay, revenue assessments, demands, realizations, interest charges, etc.

Turning to the statement of trees on hand at the end of the year, we find the following results for the five principal canals, omitting the Betwa canal, which perhaps has no trees along its banks, at any rate there are no figures given.

		No
Trees on hand at end of 1892-93	...	16,62,900
Trees cut during the year ..	...	1,32,104
	Balance	15,30,796
Trees counted at end of 1893-94	...	16,32,976
Saplings grown into trees during the year	...	1,02,180.

That is to say, very nearly 30,000 more trees were cut than were received, as it were, from the sapling stage, and if the felling continues at the same rate, in 54 years there will not be a single tree left! In the case of the Upper Ganges Canal, this state of things apparently attracted the notice of Government last year, and we should not wonder if they have something to say on the matter this year again, as the canal officers have cut out 43,172 more trees than they have received from the lower class. It seems to us, that if capital and interest in the management of these canal plantations were looked upon, as we understand it in Forestry, in addition to the purely financial standpoint, it would be a good thing.

A. S.

V.—SHIKAR AND TRAVEL.

Imperial Forest School Athletic Sports.

This annual event was brought off on the 11th and 12th October. The heats were run off on the Friday evening, and the long jump was also finished on that day, thereby permitting the sports to be brought to an end before darkness set in the next evening. This arrangement was a decided improvement

on that of previous years; not only as far as the general public were concerned, but also for the students, who were thereby enabled to get a good rest between the various events. The sports on the whole were not so good as usual, nor were the entries nearly so large; this may be accounted for partially, but not altogether, by the smaller number of students at the school. The tug-of-war was very well contested and was won, contrary to expectations, by the junior team. Kashi Ram's performance in the half-mile, when he ran clean away from everyone else, was decidedly the best performance of the day. The events were as under :—

Throwing the Cricket Ball (Open).—One prize for the best native student.

W. Brewin, 99 yards 6 inches. Best native student, Lachman Singh, 79 yards 6 inches.

Broad Jump (Open).—One prize for best native student.

Kashi Ram, 16 feet 1 inch.

Hurdle Race (open).—Distance 110 yards over 10 flights of hurdles.

W. Graham	...	...	...	1
Kashi Ram	...	...	...	2
A. E. Wells	...	...	...	3

Won by 4 yards. Time not taken. Graham and Kashi Ram were very even, and took the hurdles together, until the latter fell at the 5th hurdle, when Wells took the second place and maintained it until well over the last hurdle. In the run in Kashi Ram challenged him and passed the winning post about 6 inches in front of him.

Hurdle Race for Native Students only. The first and second in the heats on Friday ran off the finals the next day.

Kashi Ram	...	...	...	1
Pundurang Joshi	...	...	...	2
Lachman Singh	...	...	...	3

Time $25\frac{3}{5}$ secs. Won easily by five yards; a few inches between second and third

100 *Yards.* (Open).

W. Graham	...	...	...	1
A. E. Wells	...	...	...	2
Bilimoria	...	...	...	3

Times $11\frac{4}{5}$ secs. Won by one yard; 2 yards between the second and third.

100 *Yards for Native Students only.*

Bilimoria	...	...	...	1
Kashi Ram	...	..	...	2

Time $12\frac{1}{5}$ secs. Won by 2 yards after a good race.

High Jump. (Open).—One prize for the best native student.

N. Cooper, 4 feet 9 inches	...	...	1
Kashi Ram, 4 feet 8 inches	...	...	2

Half Mile (Open).

Kashi Ram	...	...	1
Paras Ram	...	...	2
E. A. Rooke	...	..	3

Time 2 mins. 30 secs. Won very easily by Kashi Ram by 60 yards. The time would have been very much better had the leading man been pressed. Paras Ram was disqualified for passing inside of the flags which marked out the course. Two yards between Rooke who got the second prize and Graham, who took the third prize.

The performances were brought to a conclusion by the tug-of-war, which was very evenly contested. The Juniors won the toss and selected the school end. The first pull was a very long and even one. The Juniors were pulled almost up to the line, but recovered in time and slowly pulled the Seniors over. On changing ends the Seniors quickly pulled the Juniors over. But in the third attempt the Juniors got well on to the rope, and though held by the Seniors for a while, pulled with great judgment, and eventually were successful.

The prizes were distributed by Mrs. Smythies who addressed a few suitable words to each winner as he came up to receive his reward, and the proceedings ended with cheers for Mrs. Smythies, the Officiating Director Mr. Smythies, and the staff who were responsible for the laying out of the course and the general arrangements of the meeting. The police sent down through the courtesy of Mr. Dobbs, the Assistant Superintendent, were most useful in keeping the course clear of the numerous and brightly coloured crowd of native who always assemble when any *tamasha* takes place.—(*Pioneer*).

VI.—EXTRACTS, NOTES AND QUERIES

The Royal Scottish Arboricultural Society's Excursion to Germany.

It is credibly stated that a Frenchman who had sojourned in Scotland for about a year was subsequently heard to remark "Scotland has no climate; it has only weather." Had he started with the forty-eight Royal Scottish arboriculturists in the steamship "Prague" on Friday, the 26th July, he would probably have added, "and such weather!"

But Scotch valour and endurances did not go unrewarded, for by Saturday morning the "half-gale" had moderated into a "breeze," and when dinner-time came a goodly number were able to do it justice. All prior miseries wholly forgotten by Sunday forenoon, when the steamship "Prague" entered the Weser and made for the wharf at Bremen.

Bremen receives a goodly share of Germany's large imports of timber; for with all her scientific forestry and vast natural forest resources that country is still dependent upon foreign supplies for at least one-third of its consumpt. It still imports annually about £6,000,000 worth of hewn and sawn timber. Its consumption is almost on a par with that of Great Britain, for our larger demand for shipbuilding purposes is offset by the fact that large quantities of beech are used as fuel in Germany. Yet our timber imports foot up to over £16,000,000 per annum. The trees indigenous to this country and to Germany are the same in species, *viz.*, spruce, Scots pine, larch, silver fir, beech, sycamore, oak, birch, alder, &c. Beech is specially cultivated and specially valuable for its heat-producing qualities as fuel, and is used extensively for household purposes in closed box-stoves. For this reason beech can be grown there at a profit which cannot be realised here. The most striking difference, however, in the conditions under which forestry is conducted in Germany and here is that in the former country, although there are many individual owners of forest, a very large proportion is owned by the State or the village corporations. Not an immediate profit, but a complete and sustained supply, is therefore the end held in view, and the example is not without its good effect upon the individual landowner. What would our British landed proprietors, who foster plantations only as shelter for game or to beautify their estates, say to a working plan like the following, *viz.*, "area to be planted in 1900, thinned in 1925, and every ten years thereafter till 2025, when the bulk of the trees are to be felled; ten trees per acre, however, to be retained for another rotation or 125 years, and finally felled in 2150"? There is much to be said for individual ownership, but as applied to forestry and contrasted with State ownership there is no disputing the fact that "the weak *must* hurry, the strong can wait."

It is only possible to summarise briefly the things seen and heard, leaving our readers to draw their own conclusions. On Monday, July 29th, after lunch our study of German forestry was begun by a visit to Brockhöfe. This district consists of sandy land overlaid with peat and quite unprofitable. The province of Hanover since 1876 has secured about 12,000 acres, and has dealt with about 1,000 acres annually. By the aid of subsoil and steam ploughing the land has been brought into condition for the growth of Scotch fir, spruce, &c., and the young woods show every appearance of eventual success for the enterprise. A penitentiary has been established on the estate, and its inmates supply

the requisite unskilled labour, with profit to themselves and to the nation. There can be no question that such outdoor work promotes both moral and physical health at a minimum of restriction and hardship.

From Hanover, on Tuesday, 30th ult., the party proceeded to Lanenan to inspect the beech forests of the Deister Hills. These forests, of large extent and admirable growth, abound with fallow roe and red deer, and wild pigs are also plentiful. They are so free from rabbits and hares that the natural regeneration system can be, and is, applied. When the beechwood has reached the age of 100 years or so, it is severely thinned so as to enable the trees to bear seed in quantity. In the autumn the ground is hoed in strips to receive the seed when it falls. One beech wood, 160 years old, was said to contain 9,750 cubic feet per acre, and yield vastly in excess of anything in Scotland, or. we believe, in England. From Lanenan the company proceeded to Springe. Here also the beech predominates. The trees are close together and straight as an arrow to the height of over 100 feet. The Emperor has a hunting-seat here for wild boar shooting, and indulges in the sport a few days in each year.

Leaving Hanover early on Wednesday morning (31st ult.) the party reached Goslar before 9 a. m. on a visit to the Harz district. Goslar possesses many very beautifully carved wooden houses, and opportunity was also given to view the Kaiserhaus which has been an Imperial Palace since the eleventh century, and is a magnificent piece of architecture. Our cavalcade of fifteen carriages then drove slowly for eight or ten miles through the delightful scenery of the Oker valley, and some insight was given us also into the scientific management of pure spruce woods. About 100,000 acres are devoted to this wood in the Upper or Western Harz. Beech, oak, &c., do not abound. These spruce woods are regenerated by artificial planting at the 100 years rotation, and restocked with young trees brought from temporarily-formed nurseries in the district. The regeneration starts on the east side of the forest and works westwards, so as to avoid the disastrous effects of gales, which are chiefly westerly. The felling is done in sections about thirty yards wide, the roots are removed, and a year or two later replanted. Spruce trees here reach a height of 120 feet, and average 5,000 to 7,000 cubic feet per acre. There is a strong local demand for the timber, not only for structural purposes, but largely for the manufacture of woodpulp, Mechanical pulp-mills are numerous and are driven by the mountain streams. The product is exported chiefly to Great Britain. The net rental of the Upper Harz Woods out, we are informed, at 14s. per acre, with the value of spruce at 6d. to 8d. per cubic foot —a profit unknown in Scotland under our less scientific methods. Nor is outlay a first consideration in Germany. The forest staff of this district numbers 1,000, and they have a State-aided provident fund.

At Altenau, later in the day, the reception accorded our party was most enthusiastic, the inhabitants turning out *en masse* and with musical honours. And we may here remark that the arrangements made for us, under the direction of our latest honorary member, Dr. Schwappach, of Eberswalde, have been most admirable. Every consideration of comfort, convenience, and hospitality has been carefully studied, and would be difficult to rival.

Altenau is the farthest point at which carriages are available in the ascent of the Brocken. After a sumptuous lunch we proceeded on foot, headed by the Foresters' band. We reached the summit of the Brocken (3,747 feet above sea level) about 7 p. m., where every accommodation is supplied by the hotel there, so well known and patronised by European tourists, and, after despatching the accustomed postcard, our fatigues were consoled with a substantial supper, followed by songs and speeches till after midnight. We began the descent next morning about 8 o'clock. The head forest officer of Prince Stolberg, Herr Müller, and Dr. Grundner, the Brunswick Forest Officer of this district, conducted us and conversed with us fluently, not perhaps in broad Scotch, but in good English. Forest officers in Germany are almost invariably men of University education, and their emoluments much higher than anything known here. Private owners of land in Germany pay almost as good salaries to their foresters as are paid by the State or by Corporations. As we descended the Brocken, under this instructive guidance, the difference in the growth of the spruce was most marked. Many trees at the summit were but shrubs, yet these were declared to be well on to a century in age.

Our visit to the Harz Forest ended at Harzburg, and, full of gratitude to our genial conductors, we reluctantly parted from them, and reached Berlin that night. From thence we set out to visit the celebrated Academy of Forestry in the Eberswalde.

At Eberswalde we were shown a most extensive collection of objects and new tools adapted to nurseries operations. We viewed the nurseries and arborets. Every pains were taken to answer our queries fully and to afford us every explanation, and we all regretted the limit of time which precluded a more close and patient study and practical test of the many interesting objects and methods. The afternoon was spent in a drive through the woods in the neighbourhood. These cover about 40,000 acres. The Scottish fir grows readily in the sandy soil of the district, and is cultivated on two systems, either alone or with beech as a soil protection wood. The rotation is about 120 years under either system, and the yield at its close is about 4,000 to 5,000 cubic feet per acre, bringing 6*d*. to 10*d*. per foot. In regeneration of these pine woods the method is to begin on the east side with a cleared space of 60 to 80 yards broad. One year old seedlings are inserted in holes made by a wedge-shaped implement after the soil has been stirred thoroughly by spading. The means then taken to

protect the new plantations from the incursions of the pine-weevil are interesting and most effective. Each clear-felled strip is surrounded by a trench 9 in. wide and of similar depth, and at every ten yards holes about a foot deep are made. It is not, perhaps, scientifically accurate to say that the insect cannot fly, but as a matter of fact it does not. The trench proves an effective barrier to the weevil. They drop into it and collect in the holes, and either die of inanition or are devoured by birds. Other methods of prevention are also used, including the laborious one of hand-picking.

On Saturday, 3rd August, we visited the oak woods of Freienwalde, which are largely primeval forest ; almost untouched by the cultivating hand of man until about fifty years ago. The soil is very rich, and regeneration is now actively pursued. Many of the oaks are 250 and 300 years old, 120 ft. in height, and 3½ ft. diameter at 4 ft. height, perfectly straight, and we all readily admitted them to be the finest we had ever seen or believed possible. The timber per acre averages 6,000 to 7,000 cubic ft. There are also a few very fine beeches in this forest. On our way back we had a brief opportunity to examine also the town forest of Freienwalde.

On August 14th (Sunday) we visited the summer seat of the the late Emperor William I. and its beautiful palaces, and passed through a part of the Imperial Gardens at Hein Gleinecke by special permission. We lunched at Potsdam, and left Berlin for Hamburg on 5th August. There we inspected several important commercial nurseries.

Thus ended our most enjoyable and instructive visit, and for its pleasures we cannot sufficiently express our gratitude. Germany proved herself a most hospitable and courteous hostess : and, if we brought back with us considerably fewer total abstainers than we took away, this must be attributed to the inability of the German mind to understand that beer is an alcoholic fluid, and the ability with which they vaunted its innocuous qualities—nay, its virtues.—(*Timber Trades Journal.*)

Cooper's Hill Students in France.

For the fifth time since 1891, the Forest Class from Coopers Hill has been, under Professor Fisher, to visit the State forest of Lyons. M. Leguay, Conservator of Forests at Rouen, arranged an excursion for the English visitors, showing them the finest parts of the forest, among others the canton of the Castelier with its trees 50 metres high and 400 cubic metres of material per acre.

After the excursion Professor Fisher united the French and English Forest Officers, the Mayor of Lyons and the students to dinner. During dessert he toasted the French foresters, adding his

thanks to his old professors of the Forest School of Nancy. M. Leguay in replying to the toast referred to the friendly feeling and "camaraderie" which existed between French and English foresters, and remarked how this friendship had been cemented by the subscription which had been raised for a monument to the memory of M. Mathieu, the late well-known and widely regretted professor of the Nancy School.

On leaving Lyons the class next stopped at Pont de l'Arche, and M. Sainte-Claire Deville, Inspector at Louviers, took it to visit some coppice under standards areas and a working circle of Scotch pine in the State forest of Bord. The class then proceeded to make an excursion in some of the best parts of the forests of Mortagne to study the treatment of oak by the method of successive regeneration fellings, from the 25th to the 29th July being spent in visiting the following blocks, *viz.*, Bellême, Le Perche, and Reno Valdien.

The number of students in the Forest Class, which used to be at least twelve, is this year only six owing to the greater number of the higher posts in the Indian Forest Department, which are now, under the orders of the Government, being filled by officers appointed in India from the Dehra Dun Forest School. These six students of English, Scotch or Irish nationality were accompanied by a Forest Officer of Swedish origin in the Cape service, who has come as a private student to follow the course at Coopers Hill.—(*Révue des Eaux et Forêts*, 10th August 1895)

New Students at Coopers Hill.

The undermentioned candidates have qualified for six appointments, to the Forest branch at Cooper's Hill College:—Mr. Alexander Rodger, Mr. Alexander Philip Percival, Mr. Alexander James Gibson, Mr. Edgar Ralph Stevens, Mr. Arthur Lawrence, Mr. Francis Henry Cavendish.

The Dorrigo Forest Reserve.

The Dorrigo Forest Reserve is situated in the country of Fitzroy. It is bounded on the south-east by Bellsdown Creek, on the south-west by the range that divides the counties of Fitzroy and Raleigh, on the north-west by the Little Murray River, on the Nymboi River. It embraces an area of 23,880 acres.

A locality map is given, which will indicate its position, and may be useful since very few maps contain any reference to it. The Dorrigo is a place of more than usual interest at the present time, especially in view of the proposal to throw its rich forest lands open to agricultural settlement. It is not my intention to discuss this subject; all I propose to do is to give some idea of the country, and subsequently to give account of the vegetation. Dorrigo, or Don Dorrigo, is said to have been so called after a Spaniard or a Mexican who first found cedar on it. Local residents are

not clear, whether the gentleman's name was Dorrigo or Diego, or when he made his discovery, so here is a field for the Australian archæologist.

In the Dorrigo Forest Reserve itself I spent a week under canvas in December, 1893. The season of the year is not the best for the botanist; October would be better for the flowers, and March for the fruits. Nevertheless, I made copious notes of the vegetation, and also brought large collections of dried plants to Sydney. The lists, are of plants which I actually observed, and will form a basis for a flora of the Dorrigo. A number of plants were neither in flower nor fruit, and where the species could not determined with absolute certainty, it has been omitted altogether. No plant has been put down on the assumption that it will doubtless be found in the Dorrigo; I have confined myself to actual observation. The area of the forest reserve being so large, and travelling, in parts of it, so difficult, I do not submit my lists as complete, but they will be found to be far fuller than any previous lists.

Access to the Dorrigo is obtained either *viâ* the Bellinger River, or *viâ* Armidale, or *viâ* Grafton. The North Coast S. S. Company runs comfortable steamers to the Bellinger Heads, 363 miles north of Sydney, once a fortnight, calling at Port Macquarie on the way. The trip usually takes about thirty-six hours. The fare is £2 or £3 for a return ticket. Having crossed the bar, the steamer lands passengers and discharges cargo at the village known as Bellinger Heads, and an interesting drive along the right bank of the Bellinger, first through forest country, and then amongst alluvial flats cultivated as maize farms, brings us to Fernmount (6½ miles), on a hilly situation, and commanding beautiful views of river scenery backed with hills covered with vegetation.

Soon after leaving Fernmount the road passes over a hill (Marks' Hill). In the foreground is an extensive and well-planted vineyard (now somewhat neglected), and opening out before one is one of the most charming views of river scenery I have ever beheld. The artist will find many beauty spots on the Bellinger, and this is one of the chief of them. Regretfully leaving this "coign of vantage," we descend the somewhat steep hill, thenceforward travel along a flat road until we come to Bellingden (10 miles from Bellinger Heads), a rising township better known under its old name of Boat Harbour. Here it is desirable to halt, for the traveller will, as a rule, find it most convenient to make a start for the Dorrigo in the cool of the morning, soon after daybreak. Leaving Bellingen (note the final "n"), there is an excellent road, following, in the main, the direction of the Bellinger River, and the eye feasts itself with views of exceptionally fine maize crops, interspersed with sweeps of river scenery. Near the road are small gullies or creeks filled to the tops of their banks with the richest vegetation, always green, and adorned throughout the year with a greater or less abundance of flowers, many of them.

of great beauty, those which are inconspicuous being frequently succeeded by showy or curious fruits. All around are vistas of well-wooded mountains, and we peer up at the huge mass called the Dorrigo Mountain, as our guide points out to us that part of the top of the ride from which we shall strike out westerly.

About 10 miles after we leave Bellingen we find the Bellinger here a thin stream, though the great width of cobble stones and traces of undermined banks very wide apart show clearly that the Bellinger at this distance from the sea is sometimes a very formidable river. We now begin a gradual ascent, and after a mile one sees a sign-post with the simple inscription "To New England,"—a reminder that we are fairly on our journey.

The ascent now begins in earnest. The old road, or rather cedar track, used to follow the ridges, and it seems almost impossible to contemplate how bullock-drays got up, and how the cedar logs (often sadly shaken and damaged) got down. The Government has recently completed a road up the mountain, which must have been a most serious undertaking, as much of it has been blasted out of a tough basaltic rock. There is just a little bit of excitement travelling up the mountain. The road is 12 feet wide, and there are some steep pinches and sharp turns in it. One side is often so steep that contemplation of it might make one feel giddy, and when one has passed a bullock-dray well loaded with cedar, one experiences, at certain bits of the road, a feeling of relief. A few days before our ascent a carrier lost some valuable horses through his cedar-dray going too near the soft edge of the bank, horses, dray, and cedar being hurled down the side of the mountain,—and with it the profits of cedar-hauling for twelve months at least. In the old days such accidents must have been far more frequent. Carriers have only had the luxury of this new road for about twelve months, and it has already caused some traffic to set in to the Bellinger, which previously could not have been thought of. It would have been a grand thing for cedar-getters on the Dorrigo Reserve years ago, but now the cedar on that reserve is practically cut out, and the last loads are being taken to market. Nevertheless, as will be seen later on, the Dorrigo contains many other valuable timber-trees and sooner or later some of them will be regular articles of commerce. As we ascend the mountain we have beautiful views of the valley of the Bellinger, and may see the sea far away in the distance. In the foreground Billy McGrath's Hump, a huge mountain mass, clothed with trees to its summit.

Looking up and down the face of the Dorrigo Mountain, the vegetation is full of interest to the botanist and to other lovers of plants. As we ascended, the two showiest trees in the valley below were undoubtedly flame-tree and the native tamarind. The former is certainly one of the most gorgeous trees in all Australia; for 80 or 100 feet in height it is a mass of bell-shaped flowers of the size of a thimble, and of a beautiful scarlet colour. The colour is

not dimmed with the presence of a single leaf, for the foliage succeeds the flowers. The native tamarind is a most striking object, with its enormous bunches of orange-coloured fruit nestling in the handsome dark foliage at the tops of the trees, many of them nearly 100 feet above the ground. For the first few hundred feet of ascents we see tallow-wood, grey gum, red mahogany, a little turpentine, and other hardwoods. Passing these we find a profusion of brush-trees and shrubs up to the summit, never again seeing a gum-tree until we arrive at the "plains" in the Dorrigo. It would be mere repetition to enumerate the brush-trees seen along the mountain, but they are full of interest. One of the features of the vegetation is the great number of *Solanums* of varying size. The flowering shrubs are plentiful, interesting and many of them beautiful.

Such is a cursory account of the vegetation one meets on one's way to the Dorrigo. Fuller details must be looked for in the lists of plants.

Ascending the mountain, and contemplating the views at my feet and towards the ocean, I saw much to remind me of the views from the Bulli Mountain and the Sugarloaf Mountain, near Braidwood. The Dorrigo Mountain is bigger, and the views are on a grander scale than the Bulli. The Sugarloaf Mountain is beautiful, and I do not know how that scale of beauty is graduated which would enable one to put any other mountain scenery of the same character higher in the scale; but I am paying the Dorrigo Mountain what I intend to be a great compliment when I say that it is not inferior in beauty to the better-known Sugarloaf Mountain. I trust that some of our travellers, who seek in other colonies and in distant lands fresh scenes of natural beauty, will bear in mind the attractions of a trip up the Dorrigo Mountain, which may now be ascended and descended from Bellingen within the space of a long day.

When we are fairly on the top of the mountain (2,900 feet) after a journey of about a mile through rich chocolate soil, we cross Rocky Creek, and on the banks of it I saw for the first time the true beech of New South Wales (*Fagus Moorei*), of which I had heard so much,—a large tree, with dark, handsome foliage, of which I must have literally seen millions between here and Bald Hills Station (its most western locality), 65 miles from Armidale. We saw a few poor specimens of colonial pine (*Araucaria Cunninghamii*) coming up the mountain, but in the country past Rocky Creek, there are many fine trees, which are not at present utilised. The Bellinger is the most southerly for this species. Pursuing our journey, the country right and left of the road consists of almost impenetrable scrub, containing pine, coachwood, sassafras, ironwood, and a host of less-known timbers, while the graceful little walking-stick palm (*Kentia monostachya*), is tolerably abundant, and locomotion in the scrub is rendered difficult by the prickly clothes line stems of the Lawyer palm (*Calamus australis*) and the

prickly *Rhipogonums*. Fine *Todeas* and various tree ferns are plentiful, as are handsome flowering shrubs on the skirts of the brush land.

After 2 or 3 miles of this road, we suddenly enter one of the "plains" or meadows, and are fairly in the Dorrigo.

The Dorrigo Forest Reserve consists for the most part of brush land, containing a great variety of timbers. In various parts are plains, which simply consist of grass land, usually entirely destitute of trees, except a few specimen trees dotted about as in a gentleman's park. Usually the edge of the scrub and of the plain are as sharply defined as it is possible for them to be, as though a Brobdingnagian with mighty sickle, had there finished his reaping. The country is not by any means flat; it is usually undulating, and sometimes hilly. On the greater part of it, it would be difficult to find an area suitable and sufficient for a cricket match. In the forest itself there is almost perpetual gloom. The trees are so close together, are so tall, and have such leafy tops, that unless one keeps in beaten tracks, along which the timber has usually been felled, one rarely sees the sky, except an occasional glimpse obtained at the expense of a crick in the neck. There are many tracks in the forest, but most of them lead to cedar-pits, and a stranger to such country might pass from track to track for an indefinite period and readily get bushed. To the untrained eye there seems but little diversity in the forest vegetation, and this would add to the difficulties of a stranger.

The arboreal vegetation of the Dorrigo consist entirely of what are known as "brush" timbers. Not a single species of Eucalyptus is found in it, though on the skirts of it (never penetrating beyond the fringe) is one solitary species of gum (*Eucalyptus viminalis*). To specify all the timbers of the Dorrigo would be far too tedious, but I may mention cedar, rosewood, tulip, ironwood, hoop, pine, negro-head, beech (*Fagus*), one of the silky oaks (*Orites*), sassafras, corkwood, marblewood, maiden's blush, and black apple. On the trunks of many of the trees, and particularly on the moisture loving *Fagus*, are innumerable individuals of orchids, ferns, and mosses, but I was disappointed to find that they consist of fewer species than I had expected. The charming Aroideaceous plant (*Pothos Loureiri*), is quite a feature in parts of the reserve, encircling most of the trees with graceful leafy girdles.

If scenery be desired, on the Dorrigo we have many choice spots. Near the south-eastern boundary of the reserve, the Beilsdown Creek, a considerable brook, and even a small river at times, throws itself over a ledge of rock some 60 feet high, forming a beautiful waterfall known as the Beilsdown Falls. The water has excavated a deep basin, and the banks of the creek at this part form a deep gorge, while round the basin, and skirting the gorge are ferns innumerable, the whole forming a very pleasing view. Another creek (Boggy Creek) no great distance away, also has a pretty waterfall, embowered with shady trees. The views of undulating country near Coghlan's, backed with well-wooded hills,

are, in my opinion, simply charming, while the landscape, as one emerges from the dense forest, and looks towards the little Murray River, with the Bald Hills in the distance, is so beautiful that I commend it to the attention of those of our artists who love to depict Australian scenes. This magnificent view gives me pleasure every time I view it with my mind's eye, and visitors to the Dorrigo could be promised other lovely scenes, though I cannot think of any finer than this.

According to all accounts, the Dorrigo is favoured with a singularly delicious climate. My visit was in December, but, while it was hot in the middle of the day it got chilly at sundown, and one was always glad of a blanket at night. There is abundance of good water in the creeks, which I am told are never dry. No observations have been taken in regard to the rainfall, which is, I should imagine, pretty considerable. On the adjacent coast there is much rain, Mr. Russell's report for Fernmount giving 98·69 inches as the mean annual rainfall, and the average number of rainy days in the year is 134. Records have been taken for three years only.

The Dorrigo is, without doubt, the sanatorium of the Bellinger Valley. Whatever the extent of the development of its agricultural and forest resources in the future, there is no doubt it is destined to become important to furnish cool salubrious residential sites for jaded, anæmic dwellers in the heated valleys and coast lands. In the "plain" lands in the Dorrigo there are very many charming sites, either on land entirely denuded of timber, or possessing but a few trees scattered here and there.

When we left the Bellinger for the wilds of the Dorrigo we could not truthfully say that we had not been solemnly cautioned in regard to the perils we were about to encounter from ticks, snakes, or leeches, or all three. But I do think the Dorrigo has been shockingly maligned. My duties took me into the most snaky-looking country, and I constantly had to fight my way amongst shrubs which are here and elsewhere always pronounced to be full of ticks, and I certainly had to go wherever leeches are most expected. But after a week in the Dorrigo brush *(vulgo* scrub), and two days in the Glenfernie brush, which strongly resembles it, my companion saw one solitary snake, known locally as "Bandy-bandy." This is the common ringed snake (*Vermicella annulata*); it is venomous, but has a mouth so small that it is only dangerous to insects. I afterwards saw an unfortunate black snake which had been run over by a bullock-dray—two snakes in all—a miserable record compared with what I have seen in parts of the Blue Mountains, for example. As to ticks, I would deny their existence in the Dorrigo, if certain people I know to be trustworthy, had not assured me that there are some. In any case I am afraid their number has been exaggerated, as is often the case in regard to statements concerning unfrequented country. With regard to leeches, I saw several specimens of a small species, but not a single horseleech, a very different record to the country

at the foot of the Bulli Mountain, for instance. In my tent I caught two mosquitoes, which had probably come up with my baggage. While I do not wish to generalise from my own limited experience, I may express the opinion that the Dorrigo is unusually free from animal pests.

The visitor who desires to get to the Dorrigo from Armidale, will find clean and comfortable country hotels at Wollomombi (28 miles) Guy Fawkes (50 miles) in the Snowy Range, and an hotel ((Perrett's) at Tyringham (78 miles). So far as we have been journeying along the main Armidale-Grafton Road, a very good road for the greater part, but at Perrett's we branch off. From the hotel we, for a mile or two, travel along a road as easy as that of a park drive, and then we come to a notorious bit of road known as Perrett's Pinch. The road for a few hundred yards is here simply the side of a rather steep hill, and every traveller is glad when he is over it. From thence the route *via* Bostobrick, is mostly through rotten granite, and deep ruts and fairly steep pinches are common. Four miles from Perrett's we cross the Nymboid, which is often a formidable stream ; 2 miles further on we leave Bostobrick head station on our left ; and after 6 miles more we come to the Little Murray River, crossing which we are in the Dorrigo Forest Reserve. After a pleasant ride of a mile and a half through an undulating "plain" we enter the forest at the spot which I have above indicated as affording a lovely *coup d'œil*. There is no made road from Tyringham to the Dorrigo, and travellers must expect to rough it. The distance is, however, as has already been indicated, only about 16 miles.

The Glenfernie Forest Reserve is about 20 miles north-west of the Dorrigo by road, and about 3 miles from Tyringham. Being so handy to the Armidale-Grafton Road, the cedar in it has been cut out long since, but it contains a good deal of Colonial or Hoop Pine (*Araucaria*), and there is a mill which is almost exclusively devoted to cutting pine from this reserve. This, I believe, is the most southerly mill in which this well-known pine is cut for commercial purposes.

The Dorrigo may also be reached from the Clarence, start being made from Grafton, along the Grafton-Armidale Road. The road is *via* Nymboida and Cloud's Creek, and after crossing Blick's River, one comes to Perrett's (Tyringham), and then branches off along the same road which would be traversed by a traveller from Armidale to the Dorrigo. The distance from Grafton to Perrett's is about 75 miles. The disadvantage of the Grafton route is its greater length, especially in view of the new road up the Dorrigo Mountain. The chief drawback to the Bellinger route is the uncertainty of the bar. Grafton is the metropolis of these parts, and my only regret is that I could not approach the Dorrigo both by the Bellinger and the Clarence.—(*J. H. Maiden, Agricultural Department, N. S. Wales*).

VII.—TIMBER & PRODUCE TRADE.

Statement of average selling rates of timber and bamboos in Meerut, Cawnpore, Bareilly, Pilibhit, Moradabad and Bulandshahr for the quarter ending 30th of September, 1895.

Description.	Timber Scantlings per score.		Bamboos per 100 scores.		Remarks.
	From	To	From	To	
MEERUT.	R. A. P.	R. A. P.	R. A. P.	R. A. P.	
Sal 10′ Tors (Poles) ...	10 0 0	20 0 0	...	...	
Sal and Sain, &c., Karies, 12′ × 5″ × 4″	25 0 0 40 0 0	40 0 0 70 0 0			
Sal bed posts, 7′ × 2½″ × 2½″ ...	12 8 0	15 0 0	...	...	
Bamboos of 9′ to 10′, per 100 scores ...	...	...	30 0 0	100 0 0	
CAWNPORE.					
Sal 10′ Tors (Poles) ...	4 8 0	5 4 0	...	...	
Sal & Sain, &c., Karies, 12′ × 5″ × 4″ ..	20 0 0	60 0 0	.	...	
Sal bed posts 7′ × 2½″ × 2½″ ...	10 0 0	12 8 0	...	..	
Bamboos of 9′ to 10′, per 100 score ...	...	...	30 0 0	60 0 0	
BAREILLY.					
Sal 10′ Tors (Poles) ...	5 0 0	10 0 0	–		
Sal & Sain, &c., Karies, 12′ × 5″ × 4″	25 0 0 40 0 0	35 0 0 50 0 0 60 0 0	... ...	...	
Sal bed posts 7′ × 2½″ × 2½″ ...	10 0 0	25 0 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	50 0 0	... 137 0 0	
PILIBHIT.					
Sal 10′ Tors (Poles) ...					
Sal and Sain, &c., Karies, 12′ × 5″ × 4″ ...					
Sal bed posts, 7′ × 2½″ × 2½″ ..	Not	received.			
Bamboos of 9′ to 10′, per 100 score ...					
MORADABAD.					
Sal 10′ Tors (Poles) ...	20 0 0	25 0 0	...	...	
Sal & Sain, &c., Karies 12′ × 5″ × 4″ ...	30 0 0	55 0 0	...	..	
Sal bed posts 7′ × 2½″ × 2½″ ...	0 8 0	0 10 0	...	...	
Bamboos of 9′ to 10′ per 100 score ..	...	...	50 0 0	75 0 0	
BULANDSHAHR.					
Sal 10′ Tors (Poles) ...	...	..	...	...	
Sal and Sain, &c., Karies 12′ × 5″ × 4″	...	...	...	...	
Sal bed posts 7′ × 2½″ + 2½″ ...	...	..	...	...	
Bamboos of 9′ to 10′ per 100 score	...	...	50 0 0	100 0 0	

Churchill and Sim's Circular.

3rd October, 1895

EAST INDIA TEAK.—The deliveries for the first three quarters of the year amount to 13,554 loads instead of 8,471 loads in that period of 1894, and the advance in the rate of consumption has been more than maintained in September, the figures being 2,123 loads delivered in the month just past, as compared with 717 loads in September last year. So far good, but the supplies are correspondingly heavy, and the Dock Stock remains unchanged. The crowd of vessels afloat too keeps buyers nervous, though they mostly dissipate into various European Ports for consumption as they come to hand. Prices in London remain unaltered and for small handy cargoes near at hand, but large cargoes only recently sailing are rather unsaleable at the mount.

ROSEWOOD.—East India—is of slow sale, although the stock is small.

SATINWOOD.—East India—is in fair demand, and there is very little stocks.

EBONY.—There is no stock but only really good woods should be shipped.

PRICE CURRENT

Indian Teak	per load	£10.	to £16.
Rosewood	„ ton	£6.	to £9.
Satinwood	„ sup. foot	6d.	to 12d.
Ebony	„ ton	£6.	to £8.

MARKET RATES OF PRODUCE.

Tropical Agriculturist, September, 1895.

Cardamoms	per lb.	1s 8d.	to	2s 3d.
Croton seeds	per cwt	30s.	to	37s.
Cutch	„	20s.	to	32s.
Gum Arabic, Madras	„	20s.	to	33s. 6d.
Gum Kino	„	£25.	to	£30.
India Rubber, Assam,	per lb	1s. 7d.	to	2s. 2d.
„ Burma	„	1s. 6d.	to	2s. 2d.
Myrabolams, Bombay,	per cwt	7s. 9d.		
„ Jubbulpore	„	6s. 3d.	to	7s.
„ Godavari	„	5s. 6d.	to	6s. 6d.
Nux Vomica, good	„	6s.	to	9s.
Oil, Lemon Grass	per lb.	1½d.		
Orchella, Ceylon	per ton	11s.	to	15s.
Redwood	per ton	£3 10s.	to	£4
Sandalwood, logs	„	£30	to	£50
„ chips	„	£4	to	£8
Seed lac	„	50s.	to	60s.
Tamarind	„	9s.	to	11s.

THE

INDIAN FORESTER.

Vol. XXI.] December, 1895. [No. 12

Recruitment of Officers for the Indian Forest Service.

The Forest Service of India as defined in the Forest Department Code is composed of

(1) the Indian Forest Service
(2) the Provincial Forest Service
(3) the Subordinate Forest Service.

The *Indian Forest Service* with the exception of 40 appointments which will, as opportunities occur, be absorbed into the Provincial Forest Service, is now recruited exclusively through the Forest Branch of the Royal Indian Engineering College, Coopers Hill.

The regulations which govern the admission of probationers for the *Indian Forest Service* to Coopers Hill, together with the syllabus of subjects which can be taken up at the *competitive* entrance examination now in force, some information with regard to the nature of the course of studies of the Forest Branch of the Royal Indian Engineering College, and also, as regards the emoluments, promotion, leave, and pensions, to which they will be entitled, were circulated by the Government of India last month (October 1895).

The syllabus of subjects offered for examination is virtually the same as was brought into force for the first time, I think, at the competitive entrance examination held in July 1892, as the extent and character of the Forest entrance examination, from and after June, 1892, was then described as follows :—

"The main object to be borne in mind with reference to the 'entrance examination is to secure a youth who has had a thorough-'ly well-grounded liberal education as an English gentleman. Any 'curriculum which renders those who are unsuccessful, unfit for 'other professions, is greatly to be deprecated. The Regulations 'for the Forest Examination *which follow the lines of the Woolwich 'examination*, are intended to provide a test that the candidates 'have received such an education as is indicated in these words.'

An alteration has been made in the place at which the written part of the examination is held, now "the written part of the 'examination may be held at the end of June at any of the provin-'cial centres at which simultaneous examination of candidates for 'admission to the Royal Military College, Sandhurst, is to be held," instead of only in London as was formerly the case. The oral and practical parts of the examination are to be held in London only. As the medical examination and physical test which precede the written part of the examination are held in London, it is difficult to see the advantages of this change, especially as the oral and practical parts of the examination necessarily come after the written papers.

The division of the subjects which may be taken up by candidates for examination, is the same as in former years and contains the same three classes.

I.—OBLIGATORY SUBJECTS, including Lower Mathematics, (Algebra, Euclid and Trigonometry), English composition, and German.

II.—OPTIONAL SUBJECTS (only two of which may be taken up), include Higher Mathematics, French, Latin, Greek, English History, Elementary Botany, Elementary Inorganic Chemistry, Elements of Physics and Physical Geography and Geology.

III.—VOLUNTARY SUBJECTS, which in practice become compulsory, as the result of the examinations will prove, embrace Freehand drawing and Geometrical drawing.

The most important addition to the present regulations, as *The Pioneer* has already pointed out, is the notice that "*it is possi-'ble that after 1896 recruits from the Indian Forest Service will be 'selected foom Coopers Hill College-students at the end of their first 'year's course of studies.*" The significance of this statement will be discussed later on.

The prescribed course of studies for Forest Probationers at Coopers Hill is divided into :—

I.—AUXILIARY SUBJECTS, embracing Geometrical Drawing, Free-hand Drawing, Surveying, Forest Engineering, Accounts, German, Mechanics, Physics, Chemistry, Geology and Mineralogy, Entomology, Botany, Drill and Gymnastics, and

II.—FORESTRY, theoretical and practical in all its branches.

These two main division are grouped into several branches, which are not detailed in the regulations (but are to be found in the Royal Indian Engineering College Calendar) and a fixed minimum of qualification is required in each branch, as well as in the subjects taught during the Forest tours, and in all the subjects taken together.

The only other point which calls for notice in the regulations, is the statement that "The more favourable pension rules have 'recently been extended to the Forest Officers appointed from 'England, *who are thus placed on an equality with Public Works 'Offieers appointed from Coopers Hill College.* Any Forest

'Officer who has rendered not less than 3 years' approved service 'as head of his department, has also been made eligible for an 'extra pension of Rs. 1,000 a year."

This statement is not in accordance with facts as they at present exist, as the Indian Government has ruled that the Inspector-General of Forests *only* is eligible for this special pension and that Conservators of Forests, who are the heads of the Forest department in their special provinces or Circles of Provinces, are not entitled to it.

The position of the Inspector-General of Forests in analagous to that of a Chief Engineer, while Conservators of Forests correspond to Superintending Engineers of the Public Works organisation; so that if, as stated in the regulations under consideration, "the Forest officers are on an equality with Public Works officers appointed from Coopers Hill" then it must be the intention of the India Office to extend to Conservators of Forests the Rs. 1,000 a year extra pension that has already been accorded to Superintending Engineers, and we hope that the Indian Government will recognise this and make the necessary alterations in the present pension rules of the department at once.*

Whether the change in the manner of selecting probationers for the Indian Forest Service, in accordance with the possibility held forth in the regulations, will be carried into effect at once, remains to be seen. The recruits for the Indian Telegraph Department are at the present time selected from the Engineering students at the end of the first year. Usually, the last two men who are likely to get Public Works appointments, elect to take appointments in the Telegraph Department; they then go through a year's special course of training (in which it is only necessary to *qualify*), and than come out to India.

The lowest men on the list of students who are likely to get Public Works appointments take the telegraph appointments, as the prospects in that department are not considered so good as in that of the Public Works. Engineering students at Coopers Hill have only to pass a *qualifying* examination to get into the college, whereas at the end of the three years course, appointments are given (up to the number offered at the time of their entering the college) to the men who are at the head of the list of students in the examinations held at the college doing the whole of their course. Thus they have what practically comes to a *competitive examination* spread over three years, to determine their place on the final list. This means that they *must* all work *exceptionally hard* the whole time they are at college if they wish to pass out high. In the case of Forest Students, at present, exactly the opposite state of affairs

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*Note,—See also in 'Extracts Notes and Queries.'

HON. ED.

exists. They pass a competitive examination to enter the college as probationers, and only have to qualifiy in order to become appointed to the Indian Forest service. This means that, when once they have passed into the service, they have only to work *reasonably hard* in order to obtain appointments in the Forest service.

The present Engineering course consists of three years study at the college (during which time the student pays the ordinary College fees) and one year of practical work, during which he is deputed to some large engineering work in Great Britain to acquire some practical knowledge of his profession. During the fourth year he receives an allowance, sufficient to pay his expenses, from Government.

The present Forest students' course extends over about three years and is mainly conducted at the College. If the Forest probationers are selected at the end of the first years' course at Coopers Hill, it means that the course for their first year must be one which will be generally suitable to Engineers, Telegraph men and Foresters; that the technical subjects, such as Forestry, Botany, Entomology, and Organic Chemistry cannot be commenced until their second year; and that unless the present course he lengthened, the technical knowledge which is now taught in three years must be taught in two only.

As—the present Regulations for admission to the Forest Branch tell us they are!—the Forest offi cers and Public Works officers appointed from Cooper's Hill College are on an equality as regards promotion, leave and pension, it stands to reason that the *bottom men* on the list of those who are likely to get Public Works appointments, will *not* be those who will choose Forest appointments, since the Forest students will be in a more favourable position than their Engineer *confrères*, in that they will only have to *qualify* instead of to *compete with each other* for appointments, for the remaining two years that thay are at college.

It is therefore probable that several of the men, well up on the list, if not at the head, will elect to become Forest Probationers, unless some special conditions are introduced to prevent them doing so, as the knowledge (even if then possessed) that the more highly paid appointments in the Public Works Department are more numerous than in the Forest department, will have but little weight with them, compared to the *present* advantages of having a qualifying, instead of a competitive examination for the remaining two years that they are at Coopers Hill, *i. e.* almost a certainty of appointment instead of a chance only.

The entrance examination at present in force does not offer any special inducements to men who have had a scientific—as opposed to a purely classical—education, and who have presumably a marked inclination to tho study of natural history or kindred subjects, and this is, I venture to think, a mistake, as given two men of an equal standard of education, the one who has a

bent towards natural science and is fond of out-door life and observation, would be most likely to make a good forest officer. If the marks which could be gained in the science subjects included in the optional class were made higher than those which are given for Latin, Greek, English History, Higher Mathematics and possibly French, it might, I think, be sufficient to induce men with a scientific, rather than a classical bent, to offer themselves as candidates for Forest probationerships.

C. G. R.

Pruning Epicormic Branches of Oak.

The "Révue des Eaux et Forêts" of 10th September has interesting article on the above subject, by M. D'Arbois de Jubainville of which the essential part is translated below. One is rather apt to become hide-bound in one's Sylvicultural ideas and it is therefore, in my opinion, particularly advisable to give publicity to new theories, if, as in the present instance, their authors can bring practical evidence in support. H.-H.

"When M. Boppe, the Director of the Forest School (of 'Nancy) lately brought the students to see the Forest of Ligny 'l'Abbaye (Ardennes), which is worked in coppice under standards, 'he remarked that the *epicormic branches* of the oak standards 'were not pruned, and asked us the reason. We answered that we 'had cut up numerous pruned oaks in the sixth, seventh, ninth, and 'twenty-fourth Forest Circles when stationed there; that we had 'invariably remarked that this pruning was more harmful than 'useful; that we had never found pruned oaks preferred by timber 'merchants; and finally that as regards the oaks of this particular 'forest, it had been very generally noticed that the omission of 'pruning did not cause the death of the trees or of their crowns.

'The Director asked us to further study this important 'question, and the Government Forest of Champenoux (Meurthe 'and Moselle) was chosen for this purpose, because the oak stan-'dards there had been pruned for many years. MM. Henry and 'Hüffel, Inspectors of Forests and Professors at the Forest School, 'took us there on the 16th August last. The oaks here had been 'pruned one year after the exploitation of the coupes, and again 'several times, at intervals of five years, so that the epicor-'mic branches were one year old at the first pruning, and 'five years old afterwards. We felled and cut up some oaks that 'had been thus treated. The lopping of the branchlets one year 'old had done no harm; but the pruning of the five year old 'shoots had been harmful to an extent about ten times as great as 'in the case of similar shoots which had died off naturally, for we 'examined these at the same time.

'The wounds resulting from the removal of the epicormic branches of five years old had become covered over in about two 'years; but the result had been that the wood had become dead for 'a length of from one to three decimetres and a thickness which at 'centre attained one centimetre. This mortification had spread 'above and below the wounds, and was accompanied by a separa- 'tion in the layers of the wood reaching one-third of the lengtho 'the dead tissues. The instrument must have killed the cambium 'all round the edge of the section; and thereafter the air and 'rain water had entered at the hole in the bark, vitiated the sap, 'and marked and killed the tissues of the sapwood. The damage 'would have been very much worse had the branches been in 'bunches (a very common case), and the wound would have 'been connected and formed one large one. If, then, as one 'often sees, fungus had attacked the place, the result would have 'been even more diastrous.

'On the other hand the defects arising from the natural dying 'off of this same sort of branch come, as a rule, to nothing more 'than the growing over of a very small piece of dead wood which 'is enclosed within the tree, and has not affected or separated the 'surrounding layers of the wood. When a small branch of oak 'dies naturally, it resists for several years at the point at which it 'is inserted in the bole. During this period the dead part is 'decomposed by saprophytic fungi, and this is brought about 'quickly if there is no heartwood in the little branch. At the same 'time the tree surrounds the base of the dead branch with a lump, 'so as to protect it and cover it over as the decomposition goes on, 'in such a way that this lump appears to strangle and to gradually 'amputate the dead branch. This is the natural pruning of the 'oak."

"NOTE.—This natural pruning prevents any degradation of the trees when 'the Standards are numerous in the coppice coupe. The boles being in this 'case shaded by the neighbouring crowns, the *epicormic branches* grow less 'vigorously and soon disappear. Consequently pruning is unnecessary in a well 'marked coupe, and the trouble and expense of it are done away with."

Is the Lantana a Friend or an Enemy?

We have received from the Inspector-General of Forests some correspondence on the question of how to get rid of the Lantana in places where, as in Berar, it is making itself a nuisance.

The plant referred to is an American plant with orange-yellow flowers, very prickly rambling stems and a blackish fruit which birds are fond of and which we have seen being eaten by children in the Nilgiris. Its scientific name is *Lantana Camara*, Linn. The Indian indigenous Lantanas are pretty shrubs of a much less aggressive character.

Most of our readers will have come across the Lantana at some time or other, for it may be seen almost anywhere in the Indian plains, but it is chiefly in the South-West, along the Western Ghats in such regions as Coorg and the Wynaad, that it is so troublesome.

The question of whether, after all, it may not, in some cases, be useful in improving the soil and in protecting tree growth from cattle, is one which has now and again been discussed. Dr. Watt, in his Dictionary, quotes Mr. R. H. Thompson as writing in our pages (Vol. VI.) and considering it highly useful in tracts which have been disforested. Mr. Hill writes to us on the subject as follows :—

"It is evident that the *Lantana* grows densely and has great 'vitality and often spreads over large areas, effectually preventing 'the growth of grass. On cultivable and pasture lands, as well 'as on lands where grass is grown and harvested and where tree-'growth is at best a secondary aim, there would seem to be no 'doubt that the shrub is an evil, and should be eradicated as is 'being done in the neighbourhood of Chikalda and elsewhere.

'The correspondence, however, is by no means convincing as 'regards the utility or otherwise of this plant in forest areas where 'the object is solely to obtain a dense growth of trees and bamboos 'and to complete the canopy. In such cases, it seems quite 'possible that the spread of *Lantana* over blanks and open places 'may materially aid in attaining the object in view. *Lantana*, as 'stated by Mr. Thompson, is a light-loving plant, and is, therefore, 'only found in places where the canopy is incomplete. Under 'these circumstances, as it is admitted that the plant is a free 'grower and a wonderful soil improver, it may be inferred that 'it may well serve, under these conditions, as an auxiliary to the 'growth of valuable species whose self-sown seedlings may spring 'up under its shelter on the improved surface-soil. There would, 'doubtless, be conditions, under which, the seedling being estab-'lished, it would be desirable to weed out the *Lantana* to enable 'these to overtop it or pierce its cover ; but when once tree growth 'had assumed the lead, it is probable that the light-loving *Lantana* 'would gradually die out under the cover of the young trees and 'thus disappear from the forests as blanks became filled up.

'It is hoped that your correspondents who have had expe-'rience of the effects of *Lantana* on the spread of natural repro-'duction in open or incomplete forests, will communicate their 'observations and conclusions."

In reviewing the Berar Forest Report for 1893-94, the Gov ernment of India had drawn attention to the difference between the opinion expressed by the Conservator in Berar and that which Mr. Prevost had given, writing from Coorg. They said :—

"The conclusions of the Conservator in paragraph 24 of the 'report that *Lantana* thereatens the existence of the forests, are

'noticed to be strangely at variance wit the observations of 'Mr. Prevost, the Deputy Conservator in Coorg, where the same 'shrub is said to materially aid the reproduction of trees and not-'ably that of sandal. Its effect on forest growth in Berar should, 'in the opinion of the Government of India, be further studied 'before any large expenditure is incurred on its extermination 'within forest tracts."

On receipt of this, an enquiry was set on foot in Berar, and the Conservator finally submitted the following report :—

"I have the honor to report as follows on the question of the 'growth of *Lantana*. It seems best to deal with the question first 'generally, and then to note on *Lantana* in Berar and specially in 'State Forests of the better class."

"Opinions undoubtedly differ as to the effect of growing the 'exotic species of *Lantana*, as may be seen from the 'Suggestions of 'the Inspector-General of Forests (Mr. Hill) for the administration 'of the forests in Coorg,' which give notes bearing directly or in-'directly on *Lantana* growth in Coorg, and which were made in '1890 during a tour, when he was accompanied by Mr. Dickinson, 'who had been in charge of Coorg for twelve years, and Mr. 'McKee, his successor in the charge. In this note, while noticing 'the way sandal grows in *Lantana* hedgerows (a fact to which Mr. 'Prevost is probably referring in his 1893-94 report), he does not 'describe *Lantana* as an assistant to reafforestment, which should 'be encouraged, but rather as a growth having certain good and 'certain bad qualities. From the enclosure it will be seen that 'Mr. Dickinson in January 1892 wrote strongly condemning '*Lantana* and advising its destruction—a work which he started in 'a small area the same year, and proposed extending in later years.

"Mr. Prevost, who was seven years in charge of the Melghat 'forests, was in 1893 consulted as to the extension of these *Lantana* 'destruction experiments, when he wrote :—

"I certainly think the experiment worth a trial, and the 'Chikalda plateau can, and in my opinion, *certainly* ought to be 'cleared."

"To the above he added a rough estimate of the cost, which 'ultimately proved over the mark. Writing later from Coorg, 'he said :—"The *Lantana* here is *too* awful ; it costs Rs. 30 per 'acre for clearing the first year, and Rs. 10 per acre the second, 'and then only a few rupees annually. Hundreds of coffee estates 'have been abandoned owing to the *Lantana*."

"Mr. McKee, Conservator of Forests, Southern Circle, 'Central Provinces, writes strongly against *Lantana*.

'On the other side of the question we have the facts 'that *Lantana* is a free grower, a wonderful soil improver, and 'that where, as in hedgerows, it has loosened and enriched the soil, 'and where, owing to clipping, &c., it is kept within bounds, it was 'an admirable nurse in Chikalda to mango, jaman, tún, nim, and

'other trees sown beneath its shelter, while in Coorg in hedgerows 'and isolated roadside shrubs it has proved similarly beneficial.

"Lastly, where *Lantana* grows, grazing is absolutely stopped 'and the growth of grass and shrubs destroyed, while the high 'cost of clearance practically stops the extension of cultivation in 'forest tracts save by the wealthy.

'Finally, there is the assumption (for it cannot be allowed to 'be a fact in all or even many localities) by as great and generally 'accepted an authority as Mr. R. H. Thompson, Conservator of 'Forests, Northern Circle, Central Provinces, who writes:—"In the 'event of the land (*i. e.*, which is more or less covered with '*Lantana*) again coming under forest, the light-loving *Lantana* 'quickly dies out.

'Another question, however, arises here as to the probability 'and the cost of ensuring areas covered with *Lantana* "again coming 'under forest." In the most thickly *Lantana*-covered areas, near 'Chikalda, there were dense masses of this climbing shrub attain-'ing a height of 30 to 35 feet, and showing no signs of allowing 'forest growth to top and kill it out.

'Turning now to *Lantana* in Berar, we find that it flourishes 'on the plateau and in the ravines of Chikalda with an elevation 'of 2,500 to 3,500 feet, and grows with equal luxuriance in the 'nullahs and waste lands near Ellichpur at an elevation of 1,200 'to 1,500 feet, while it was spreading (thanks to hedges planted on 'the road sides) into the large reserves of the Melghat to which 'we look for a large part of our timber and bamboo supply.

'The position of *Lantana* in Berar is therefore not generally 'similar to that of Coorg, where it only grows in the higher and 'drier forests, whereas in Berar it threatens alike the high and low 'grazing lands, the areas in the Melghat where cultivation should 'spread, and, above all, it affects the water-supply injuriously, as 'has been proved by successive analyses of water taken when a 'collecting basin was covered with *Lantana* and at different periods 'after clearance. Finally, though this is not a forest matter, the 'shrub when it grows in masses near villages tends to insanitary 'conditions.

"It is apparent that *Lantana* in Berar threatens the general 'well-being of the country alike, near towns and villages, as well as 'in the most remote forest tracts set aside for grazing and the 'extension of cultivation by aboriginal tribes, and that it is not 'possible to limit our attention to the effect of the growth in the 'timber and bamboo forests.

'It is obvious that *Lantana* cannot be watched from a sylvicul-'tural point of view in some State-forests, and at the same time be 'made the object of extirpation in some others and in the unculti-'vated areas near towns and villages. The work of practical extir-'pation is one that must be taken in hand thoroughly and at once 'if success is to be possible. A few years of neglect will put

'Berar in the position of Coorg, where extirpation is impossible at 'any reasonable or possible cost.

'It may be well here to note the line adopted in dealing with '*Lantana*. The growth started in the hedges in Chikalda and on 'many miles of the roads to that place, and it was similarly started 'in Ellichpur and a few other towns in Berar.

'Work has been started by a clearing at all outlying places 'and as much as possible bringing the growth within a ring fence 'gradually to be contracted; while simultaneously the most dense 'growth was attacked at the centre, and such clearance carried 'outward.

'The result of the operations has been that the limited growth 'in hedges, &c., planted in three districts, has been quite cleared. 'In two districts where the area was more extensive, a first 'clearance has been made, and the second year's cleaning has taken 'place, so that another year are two should record extirpation. 'In Chikalda and Ellichpur and in Ellichpur district every hedge 'has been grubbed; and a large area of the densest growth has 'been cleared, and had a first cleaning; while nearly all outlying 'plots of *Lantana* in the Melghat north-east and west of Chikalda 'have been cleared once, and are now being cleaned. The growth 'in and near Ellichpur cantonment and town has recently been 'taken in hand, and progress in clearing it should be made this 'year.

'As to the cost, it has proved much below that of experi-'mental areas or of figures obtained from Coorg, the densest areas 'costing Rs. 15-8-0 an acre, while the first cleaning where the growth was heavy, has been Rs. 1-2-0 an acre the first year, and 2 'annas or 3 annas the second year.

'It is hoped that if the work is pushed with energy by all, the close of 1896 will see *Lantana* in Berar mastered, and that 'steady work for a few years will see *Lantana Camara* an uncom-'mon botanical species in Berar.

"In conclusion, I cannot conceive that we should be right in 'trying experiments as to the regenerating effects of *Lantana* in 'our forests when it is at best only probable that it will ultimately 'and at a moderate cost give way to more valuable growth. The 'fact that protection from grazing and fire has already done so 'much, and promises to do so much more, appears to me a further 'reason for not experimenting with an exotic plant that, even if 'it may possibly do good to forest growth, is certain to do harm 'elsewhere."

Appended to this report is the following extract from Mr. Hill's Coorg suggestions to which he had referred.

"The whole of the undergrowth, including trees with low 'cover and *Lantana*, should be thoroughly cleared off the ground and 'burnt. The area to be treated should not be clean-felled, but as 'many trees with elevated cover as are conveniently situated, where

'they can be isolated, should be carefully kept. It may be objected that on several occasions this has been tried and failed, the plants having died off from excessive moisture. The failure, it is thought, was not so much due to the trees left standing as to the weeds and undergrowth not being regularly kept down around the young plants during the rainy season, when their injurious effect would be increased by overhead shade. Partial clearings of the undergrowth or *Lantana*, so as to imitate the conditions under which sandal plants spring up naturally by the sides of roads and in hedgerows, would at first sight appear sufficient; but experience goes to show that undergrowth and *Lantana*, especially when so treated, grow with such luxuriance that they become uncontrollable and render the young sandal weedy, and eventually smother them. Under the circumstances, it seems imperative to make a thorough clearing, and in this way give the sandal plants a year's start."

Besides the above, he also quoted Mr. F. B. Dickinson as urging that *Lantana* "should be improved off the face of the earth 'altogether' even as hedges, for the birds eat the seeds and distribute thereby plants all over the country"; and Mr. McKee as saying :—

"The plant is an old friend, or rather enemy, of mine, for it was a source of much trouble in many of the forest reserves of Coorg, where it was rapidly covering the ground rendering all chance of teak, or indeed any other kind of tree, reproduction impossible, ruining the grazing, and by its inflammable nature increasing the difficulty of fire protection. It was brought to Coorg some 30 years ago in a flower pot by a missionary and then used as a hedge plant, for which it is well suited if kept under strict discipline and constantly trimmed with shears. But it soon advanced from the hedges to the fields and hill sides, and is now so fully established in the province of Coorg that it would be quite impossible, even by spending lakhs of rupees, to eradicate it."

In forwarding the paper to the Government of India, the Resident, Colonel Kenneth Mackenzie, expressed himself as considering it to be a pest which certainly ought to be kept off grazing lands.

II.—CORRESPONDENCE.

Dominated Trees.

SIR,—Mr. Smythies takes exception to my speaking of "dominated" trees which are in "one and the same storey" as the dominating ones. I don't doubt that he is right, and that my use of

the word "dominated"—I took it from the French, who occasionally employ it in the sense that I did—is unusual: had I had access to books when writing to you, I daresay I should have noticed this. But the idea of dominated trees in an upper storey is at least, to my thinking, a very definite one and to shew what that idea is, I will quote two sentences from a recent circular order by the Belgian Forest Department, on the subject of thinnings, which convey it very clearly:—"Il convient de ne pas se presser, 'et de laisser à la nature le soin de désigner les perches d'avenir. 'C'est alors autour de celles-ci qu'il faut déserrer afin de permettre 'le developpement des cimes."

In any case, I now see that, as I was writing of the history of thinnings, I should have done better to have avoided the use of the words "dominated trees" when referring to modern practice in the matter; whereby I should have avoided any possible confusion.

But whether my use of the werd "dominated," in the sentence under consideration, was right or wrong, the construction of the sentence shews clearly enough, that I was writing of the trees which, as Mr. Smythies says, "have suffered in the struggle."

I may add that, if, in your review, when you said that "in 'thinnings...it is by no means right to say that the less vigorous trees should be cut," you meant that dominated trees in the lower storey should not be cut, my criticism is still not unreasonable. Your remark was a very general one, and I have given an example of an important tree, the *Pinus sylvestris*, in which it is right to remove the lower storey trees in thinnings. On this point Broillard (Traitement des bois, page 229) says:—"....."Il est bon, non pas d'isoler les cimes mais d' exposer à la 'lumière directe par des éclaircies successives toute la pyramide des 'branches." And I find in my note book that, at Nancy in 1884, we were told that, in thinning the *Pinus sylvestris* it, was "abso-'lument inutile de conserver les brins des pins dominés."

I said in my former letter to you that the original practice of thinnings had expanded into others which "aimed at inproving 'the growth" of the more important trees while, at the same time, they "did not neglect the original object of the operation" which was to increase the revenue derived from the forests. Concerning this remark, and to show that the realization of revenue is not "neglected," I may quote Broillard again, who says (op. cit. page 183) when writing of the making of thinnings in general:—"On y trouve plusieurs avantages. Ces éclaircies 'donnent des produits, souvent assez importants, qui sans elles 'seraient dégradés par une altération prolongée."

As to the "jardinage composé" I will quote Puton (Traité d' Economie Forestière, Amenagement I, page 201 at seq.) He writes, after having discussed "jardinage simple":—"Il résulte 'des explications précédentes que dans les forêts jardinées à un

'âge avancé il est utile de recolter des produits *intermédiaires* 'parmi les tiges de remplissage qui, sans cela, se détruiraient dans 'la lutte de la végétation. Le jardinage *composé* est une exploitation 'à plusieurs termes. un *principal* et d' autres *intermédiaires* '... .....On peut considérer, aussi, le jardinage composé comme 'étant accompagné d' éclaircies, mais il faut bien noter que ces 'éclaircies sont d' une nature toute différente à celles qu'on 'pratique dans les futaies pleines. Dans celles-ci on ne coupe que 'les tiges dominées ou retardataires formant le déchet naturel de la 'végétation.....Dans le jardinage, au contraire, le produit inter-'médiaire provient d' une suite de tiges aménagées à un âge inférieur 'à l' âge principal en sus de celles qui forment l' aménagement 'principal.....Il en résulte que ce sont des tiges maitresses et 'dominantes et non des tiges dominées qui fournissent les produits 'intermédiaires." Later on he says :—".....nous devons convenir 'que.....on ne saurait en faire un grief d' infériorité au jardinage 'parce-que les éclaircies dans les futaies pleines sont pratiquées uni-'quement par une appréciation culturale. Nul n'a encore tracé la 'règle économique des éclaircies dans les peuplements d' un seul 'âge, et celles-ci sont, à cet égard, sur la même ligne d'ignorance 'que les coupes intermédiaires des futaies jardinées. La seule 'différence est que les éclaircies de futaie pleine ont été longuement 'décrites dans les traités de sylviculture et fréquemment pratiquées, 'tandis que les *éclaircies jardinatoires* n' ont encore été enseignées par 'personne en France.....He then gives a method of calculating the "produits intermédiaires" and says of it :—"c' est une 'sorte de supériorité sur la futaie pleine ou les éclaircies s'opérent, 'sans aucune donnée de calcul....."

I find, on consulting Broillard (op.cit. page 249) that I was mistaken in saying that thinnings were made in a selection-worked forest of pines *mixed with* larch. I should have said pines *or* larch —a slip which does not, however, affect my argument. About these thinnings, Broillard (op.cit. page 248) says :—"De plus il 'est necessaire d' eclaircir les perches de pin."

For the last paragraph of my letter of the 5th ultimo I should have said that I was referring to forests of deodar and blue pine, for these are the only ones which have any practical working importance in Kulu, where alone my experience lies. In these forests the 'état jardiné' is not seldom missing.

Kulu, 29th October, 1895. C. P. FISHER.

Flowering of Strobilanthes.

SIR,

It may interest some of your readers to know that the *bākrā* (*Strobilanthes sessilis*) flowered in the Belgaum district in 1888, and is now again flowering for the first time since that year.

J. L. L-McG.

The word 'Siwalik.'

SIR,

In your issue of October last, I observe an enquirer asking the meaning of the word "Siwalik."

If I am not mistaken, I think I have seen it stated somewhere that "Siwalik" means the "saw like range of hills" the derivation being, I understand, from some Sanskrit word meaning a saw.

E. McA. M.

DEAR SIR,

In the October number of the Indian Forester, Mr. Sunder Lall Pathak raises the question as the meaning of the word and name "Siwaliks" or "Siwalik Hills." It seems to me that the word "Siwalik" is only an *Anglicised* form of the Sanskrit word "Siválaya," which is made up of two words—*Siva* and *álaya*—the first word being the name of one of the three principal deities of Hindu theology, *Siva*, and the second word meaning house or temple. So then the word Siválaya or 'Siwalik' means the temple or abode of *Siva*. It does not appear uncommon in the Sanskrit language to use the word 'álaya' to signify a group or chain of temples, houses or hills; for instance, compare the termination *alaya* in the compound word 'Himalaya' which literally means the abode of snow, as applied to the "Himalayas."

As to why the range of Hills South of Dehra Dún is called 'Siwaliks,' or 'Sivalayas,' I believe that it was so named on the supposition or *puranic* belief that it was the chief abode of the Hindu God *Siva*, also known as Rudra, Eswara, &c.

M. RAMA RAO.

How to utilize Papilionaceous Plants.

DEAR SIR,

As it appears to be the fact that Papilionaceous plants import nitrogen into the soil from the large stores of free nitrogen in the atmosphere, and that when once thus imported the nitrogen becomes available, in combined forms, for the use of the rest of the crop, a new reason for mixed forest, as against pure, has been found. It may even be that in future 'forest operations' the marking officers will actually consider the proportion of the nitrogen-inducing plants that he is leaving.

The "Forester" has recently had a good deal about the *Robinia pseudo-Acacia* in it, but the advocates of Robinia have not, I think, recollected that it has this additional virtue, that it is a Papilionaceous plant, and thus a most useful aid, chemically, as well as physically, towards the proper constitution of the forest.

H-H.

The Patiala Western Siwaliks.

SIR,

In the October number of the "Forester" you publish a "Note on the Patiala Western Siwaliks" under my name. This note was compiled at the request of then Commissioner who was anxious to obtain such little assistance as I could give him towards inducing the Patiala State to spend a little more money on these afforestation works. Under these circumstances, it will be readily understood that the Note was not written or intended for publication: indeed I am unaware how it reached you. Whoever sent it to the "Forester" might perhaps have 'edited' it a little less than he has done, for after careful comparison with the office copy, I find this person has made no less than ninety-nine alterations in the punctuation and twenty in the text generally. I had thought of compiling a list of *errata* for you, Mr. Editor, but had perhaps better refrain and shall be satisfied if you will kindly put this letter into the next "Forester" and allow me to state that the article in question was not in any sense of the word, contributed by me. In conclusion, I give one example of the way in which the unfortunate Note has been treated. A certain portion of the original reads: "On enquiry from Pandit Sunder Lal, I find that he is only allowed 'three hundred rupees per annum for the whole of this work in 'these Khols, a sum that is entirely inadequate for what has to be 'done. Surely the Patiala State could afford to increase this 'grant to a thousand rupees a year. The indirect benefit they 'would derive from the reafforestation of these Khols would be 'great and the direct benefit. * * * * *" The corresponding portion of the article in the "Forester" is as follows: (p. 369) "for this purpose a sufficiently large sum should be set aside by 'the state every year for the up keep and extension of those works; 'the direct benefit. * * * * *"

G. S. HART.

III—OFFICIAL PAPERS & INTELLIGENCE.

The reorganization of the Imperial and Provincial Services.

The following Circular Letter and Resolution of the Government of India have reached us and we reprint them as they may interest our readers at a distance.

With reference to former correspondence I am directed to forward a copy of a draft Resolution which it is intended shortly to issue on the subject of the reorganization of the Provincial Forest Service. The short recruitment alluded to in paragraph 6 of the resolution, which dates from 1890, has not had its due effect upon the Indian cadre, because many of the senior officers are postponing their retirement until the question of what extra pensions, if any, are to be given to the Indian Forest Service, on the analogy of those enjoyed by the Public Works and Telegraph Departments under article 714 of the Civil Service Regulations, is settled.

2. The Secretary of State has recently been addressed on this subject, and it is hoped that his orders will very shortly be received. A considerable number of retirements may then be expected, which will reduce the Indian cadre below its normal strength, and render possible the transfers alluded to in paragraph 6 of the draft Resolution. It is therefore thought advisable to postpone the publication of the scheme till the orders regarding special pensions can accompany it.

3. Meanwhile I am to ask that, the transfers to be made under paragraph 6 of the draft Resolution may be considered, and proposals made to the Government of India, together with the names of the Provincial officers whom it is propose to promote, so that action may be taken immediately upon the issue of the resolution.

4. In past years picked men have occasionally been transferred from the Provincial to the Indian list Such transfers have never, indeed, been quite regular; but the practice has been (in some provinces at least) so far recognised that the possibility of such a transfer from time to time has entered into the reasonable expectations of both services. It may be that in some provinces the Provincial list includes one or more men of exceptional ability, who would in all probability have been holding Indian appointments by this time had not the announcement of the new scheme put a stop to all such transfers for the past four years. In such cases, if the Local Governments concerned are of opinion that an

appointment corresponding with that to which such a man would by this time have risen, can be at once transferred from the Indian to the Provincial service consistently with a scrupulous regard for the due expectations of the Indian staff, the Government of India will be ready to consider their recommendations, which should be supported by a full statement of the facts. Such instances must necessarily be rare exceptions.

RESOLUTION.

In paragraph 5 of Circular Resolution No. 18-F. dated 29th July 1891, it was remarked as follows :—

"There will at present be 193 officers on the Upper controlling staff (exclusive of officers on foreign service), and 86 officers on the Lower Controlling Staff. The Upper Controlling Staff will be divided into an Imperial and a Provincial Branch. At the outset the Upper Controlling Staff will comprise only officers of the Imperial Branch, but, as opportunities occur they will be replaced by officers of the Provincial Branch up to a limit of 40 appointments."

It now remains to detail the 40 appointments which are to be transferred from the Indian to the Provincial Forest Service and their distribution, and to lay down the manner in which their transfer will be gradually effected.

2. The appended table show the forest services of each province or group of provinces as constituted before the transfer is begun (Table A) and after the transfer is complete (Table B).

It will be noticed that the total strength has been reduced in the Punjab, and increased in Madras, by the transfer of two Assistant Conservatorships from the former to the latter province. This change has been made in order in some degree to reduce the inequalities which still exist in the proportions between Deputy and Assistant Conservators. Each Provincial service will, when the transfer is complete, be independent of the Indian service in the province concerned, and will (except in one point, presently to be noticed, connected with the Bengal, Assam and North-Western Provinces services) be self-sufficing and self-contained. For every new post created in the Provincial service, an appointment of corresponding class and grade in the Indian service must simultaneously be abolished, *viz.* an Assistant Conservatorship 2nd grade for an Extra-Assistant Conservatorship 2nd grade, a Deputy Conservatorship 4th grade for an Extra-Deputy Conservatorship, 4th grade, and so on.

3. A further table shows the grading and distribution of the appointments that are to be transferred. The transfer will ordinarily be made as follows :—The annual recruitment from England has been cut down so as to suit the reduced Indian cadre, and

so adjusted that each year the number of recruits who will arrive from England will be fewer by two than the number which would be required to mantain the cadre at its present strength. There will thus be two appointments in the 2nd grade of Assistant Conservators annually available for transfer, and they will be transferred accordingly by the Government of India to the Provincial list as Extra-Assistant Conservatorships of the 2nd grade.

4. The initial appointments thus transferred to the Provincial service may be regarded as pilot appointments and will govern the transfer of appointments in the higher grades. Each such *appointment* will continue for the present to be shown in the Indian list in its proper place and with its proper number, the words "transferred to the Provincial service" being entered in italics instead of the name of the officer, who will be shown on the separate Provincial list to which he belongs. The pilot appointment will rise in the Indian list in ordinary course and whenever any pilot appointment reaches in any province a grade from which a transfer is to be made in that province, an appointment in that grade will be reduced in the Indian list, and a corresponding appointment created on the Provincial list. When the appointments to be transferred in any province, do not include the lowest grades, the transfers made as above in these grades will be temporary only, for the purposes of the process of transfer - and as soon as that process is complete, these temporary appoint; ments will be re-transferred to the Indian list. As soon as the transfer of appointments to the Provincial cadre is complete in any province, the Provincial service of that province will be self-contained and independent, and the pilot appointments will cease to be shown on the Indian list.

5. Appointments to and promotion in the grades of Extra-Deputy Conservators will in all cases be dependent on fitness; and in any case when a competent officer is not forthcoming for a vacancy in those grades, an Indian officer may be appointed to hold it temporarily on the pay of the corresponding Indian grade, until a fit officer is available on the Provincial list. But, subject to this condition, all vacancies on the Provincial list will be filled up from that list, the promotion in it being entirely independent of the Indian list. Promotions from Extra-Assistant Conservator to Extra Deputy Conservator will mainly depend on the qualifications of officers and the practical efficiency shown by them in the discharge of their duties; and though the position attained by seniority on the list of Extra-Assistant Conservators will be taken into consideration, such promotion cannot be given or claimed on grounds of seniority alone, and Local Governments may promote a meritorious officer of a lower grade to an Extra-Deputy Conservatorship which may have become vacant. When an appointment on the Provincial list is temporarily held, under the circumstances explained above, by an Indian officer, a temporary

transfer to the Provincial list may be made in any lower grade for which there is a fit Provincial officer available. It will be noticed that a part of the improved prospects which the reorganisation was to afford to the Provincial service has already been enjoyed by that service for some years past, the pay of certain Extra-Assistant Conservatorships having been raised to Rs. 300 and Rs. 350 per mensem. The Extra-Assistant Conservatorships which will now be transferred in the first instance, will be of the Rs. 300 grade as already explained; but the existing Extra-Assistant Conservatorships in the Rs. 350 grade will of course rank as senior to them.

6. Such will be the future course of affairs. But there is some back-way to be made up. On a consideration of the state of the Indian list in 1890, it was decided that it was possible, consistently with all due regard for the interests of the existing staff, to transfer 12 appointments to the Provincial list between 1891 and 1895, and the home recruitment was readjusted on this basis. Of these appointments, only two have actually been transferred. The general scheme was sanctioned in 1891, but unfortunately there has been delay in carrying it into effect. It will therefore be possible, without injury to vested interests, to make some 8 or 10 transfers at once ; and Local Governments will be asked for their recommendations to this end.

7. With reference to the exception mentioned in paragraph 2 of this resolution, is must be explained that, although a certain number of Extra-Deputy Conservators have been allotted to the Lower Provinces of Bengal, to Assam, and to the North-Western Provinces and Oudh respectively, yet it is impossible to arrange that every grade of that class should be represented in each of the three Provincial services. It is, therefore, necessary for the present to unite these services for the purpose of promotion in the grades of Extra-Deputy Conservator.

One Extra-Deputy Conservator of the 3rd and one of the 4th grade have therefore been allotted to Bengal and Assam jointly, and one of the 2nd and one of the 1st grade to the three services jointly. Of these four appointments of Extra-Deputy Conservator one will be held in Assam, two in Bengal, and one in the North-Western Provinces ; but promotions from grade to grade will, so long as the strength of the grades remains unchanged, be common to the services that are combined in each case, and will, *cæteris paribus*, fall to the senior officer.

8. Finally, it must be understood that the eight allowances of Rs, 50 per mensem to Extra-Assistant Conservators holding charge of Forest Divisions, of which two are held in Bombay, two in Madras, and four in Bengal, under the terms of this Department's Circular Resolution No. 18-F. of 29th July, 1891, are not affected by the present orders.

Table A.—Constitution before commencement of transfer.

Province.	Indian Service.				Provincial Service.			Total strength.
	Conservators.	Deputy Conservators.	Assistant Conservators.	Total strength.	Extra-Deputy Conservators.	Extra-Assistant Conservators.	Total strength.	
1. Bengal ..	1	9	5	15	...	7	7	22
2. Assam ...	1	6	3	10	...	3	3	13
3. North-Western Provinces and Oudh (with Ajmere) ...	3	9	7	19	...	8	8	27
4. Punjab (with Baluchistan), Central Provinces, Berar and Coorg ...	4	22	16	42	...	23	23	65
5. Burma ...	4	20	13	37	...	15	15	52
6. Madras ...	3	21	10	34	...	11	11	45
7. Bombay ...	2	22	7	31	...	19	19	50
Total ..	18	109	61	186	...	86	86	274
For Imperial List ...	...	...	...	5	..	...	...	5
For Foreign Service ...	...	...	..	3	...	...	..	3
Grand Total ..	...	...	...	196	...	..	86	282

Table B.—Constitution after completion of transfer.

1. Bengal ...	1	7	4	12	2	8	10	22
2. Assam ...	1	5	3	9	1	3	4	13
3. North-Western Provinces and Oudh (with Ajmere) ...	3	6	6	15	3	9	12	27
4. Punjab (with Baluchistan) Central Provinces, Berar and Coorg ..	4	14	14	32	8	23	31	63
5. Burma ...	4	14	11	29	6	17	23	52
6. Madras ...	3	15	8	26	6	15	21	47
7. Bombay ...	2	16	7	25	6	19	25	50
Total ...	18	77	53	148	32	94	126	274
For Imperial List ..	...	..	...	5	...	...	...	5
For Foreign Service ...	...	...	...	3	...	...	...	3
Grand Total ...	...	...	..	156	...	...	126	282

Alteration of the Forest School Rules.

The following Resolution explains the newly settled arrangements by which, after January, 1st 1897, students will begin their course by a short period of practical work in the forests.

The Director of the Imperial Forest School and his staff having noticed the difficulty which the students experience in intelligently assimilating the lectures with which the school course commences, and which deal with technical subjects in their relation to the practice of forestry, proposed, following the example of the Forest Schools of Europe, that the students should join the School each year on the 15th April instead of on the 1st July, in order they might commence their studies with practical work in the forests under an Instructor, and thus become to some extent famiiliar with the forests and the nature of the work to be done in them, as a preliminary to the study in the class-room of sylviculture and forest-mathematics.

Under this proposal which has received the approval of the Government of India, and to which effect will be given from the beginning of the year 1897, the School course will last 23½ instead of 21 months as at present; and it will be necessary to hold the examination for entrance into the School in January instead of March. The additional expenditure entailed on each student by the change will be as follows:—

		Rs.
(a)	For a European student of the Upper Class ...	112½
(b)	„ Native „ „ „ ...	87½
(c)	„ „ „ „ Lower „ ...	70

2. The Government of India have also approved of a recommendation by the Board of Control that Rule 15 of the Forest School Rules should be amended, so as allow of candidates for the Lower Class who are already in Government service being admitted into the School, even though they may be 25 years of age or over and may have been in the Subordinate Forest Service for less than three years. The conditions now imposed by Rule 13 (ii), (*a*) and (*c*), may therefore be waived by a special order of the Local Government or Administration in the case of any Government student whom it may be in future proposed to send to the Lower Class.

D'Arcy's Working Plans.

We are glad to see, from a Circular of the Inspector-General of Forests, that a revised edition of the late Mr. D'Arcy's excellent little Manual of Working Plans is now out. Copies may be obtained from the Storekeeper at the Imperial Forest School, or from the Superintendent of Government Printing.

IV.—REVIEWS.

A Manual of Forestry. Vol. III. Forest Management. by Dr. W. Schlich, C.I.E.

This is the third and last Volume of this valuable and important Manual of Forestry so far as Dr. Schlich's work in it goes. Two or more Volumes will be added, one of these is already out and the other may soon be expected, but these are from the pen of Mr. W. R. Fisher, a former Editor of this Journal. Dr. Schlich's first Volume was reviewed in our Journal by Sir Dietrich Brandis (see Vol. XVI, p. 306) and his second Volume though not specially reviewed, was fully described in a translation from the German (Vol XVII, p. 464).

We have examined this third Volume with great interest and most especially have we been interested in the sample German Working Plans at the end, and in the very useful, clear and interesting Part I on Forest Mensuration. Part II on Forest Valuation we confess to have found rather difficult and indeed we rather incline to thinking it too technical and too mathematical for English and Indian Foresters. In connection with this Part, we hope the author will excuse our pointing out how very confusing is the expression 1.0p as used for the capital *plus* first year's interest. Had it been written 1.0p and some small explanation given it would have been better, but the writing of a little 'o' instead of a 'nought' is one of the matters which certainly, we think, ought to have been set right by Profr. A. Lodge who, as the Preface tells us, looked over the proof sheets of the Mathematical part.

Some of our correspondents have drawn our attention to a review of the work which has lately appeared in the 'Révue des Eaux et Forêts" over the familiar intials 'C. B.' and suggested the reproduction or translation of his remarks. We have therefore decided to publish the translation and most especially because the author of the review is known to be one of the highest authorities of the present day on Forest organization and because his views and teaching have left no light impression on the forest management in India of the present day.

"Dr. Schlich, professor of Forestry at the Royal Indian 'Engineering College at Coopers Hill, has published the 3rd Vol.

'of his "Manual of Forestry." This Volume is entitled "Forest 'Management" and is divided into four parts, *i.e.* Forest mensura-'tion, Forest Valuation, Principles of Forest Working Plans, and 'prepartion of Forest Working Plans; and Appendices in which are 'given examples of Working Plans, and interest and other 'tables.

'The two first parts are an introduction to the study of 'Working Plans. After a detailed study of the processes used in 'Forest mensuration, in calculating the volume of trees and of 'whole woods, and in the determination of the increment, the 'author goes on to explain the formation and use of yield tables 'by which valuations and organizations are effected. The theory 'of the calculations indispensable to Working Plans, based on 'Forest Valuation, is explained with the help of Algebra and from 'the various points of view of the soil, of the *growing stock*, of the '*whole woods or forests*, as well as from the point of view of the '*rental*. In each case the expectation value, the cost value, the sale 'value, and *the rental* value are shown by formulæ, fully and 'precisely laid down. Theorists will here find a good deal to 'interest them, more especially as everything is so "exact." It 'can even be seen how the expectation value of the growing stock 'is equal to the cost value, when the expectation value of the soil 'is worked out to its maximum. The practical conclusions arrived 'at are perhaps not quite so certain. For example:—the discussion 'to the rate of interest, the choice of which is of the first impor-'tance in the calculations, is summed up as follows.—On the whole 'it is a good way in determining the rate of interest for the 'Forest industry to accept the rate of interest of "Consols" in a 'well regulated state, notwthstanding that in certain cases differ-'ences may arise.

'After this the author proceeds to discuss the principles and 'preparation of Working Plains.

'Written clearly and concisely the book enables the reader 'to make himself acquainted with the system of Working Plan 'methods in force in foreign countries. It is chiefly the German 'Systems of Working Plans, that are reviewed; and as Dr. Schlich 'acts the eclectic with great talent, and as their methods can only 'be adopted in England after being suited to the practical and far 'seeing ideas of our eastern neighbours, the book is not perhaps 'the best means of initiating us into the German processes. It is 'however desirable that this work should be translated; at least 'the most interesting Chapters, such as the Chapter on the "Selec-'tion of woods for cutting in accordance with sylvicultural re-'quirements and the objects of management" page 330. This 'Chapter treats of Judeich's system of small cutting series, a 'system exported from the continent.

'Throughout the work, large use is made of Mathematics, 'and in consequence subjects are expounded under a cloak of

'positiveness, which even the author himself frequently tries to 'throw off. For example: in the study of the system, in a theoretical 'coppice with standards, how is the size or extent of the age 'classes of standards to be worked out? To solve this, the author 'assumes that each age-class occupies an equal area as in a regular 'high forest, and that the standards of each class are brought 'together on the same area, and would thus form an open high 'forest resembling a selection forest. These two or three hypo-'theses granted, three simple equations become permissible. The 'resulting combinations of such calculations may exercise the 'young idea; but can hardly be worth studying by men who have 'practical knowledge of the selection of standards in the coppice 'with standards, and even the author allows that the calculations 'are only of theoretical value. Is this not the same for all forests 'qualified as normal, and submitted to mathematical calculations? 'It has often been said that trees prevent people seeing the forest, 'for the unprofessional this is often true, but inversely when the 'Forester forms his calculations on an imaginary type of forests, 'may it not be said with equal truth that the forests prevent his 'seeing the trees?

"The author clearly distinguishes the different systems of 'exploitability and the rotations corresponding to each of them. 'Finally, he relies on the proposition that practically speaking the 'starting point is the financial rotation, which should be diverged 'from only in the special interests of the proprietor, care being 'taken to point out the financial loss to which he will have to 'consent. In France almost exactly the opposite is laid down. 'For State and Commercial Forests in particular the suitable 'exploitable age is that which gives the greatest annual revenue, 'the rate of interest being altogether ignored, and we hold that 'any deviation from this age should be as small as possible. This 'without doubt is the safest point to start from, as may be seen 'from the position in which proprietors are now placed who have 'worked their forests of leaf-bearing species on the highest rate 'of interest on the capital invested. The fall in the price of fire 'wood and the consequent fall in the rate of interest would under 'present conditions exact the doubling of the rotation—This at the 'present moment is simple ruination.

'A sample "Working Plan" prepared in accordance with 'the Austrian system is given *in extenso* in Appendix C of 'the book. This is a Working Plan of part of the forest of 'Herrenwies belonging to the State of the grand Duchy of Baden 'in the Black Forest. The forest is composed chiefly of spruce and 'silver fir and is situated at an altitude of from 2,000 to 3,400 'feet. It covers an area of some 1,700 acres, divided into twelve 'compartments of various sizes, varying from 34 to 362 acres; 'but it may be mentioned that there are some sub-compartments

'The increment of each compartment is calculated for the next 'ten years with the help of yield tables drawn up in Saxony, which 'give for each species the volume for a completely canopied forest, 'at different ages, and for the five classes of soil. The actual growing 'stock has been reduced to cubic feet and the normal growing 'stock is calculated in accordance with a formula which is no 'other than that of Masson's (this formula is for a normal and fully 'stocked forest starting from zero, and reaching the felling volume 'with a constant yearly increment.) From the tables it is seen 'that the actual growing stock is in excess, and it would be right 'to dispose of both the estimated increment and the excess of 'stock; but prices being low, the realization of the greater part 'of this excess is deferred. The study of the various compart-'ments also shews that from the sylvicultural point of view, it 'would be convenient to fell a volume exceeding by one-fifth that of 'the estimated increment, and this would allow of getting rid of 'about half of the excess of growing stock, provided the prices 'did not rise during the decennial period. Should prices rise, 'additional fellings might take place. The final and intermediate 'cuttings are combined, and the latter are calculated to yield 'about two-fifths of the former. All this applies to the area under 'selection fellings as well as to the are as treated as high forest 'by the regular method.

'The figures are in no way extraordinary. The normal grow-'ing stock would contain an average of about 4,238 cubic feet to 'the acre, whilst the actual growing stock gives 5,086 cubic feet. 'The fellings during the preceding 40 years have yielded 57 cubic 'feet to the acre, and will rise during the next decennial period to '66 cubic feet, not taking into account any additional fellings.

'After this comes the description of the compartments, then 'a table of yield capacity for the age classes, and the increment 'normal and real, all of which are well arranged.

'The special "working plan" fixes the final and intermediate 'fellings to be done in each compartment, and also the nature of 'the cuttings and the work to be carried out, during the next 'decennial period. The removal of cancerous trees is prescribed 'throughout, notwithstanding that such operations will open out 'the canopy.

'A summary of the proposed and executed fellings in each 'compartment, and a sample page of the detailed control book 'brings to a conclusion this very model Working Plan.

'It is the old system of "Working Plan" by volume, brought 'up to date and applied by sound Forest officers. They have 'made no mistakes, as they knew the forest thoroughly. But to 'what a large number of hypotheses are they led? Commencing by 'those of the yield tables mentioned in Appendix. D. The Forest 'is divided in some way into as many incomplete series as there 'are compartments, and undergoes in each the prescribed cultural

'exploitations, laid down in the "*Special Working Plan*"; but these 'fellings yield very different quantities to those estimated for, 'both in the regular thinnings and by wind-fall and other un- 'foreseen events. As regards the treatment, it brings together 'clever combination of regeneration, methods of thinning and of 'various cuttings. Would not the same result have been obtained 'by simply prescribing to fell the volume of from 57 to 70 cubic 'feet of wood per acre, per annum, in the manner and places 'laid down? It is quite true that the disorder inherent in felling 'by volume as in all Working Plans based on volume, would 'remain the same notwithstanding the simplicity that would 'thus be brought to bear on the calculations. The English Forest 'officers in India who probably each have some 25,000 acres 'of trackless forest to administer, will no doubt eventually see 'their way to steer through what appears to us a rather labyrin- 'thine path. Every nation has its own manner of proceeding.

'In France, the 3rd Vol. of the "Manual of Forestry", a work 'both didactic and well arranged, may be useful to all Foresters 'wishing to keep themselves up to date in the progress of Forest 'teaching. It will permit them perhaps to set themselves right 'on some points and may well on others help to confirm their 'views."

'The Forest.' An American Illustrated Forestry Magazine.

This is a new Forest Magazine started in January last by the New Jersey Forestry Association, of which we have received Nos. 4 and 5. It is published every second month and the Yearly subscription is 50 cents a year. The Editor is John Gifford of May's Landing, New Jersey. The parts we have received are chiefly devoted to preaching the advantages of forest conservancy and management in the United States in general and New Jersey in particular; and an especial feature is the urgent demand for measures to stop the forest fires which are so terribly disastrous in America when once started. We have read these numbers with much interest. The illustrations are chiefly reproductions of photographs; and the type, though small, is exceedingly clear and beautiful and can only be a source of envy to us who have to put up with the primitive founts and bad printing of India. We hope that future numbers will contain more notes on the results of actual professional work and experience and wish our new contemporary a hearty welcome and a great success in its very important mission of educating the American public to the urgent necessity of forest conservation.

Forest Administration in Jeypore in 1894.

The Report for 1893 was reviewed at p 351 of Vol. XX. The present Report shews that things are going on well under Munshi Shiva Bakhsh who is again supervised by the Dewan, Rao Bahadur Babu Kanti Chandra Mukerjee, C. I. E.

The year was noticeable for the complete absence of fires, for the rest the Report tells us very little. It has 10 sparsely printed pages of Report with no less than 25 pages of Statements, some of them quite blank. We note that, as in Jodhpur, goats, sheep, and camels are largely excluded from the forests, which is quite right.

The area of Reserved forest was 283 square miles, the Revenue Rs. 18,558, the expenditure Rs. 11,788 so that the surplus was Rs. 6,770,

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Forest Administration in Jodhpur, 1894-95.

We reviewed the Forest work of this State at p. 61 of Vol. XXI, of this Journal (February, 1895). The present Report shews steady progress, though there is little of special interest to record The *revenue* of the year was Rs. 27,969 and the *expenditure* Rs. 20,567 giving a *surplus* of Rs. 7,402, which is considerably larger than last year. Fire-protection was fairly successful, the chief fires which occurred having come from outside, from the Ajmere forests, or from Meywar.

In regard to *grazing* it is noticeable that all the forests are closed to sheep, goats, and camels and open only to 21,251 head of cattle belonging to right-holders; also that the said right-holders are learning to cut and stack a considerable amount of grass.

The reproduction of the 'Dhau' (*Anogeissus pendula*) is said to be excellent. We are told that grass does not grow under 'Dhau' trees, so that cattle are not tempted to look under them and the seedlings consequently escape. The planting of bamboos both by rhizomes and by 'Kalams' (we should like to hear more of how this method is practised, for Jodhpore must be a dry country for cuttings to do well in) has been fairly successful.

The Superintendent of Forests is Pandit Gopal Das who is commended for his work by the Musahib Ala, M. D. Lt.-Col. Sir Pratap Singh, K. C. S. I., in his review of the work of the year, a review which shows that he still continues to take much interest in the forests.

VI.—EXTRACTS, NOTES AND QUERIES.

Manufacture of Camphor in Formosa.

On the hillsides are built distilleries consisting of oblong-shaped structures principally of mud bricks, and about ten or twelve feet long, six feet broad and four high. On each side are five to ten fire holes about a foot apart and the same distance above the ground. On each fire hole is placed an earthen pot full of water, and above it a cylindrical tube, about a foot in diameter and two feet high, passes up through the structure and appears above it. The tube is capped by a large inverted jar, with a packing of damp hemp between the jar and cylinder to prevent the escape of steam. The cylinder is filled with chips of wood about the size of the little finger, which rest on a perforated lid covering the jar of water, so that when the steam rises it passes up to the inverted jar, or condenser, absorbing certain resinous matter from the wood on its way, Whilst distillation is going on, an essential oil is produced, and is found mixed with the water on the inside of the jar. When the jar is removed the beady drops solidify, crystallization commenses, and camphor in a rude form, looking like newly formed snow, is detached by the hand, placed in baskets lined with plantain leaves, and hurried off to the nearest border town for sale. (Extract from an article in the "Scottish Geographical Magazine" for November, 1895, by John Dodd, on 'Formosa').

Planting Shifting Sands of the Sea-Coast.

We had an opportunity lately of seeing a most successful and interesting undertaking in the way of reclaiming by tree and shrub planting a large extent of sandy land on the Welsh sea-coast. Not many years ago the land in question was valueless, the ever-shifting sands preventing almost every form of vegetation from gaining a footing, and the appearance of the now verdant woodlands was at that time an ocean of loose blowing sands. The first preliminary towards reclamation was erecting a temporary furze fence a little inwards from high-water mark, the fence simply consisting of rough poles put in at ten yards apart, and to which two wires were affixed, the whole being closely thatched with furze, which, fortunately, was abundant in the neighbourhood. This has acted

as an excellent wind-guard, the saline-laden blast being wonderfully sifted and ameliorated in its passage through the finely twigged fence. Behind this storm barrier, pits were opened in the sand at 6 ft. apart, and a quantity of loam and road scrapings placed in each. The trees used were the sycamore, willow, Austrian, Corsican, and Scotch pines, and a few alder, elder, and elms. Between each of these, small patches of the sand soil were prepared and sown with gorse and broom seeds, also with a plentiful supply of birch, which on an adjoining height was found to be growing luxuriantly. This formed the outer boundary; inwards from that, many other kinds of trees being planted, and amongst shrubs we noticed that the sea buckthorn (*Hippophae rhamnoides*) was growing everywhere luxuriantly, it being a shrub above, perhaps, any other that is peculiarly suitable for withstanding the ozone-laden atmosphere of the seaside. The results that have been brought about in eight years would hardly be credited, and clearly demonstrate that the undertaking was wisely and carefully carried out.—(*Timber Trades Journal.*)

Holigarna and its Blistering Principles.

All observant forest officers in India have noticed at different times the remarkably caustic nature of the black secretion that exudes in the dry weather from various species of *Holigarna*. The tree is called in Malabar the black varnish tree, in contradistinction to the yellow-varnish tree or *Garcinia*, which yields the gum-resin known as gamboge. The black varnish is used for waterproofing boats, furniture, and houses, and for indelibly fixing black figured patterns on linen and cotton cloths. There are other natural black varnishes obtained from anacardiaceous trees growing in Burma, China, Japan, and Ceylon, and the exact character of their exudations would form the subject of an interesting research, but the present article endeavours to show the nature of the vesicating principle separated from an hitherto unexamined Indian genus.

Alluding to *Holigarna longifolia*, Roxb., Colonel Beddome describes it as a common tree about the Western Ghauts of the Madras Presidency, from Canara to Cape Comorin, which yields a very black, acrid juice from the trunk and rind of the fruit. This is used by painters as a varnish. Mr. Gamble, in describing this large tree, says, "It gives a black acrid exudation, which raises blisters and is much dreaded by the hill people." Mr. Bourdillon, Conservator of Forests for Travancore, says of it, "The whole tree, leaves, bark, and fruit, secrete a very poisonous black juice, which raises blisters when it falls on the body. It affects some people and not others." The fruit is referred to by

some writers as a medicinal agent, but its action and the uses for which it is employed, are not stated.

There are seven known species of *Holigarna*, all of which are Indian. Their names and geographical distribution are thus recorded in the 'Flora of British India.'

H. Arnottiana, Hook., Western Peninsula.
H. ferruginea, Marchand. W. Peninsula, Travancore.
H. longifolia, Roxb, Chittagong, Pegu.
H. Helferi, Hook., Tenasserim.
H. Grahamii, Hook, Western Peninsula.
H. Beddomei, Hook., Western Peninsula.
H. albicans, Hook., Pegu, Martaban.

The native names applied to these trees are charei, karun-charei, cattu-tsjeru (*Malyalum*); kalu-geri, kuti-geri, hool-geri (*Canarese*); bibu (*Mahratta*). Mr. Bourdillon forwarded some specimens of the fruits of *Holigarna ferruginea* for examination. The exudation from the stem has blistering properties, but this can only be obtained in the dry weather about March and April.

The fruit is a drupe, ovoid or elliptic in shape, black coloured, about seven-eights of an inch long by half an inch in diameter. The pulpy pericarp becomes thin when dry, and is of a uniform black colour, but the pulp when fresh is greenish and mucilaginous. The testa is thin and dark-brown, and encloses a whitish starchy pair of planoconvex cotyledons, with dark coloured veins running through them. The embryo is suspended from below the apex of the fruit, and the minute radicle is situated next to the hilum.

The aqueous soluble extract of the pericarps consisted of mucilage, with a small quantity of a tannic acid giving a green colour with ferric chloride. The ether and alcohol extracts of the pericarp contained the active vesicating principle of the fruit, associated with the black resinous substance forming the varnish. This principle was separated from the resins by adopting the process devised by Stadeler in examining the acrid principle of the cashew fruit. An ethereal tincture was made of the bruised pericarps, and the ether was allowed to evaporate without heat. The residue was dissolved in alcohol and treated with some freshly precipitated oxide of lead. The grey precipitate was collected on a filter, and after washing was digested in some ammonium sulphide solution. The lead sulphide was filtered off, and the filtrate was treated with dilute sulphuric acid, which separated a small quantity of oily substance. This melted at 26° and was recognised as anacardic acid. The filtrate from the grey precipitate was carefully evaporated at a low temperature, and left a yellowish coloured oily residue, which had a most irritating and acrid taste when applied in a most minute quantity to the tongue, and produced a redness and soreness when rubbed on the arm. It is evident, then, that the fruit contained a body very much allied to,

if not identical with, cardol, and that the constituents are very similar to those found in the marking nut.

The seeds when dry had a peculiar odour of *Ceratonia* pods. They contained gallic acid, 12·4 per cent. of tannic acid, 8·5 per cent. of fat, and 3·7 per cent. of mineral matter. A section of the the seeds touched with a drop of caustic soda turned the colour of the anastomosing veins to a bright blue and formed a pretty object under the microscope. The alcoholic solutions of both pericarp and seeds gave a greenish colour with caustic alkalies; no doubt the principle giving this colour was contaminated with other substances which afforded red tints with soda, for when separated from the tannin it gave a blue colour. Basiner in 1881 found that the oil from the pericarps of the marking nut tree gave a green colour with potash, and Dr. Lyon in his 'Medical Jurisprudence for India' relies upon this test in detecting the presence of the marking nut in toxicological investigations. As will be seen above Baisner's test for the marking nut would show the same result if applied to similar preparations of *Holigarna*.

It is interesting to notice that the properties of the Holigarnas are similar to those of two other trees of the same natural order, namely the marking nut (*Semecarpus Anacardium*, L.) and the cashew nut tree (*Anacardium occidentale*,) L.), and from recent investigations by Dr. Pfaff on *Rhus toxicodendron* and *Rhus venenata*, it is not at all improbable that cardol is present in other vegetable products of the Anacardiaceæ.

By David Hooper in Pharmaceutical Journal, June, 1895.

The Indian Forest Department and Coopers Hill.

In the light of previous events it is to he hoped that the framers of the Coopers Hill College Prospectus for the Indian Forest Department Examination, which has just been issued, have acted in ignorance of facts and of the rules which regulate the pensions of officers in the superior grades of that Department and the Public Works and Telegraphs. We fear, however, that it is not mere ignorance which has led to the insertion of misleading statements in the Prospectus, but a wild desire to obtain entries into the College by holding out prospects which are based on mere assumptions and have no foundation in fact. The Prospectus again repeats, in paragraph 17, the statement that "the more favourable pension rules have recently been extended to Forest Officers appointed from England, who are thus placed on an equality with Public Works Officers appointed from Coopers Hill; any Forest Officer who has rendered not less than three years' approved service as head of his Department has also been made eligible for an extra pension of Rs. 1,000 per annum." This we would point out is far

from being so. The Forest Department has not had extended to it the provisions of article 714 under which Chief Engineers and certain Telegraph Officers are eligible for Rs. 2,000 and all Superintending Engineers for Rs. 1,000 extra. Under existing orders, only the Inspector-General is eligible, as the head of his Department, for an additional pension of Rs. 1,000. The Government of India have for years in numerous despatches recommended that, for purposes of the extra pensions under Article 714, the Inspector-General of Forests should be classed as a Chief Engineer, and Conservators of the 1st and 2nd grades as Superintending Engineers; but these proposals have not, so far, received the sanction of the Secretary of State, and Forest Officers as a body are not on an equality with those in the Public Works. The position of officers in the Forest Service is admittedly unsatisfactory, and needs consideration; but it serves no good purpose to make that branch of Government Service appear in a better light than it is for the more purpose of attracting students to the College. It is well, we think, for candidates for the Forest Department of India to know that the Prospectus issued by the Coopers Hill authorities does not fairly explain the conditions of service.—(*Indian Engineer.*)

VII.—TIMBER & PRODUCE TRADE.

Churchill and Sim's Circular.

5th November, 1895

East India Teak. The deliveries for the ten months of this year have been 15,319 loads against 9,312 loads in the corresponding period of 1894; and in this year October, 1765 loads against 841 loads in October, 1894. It is disappointing in the face of these figures to be able to chronicle no recovery from the very low range of prices current. The great hindrance to the revival of the country's commerce threatened by suicidal labour disputes on the Clyde and in Belfast, may be now pointed to as the main cause, as, although there is plenty of wood afloat, it is becoming apparent that the demand, if it was allowed full play, would be equal to absorbing it as it gradually becomes available.

Rosewood. East India sells slowly, but stock is not at all heavy.

Satinwood. East India Stocks are small but demands not active.

Ebony. East India. Small parcels, of good logs, would sell well.

PRICE CURRENT.

Indian Teak	per load	£10.	to £16.
Rosewood	„ ton	£6.	to £9.
Satinwood	„ sup. foot	6d.	to 18d.
Ebony	„ ton	£6.	to £8.

MARKET RATES OF PRODUCE.

Tropical Agriculturist, November, 1895.

Cardamoms	per lb.	1s 8d.	to	2s 3d.
Croton seeds	per cwt	30s.	to	37s.
Cutch	„	20s.	to	32s.
Gum Arabic, Madras	„	20s.	to	33s. 6d.
Gum Kino	„	£25.	to	£30.
India Rubber, Assam,	per lb	1s. 7d.	to	2s. 2d.
„ Burma	„	1s. 6d.	to	2s. 2d.
Myrabolams, Bombay,	per cwt	7s. 9d.		
„ Jubbulpore	„	6s. 3d.	to	7s.
„ Godavari	„	5s. 6d.	to	6s. 6d.
Nux Vomica, good	„	6s.	to	9s.
Oil, Lemon Grass	per lb.	1⅛d.		
Orchella, Ceylon	per ton	11s.	to	15s.
Redwood	per ton	£3 10s.	to	£4
Sandalwood, logs	„	£30	to	£50
„ chips	„	£4	to	£8
Seed lac	„	50s.	to	160s.
Tamarind	„	9s.	to	11s.

Statement of average selling rates of timber and bamboos in Bareilly, Pilibhit, and Moradabad for the month of November, 1895.

Description.	Timber Scantlings per score.		Bamboos per 100 scores.		Remarks
	From	To	From	To	
	R. A. P.	R. A. P.	R. A. P.	R. A. P.	
BAREILLY.					
Sal 10′ Tors (Poles) ...	5 0 0	10 0 0	—	...	
Sal & Sain, &c., Karies, 12′ × 5″ × 4″	25 0 0 40 0 0	35 0 0 50 0 0 60 0 0	... ...	... ...	
Sal bed posts 7′ × 2½″ × 2½″ ...	10 0 0	25 0 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	50 0 0	... 137 0 0	
PILIBHIT.					
Sal 10′ Tors (Poles) ...	40 0 0	70 0 0	...	...	
Sal and Sain, &c., Karies, 12′ × 5″ × 4″ ...	30 0 0	40 0 0	...	...	
Sal bed posts, 7′ × 2½″ × 2½″ ...	5 0 0	6 4 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	40 0 0	100 0 0 500 0 0	
MORADABAD.					
Sal 10′ Tors (Poles) ...	20 0 0	25 0 0	...	...	
Sal and Sain, &c., Karies, 12′ × 5″ × 4 ... Sal	50 0 0	60 0 0	...	...	
... Sain	30 0 0	40 0 0	...	..	
Sal bed posts 7′ × 2½″ × 2½″ ...	0 8 0	0 10 0	...	...	
Bamboos of 9′ to 10′ per 100 score ..	...	...	50 0 0	75 0 0	

X.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

5th December, 1894. No. 1262-*F.*—With reference to the Notification of this Department, No. 1186-F., dated the 16th ultimo, Mr. Elliott, Deputy Conservator of Forests, Baluchistan, resumed charge of his office from Mr. Reuther on the 22nd November, 1894.

12th December, 1894. No. 1284-*F.*—The following reversions are ordered, with effect from 4th December, 1894, in consequence of the return of Mr. H. C. Hill, Conservator of Forests, 1st grade, Central Circle, North-Western Provinces and Oudh, from the privilege leave granted him in the Notification of this Department, No. 1135-F., dated the 8th ultimo:—

Mr. E. P. Dansey, officiating 1st grade Conservator, Punjab—to 2nd grade.

Lieutenant-Colonel C. T. Bingham, I.S.C., officiating 2n grade Conservator, Tenasserim Circle, Lower Burma—to 3rd grade.

Colonel J. E. Campbell, I.S C., officiating 3rd grade Conservator, Central Circle, North-Western Provinces and Oudh—to Deputy Conservator, 1st grade.

14th December, 1894. No. 1309-*F.*—The following changes are ordered in consequence of the return of Mr. J. W. Oliver, Conservator of Forests, 2nd grade, from the furlough granted him in the Notification of this Department, No, 294-F., dated the 28th February last:—

(i) Mr. Oliver—to hold charge of the Eastern Forest Circle, Upper Burma, with effect from 8th December, 1894.

(ii) Mr. F. B. Dickinson, Conservator 3rd grade, Eastern Circle, Upper Burma—to hold charge of the Western Circle, with effect from 9th December, 1894.

(iii) Mr. A. L. Home, Conservator, 1st grade, Upper Burma, is transferred to Assam.

(iv) Mr. A. Smythies, officiating Conservator, 3rd grade, Assam, is, on relief by Mr. Home, re-transferred to the Imperial Forest School, Dehra Dun, as Deputy Director.

(v) Mr. P. J. Carter, officiating 2nd grade Conservator, Pegu Circle, Lower Burma—to revert to the 3rd grade, with effect from 8th December, 1894.

21st December, 1894. No. 1319-*F.*—On return from the leave granted him in the Notification of this Department, No. 452-F., dated the 3rd May, 1894, and with reference to Notification No. 774-F., dated the 2nd August last, Mr. J. A. McKee, Conservator of Forests, 3rd grade, assumed charge of the Southern Forest Circle iu the Central Provinces from Mr. G. G. Minniken, Officiating Conservator, 3rd grade, with effect from 14th December, 1894.

Mr. Minniken reverted on the same date to his substantive appointment of Deputy Conservator, 1st grade, and is re-transferred to the Punjab.

1st January, 1895. His Excellency the Viceroy and Governor General is pleased to confer the title of Kyet thaye Zungshwe Salwé ya Min as a personal distinction upon:—

Maung Kale, Extra Assistant Conservator of Forests in the Tharrawaddy district, in Burma.

2.—MADRAS GAZETTE.

30*th November* 1894. To Ranger C. Subramania Aiyar, for twelve days, from 13th November 1894, under article 291 of the Civil Service Regulations.

3*rd December* 1894 No. 578.

No.	Name and designation of officer.	District.	Nature of charge	Remarks.
...	Mr. W. W. Batchelor, Assistant Conservator of Forests, Second Grade.	Salem ...		To do duty under the immediate supervision of the District Forest Officer.

3.—BOMBAY GAZETTE.

27*th November* 1894.—Messrs R. H. Madan, Extra Assistant Conservator of Forests, and H. W. Keys, Deputy Conservator of Forests, respectivaly delivered over and received charge of the West Khandesh Division on the 17th of November 1894, before noon.

1*st December* 1394.—Mr. W. E. Copleston, Assistant Conservator of Forests, who was posted to the Southern Circle by Government Resolution No. 8292, dated 10th October 1894, reported himself for duty in Belgaum on the forenoon of the 25th November 1894.

8*th December* 1894.—Mr. G R. Duxbury, Assistant Conservator of Forests, Second Grade, delivered over charge of his duties in the Poona Division on the 14th November 1894, after office hours, and received charge of the Sub-Division Forest office, Nasik, on the 21st November 1894, before office hours.

17*th December* 1894 No. 10382.—Mr. G. A. Hight, acting Deputy Conservator of Forests, First Grade, and Divisional Forest Officer, Nasik, is allowed special leave of absence for six months on urgent private affairs from 1st April 1895, or from such subsequent date as he may avail himself thereof.

No. 10411.—Mr. Shesho Manju, acting Extra Assistant Conservator of Forests, Second Grade, and Sub-divisional Forest Officer in charge Supa Sub-division, N. D., Kanara, is allowed privilege leave of absence for three months.

21*st December* 1894 No. 10550.—His Excellency the Governor in Council is pleased to appoint Mr. Ganpat Jayavant Rege to act as Extra Assistant Conservator of Forests, Fourth Grade, *vice* Mr. Shesho Manju, proceeding on privilege leave or pending further orders.

22*nd December* 1894 No. 1051.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. J. H. Clabby to be Second Grade Extra Assistant Conservator of Forests, and to be seconded.

Mr. Nánábhái Dádábhái Sátárávála, L. C. E. to be Second Grade Extra Assistant Conservator of Forests.

Mr. Ganesh Sakhárám Hinge to be Second Grade Extra Assistant Conservator of Forests.

Mr. A. C Robinson, L. C. E. to be Second Grade Extra Assistant Conservator of Forests.

Mr. Balvant Ganesh Deshpánde to be Third Grade Extra Assistant Conservator of Forests.

Mr. V. D. P. Rebeiro, L. C. E., to be Third Grade Extra Assistant Conservator of Forests

Mr. Ardesar Nasarvánji Master, L. C. E., to be Third Grade Extra Assistant Conservator of Forests.

Mr. Krishnáji Bábáji Phadke to be Third Grade Extra Assistant Conservator of Forests

Mr. Bhagvándás Harkisandás Dalál, L. C. E., to be Fourth Grade Extra Assistant Conservator of Forests.

Mr. Dattátraya Manjunáth Bijur to be Fourth Grade Extra Assistant Conservator of Forests.

Mr. Vishnu Mahádev Tilak to be Fourth Grade Extra Assistant Conservator of Forests.

Mr. Chunilál Gulábchand Dalia, L. C. E., to be Fourth Grade Extra Assistant Conservator of Forests.

Mr. Váman Gopál Tumne to be Fourth Grade Extra Assistant Conservator of Forests.

No. 10629.—His Excellency the Governor in Council is pleased to make the following promotions *vice* Mr. W. S. Hexton, deceased :—

Mr. G. A. Hight to be substantive *pro tem.* First Grade Deputy Conservator of Forests.

Mr. G. K. Betham to be substantive *pro tem.* Second Grade Deputy Conservator of Forests.

Mr. H. Murray to be substantive *pro tem.* Third Grade Deputy Conservator of Forests.

Mr. L. S. Osmaston to be substantive *pro tem.* Fourth Grade Deputy Conservator of Forests.

Mr. W. F. D. Fisher to be substantive *pro tem.* First Grade Assistant Conservator of Forests.

4.—Bengal Gazette.

30*th November* 1894. No. 5298.—Messrs. Henry Anthony Farrington and James Wyndham Alleyne Grieve, who have recently been appointed to the Forest Department, Bengal, by Her Majesty's Secretary of State for India, are posted respectively to the Jalpaiguri and Darjeeling Forest Divisions for general duty.

1*st December*, 1894. No. 5343.—Mr. C. A. G. Lillingston, Deputy Conservator of Forests and Personal Assistant to the Conservator of Forests, Bengal, is grantad furlough for one year six months and five days, under article 340 (*b*) of the Civil Service Regulations, with effect from the 15th January 1895, or any subsequent date on which he may avail himself of it.

1*st December* 1894. Na. 5340.—Mr. H. D. D. French, Deputy Conservator of Forests, Tista Forest Division, is granted furlough for one year seven months and 29 days, under article 340 (*b*) of the Civil Service Regulations, with effect from the 6th March 1895, or any subsequent date on which he may avail himself of it.

5*th December* 1894. No. 5401 —Mr. F. Trafford, Assistant Conservator of Forest, 2nd grade, is promoted substantively *pro tempore* to the 1st grade of Assistant Conservators with effect from the 7th May 1894, *vice* Mr. C. C. Hatt, Assistant Conservator of Forests, 1st grade, on deputation.

Mr. Trafford officiated as Deputy Conservator of Forests, 4th grade, for three months, with effect from the 6th August 1894, *vice* Mr. H. D. D. French, who was on privilege leave.

18*th December* 1894. No. 5684.—Mr. G. A. Richardson, Deputy Conservator of Forests, Buxa Forest Division, is granted privilege leave for three months, under article 291 of the Civil Service Regulations, with effect from the 13th December 1894, or any subsequent date on which he may be relieved.

Mr. W. F. Perree, Assistant Conservator of Forests, attached to the Darjeeling Forest Division, is posted to the charge of the Buxa Forest Division. during the absence, on leave, of Mr. Richardson, or until further orders.

5—N.-W. P. and Oudh Gazette.

6*th December* 1894.—No. 3984.—Mr. N. Hearle, Deputy Conservator of Forests, on return from furlough, is placed on special duty in the Bhabar and the Tarai, in the Naini Tal district, for the purpose of examining certain forest areas therein.

No. 3998.—Mr. E. McA. Moir, Deputy Conservator of Forests, on return from furlough, to the charge of the Jaunsár Forest Division of the School Circle.

13*th December* 1894.—No. 1148.—The Hon'ble the Lieutenant-Governor and Chief Commissioner is pleased to declare the undermentioned gentlemen to have passed the Departmental Examination of junior officers held on the 22nd October 1894 and following days, in the subjects specified below :—

Forest Law.

By the Higher Standard,

Pandit Sadanand Gairola (Extra Assistant Conservator).

Vernacular.

By the Lower Standard.

Mr. H. G. Billson (Assistant Conservator).

Precedure and Accounts.

By the Higher Standard.

Pandit Sadanand Gairola (Extra Assistant Conservator).

Mr. J. M. Blanchfield (Extra Assistant Conservator).

17*th December* 1894.—No. 4107.—Colonel J. E. Campbell, Deputy Conservator of Forests, on being relieved of the charge of the Central Circle, to the charge of the Garhwál Forest Division.

17*th December* 1894.—No. 4108.—Babu Raghu Nath Pathak, Extra Assistant Conservator of Forests, on being relieved of the charge of the Garhwal Forest Division by Colonel J. E. Campbell, to the Dicetion Division, Central Circle, Working Plans Branch.

6.—PUNJAB GAZETTE.

7th December 1894.—No. 602.—*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. F. Elliott.	Officiating Conservator of forests.	Deputy Conservator of Forests, 1st Grade,	10th Novr 1894.	Mr. Elliott reverts to his substantive appointment,—*vide* Government of India Notification No. 1186 F., dated 11th November 1894.
Mr. G. F. Prevost.	Officiating Deputy Conservator of Forests, 1st Grade.	Deputy Conservator of Forests, 2nd Grade.	Ditto.	
Mr. L. G. Smith.	Officiating Deputy Conservator of Forests 2nd Grade.	Deputy Conservator of Forests, 3rd Grade.	Ditto.	
Mr. R. J. P. Pinder.	Officiating Deputy Conservator of Forests, 3rd Grade.	Deputy Conservator of Forests, 4th Grade.	Ditto.	
Mr. C. S. Smith.	Officiating Deputy Conservator of Forests, 4th Grade	Assistant Conservator of Forests, 1st Grade.	Ditto.	
Mr. F. S. Barker.	Provisional Deputy Conservator of Forests. 3rd Grade (on sick leave).	Provisional Deputy Conservator of Forests, 3rd Grade.	11th Novr. 1894.	Mr. Barker returns from sick leave.
Mr. F. C. Hicks.	Officiating Deputy Conservator of Forests, 3rd Grade.	Deputy Conservator of Forests, 4th Grade.	Ditto.	
Mr. A. M. F. Caccia.	Officiating Deputy Conservator of Forests, 4th Grade.	Assistant Conservator of Forests, 1st Grade.	Ditto.	

24th December 1894.—No. 649.—*Notification*.—Mr. B. O. Coventry who has been appointed an Assistant Conservator of Forests of the 2nd Grade, and posted to the Punjab, reported his arrival at Bombay on the forenoon of the 21st November 1894 and at Lahore on the forenoon of the 27th idem.

Mr. Coventry is posted to the Rawalpindi Forest Division, where he reported his arrival on the afternoon of the 8th December, 1894.

7.—Central Provinces Gazette.

30th November 1894.—No. 5321.—With reference to Order No. 4676, dated the 24th October 1894, Mr. C. O. Hanson, Assistant Conservator of Forests and Working Plans Assistant, made over charge of his duties at Nagpur on the forenoon of the 14th November 1894, and assumed charge of his duties in the Chanda Forest Division on the forenoon of the 15th November 1894.

4th December 1894.—No. 5375.—With reference to Order No. 3883 dated the 29th August 1894, Mr. J. J. Hobday, Extra-Assistant Conservator of Forests, returned from the three months' privilege leave granted him by Order No. 3539, dated 9th August 1894, and resumed charge of the Sambalpur Forest Division from Mr. Narain Pershad, Forest Ranger, on the forenoon of the 20th November 1894.

15th December 1894.—No. 5569.—Mr. Henry E. Bartlett, Assistant Conservator of Forests, appointed by Her Majesty's Secretary of State for India to the Indian Forest Service, reported his arrival at Bombay on the 22nd ultimo and is posted to the Hoshangabad Forest Division as Working-Plans Assistant,

Mr. Bartlett assumed charge of his duties at Hoshangabad on the afternoon of the 26th ultimo.

19th December 1894.—No. 5642.—With reference to Government of India, Revenue and Agricultural Department, Notification No. 774-F, dated the 2nd August 1894, Mr. J. A. McKee, Conservator of Forests, on return from the eight month's medical leave granted him in Government of India, Rev and Agri. Dept. (Forests), Notification No. 452-F. dated the 3rd May 1894, assumed charge of the office of Conservator of Forests, Southern Circle, from Mr. G. G. Minniken, Officiating Conservator of Forests, on the forenoon of the 14th instant.

22nd December 1894.—No. 5711.—With reference to Order No. 4890, dated the 8th November 1894, Mr. F. S. Barker, Deputy Conservator of Forests, reported his arrival at Nagpur on the afternoon of the 10th ultimo, and assumed charge of the Chhindwara Forest Division from Mr. W. G. Gilmore, Forest Ranger, on the forenoon of the 22nd idem.

26th December 1894.—No 5743.—Privilege leave for three months, under Article 291 of the Civil Service Regulations, is granted to Mr. Ramchander, Extra Assistant Conservator of Forests, Chanda, with effect from sueh dated as he may be permitted to avail himself of it.

8.—Burma Gazette.

23rd November 1894.—No 447.—Under the provisions of Article 291 of the Civil Service Regulations privilege leaves for six days is grauted to Mr. C. W. Allan, Extra Assistant Conservator of Forests, in continuation of the leave granted to him in the this department Ootificarion No. 339, dated the 5th September 1894.

24th November 1894.—No. 448.—Mr, J. Messer, Assistant Conservator of Forests, is transferred from Rangoon to duty in the Shwegyin and Toungoo Forest divisions.

30th November 1894.—No, 23.—Mr. H. H. Forteath, Assistant Conservator of Forests, having returned from the three months and 15 days' privilege leave granted him in Revenue Department Notification No. 284 (Forests), dated the 1st August, 894, assumed charge of the Gangaw

subdivision of the Yaw Forest division, to which he was transferred in Revenue Department Notification No. 391 (Forests), dated the 19th October 1894, from Mr. D. H. Allan, Extra Assistant Conservator of Forests, on the affernoon of the 24th November 1894.

1st December 1894.—No. 23.—With reference to Revenue Department Notification No 448, dated the 24th November 1894, Mr. J. Messer, Assistant Conservator of Forests. relinquished charge of his duties as Personal Assistant to the Conservator on the afternoon of 17th November 1894.

3rd December 1894.—No. 24.—With reference to Revenue Department Notification No. 437 (Forests), dated the 20th November 1894, Mr. H. B. Anthony, Deputy Conservator of Forests, made over, and Mr. C. W. Palmer, Deputy Conservator of Forests, received, charge of the Henzada-Thongwa division on the afternoon of the 29th November 1894.

3rd December 8894.—No. 453.—In supersession of so much of this department Notification No. 391 (Forests), dated the 19th October 1894, as relates to Mr D. H. Allan, Extra Assistant Conservator of Forests. Mr. Allan, on being relieved of the charge of the Gangaw subdivision, Yaw Forests division, is posted to the charge of the Revenue subdivision of the Lower Chindwin Forest division.

5th December 1894.—No. 455.—Under the provisions of Article 291 of the Civil Service Regu-Iations privilege leave for three months is granted to Mr. E. B. Powell, Extra Assistant Conservator of Forests, with effect from the date on which he may avail himself of it.

No. 453.—So much of this department Notification No. 437 (Forests), dated the 20th November 1894, as refers to Mr. Jackson, is cancelled.

No. 457.—Mr. H. Jackson, Deputy Conservator of Forests, is transferred from the Southern Shan States Forest division to the charge of the Ruby Mines Forest division.

No. 462.—The Forest Officer in charge of the Magwe Forest snbdivision is appointed to succeed Mr. A. M. Burn-Murdoch as the Forest Officer who shall asssist the Forest Settlement Officer in the enquird ordered in this department Notification No. 240, dated the 13th October 1891, with regard to the Kyaukmigyaung, Kinmuntaung, Yinmale, any Ngaminchaung reserves.

6th December 1894.—No. 24.—Mr. T. H. Aplin, Deputy Conservator of Forests, made over, and Mr. D. H. Allan, Extra Assistant Conservator of Forests, received charge of the Alôn Revenue subdivision of the Lower Chindwin Forest division on the afternoon of the 28th November 1894.

6th December, 1894.—No. 25.—Mr. C. W. A. Bruce, Assistant Conservator of Forests, made over, and Mr. C. W. Allan, Extra Assistant Conservator of Forests, received, charge of the Kindat Revenue subdivision, Upper Chindwin Forest division, on the forenoon of the 1st Decem ber 1894.

6th December 1894.—No. 27.—Mr. C. S. Rogers, Extra Assistant Conservator of Forests, made over, and Mr. E. A. O'Bryen, Deputy Conservator of Forests, assumed. charge of the Myadaung subdivison on the afternoon of 12th November 1894 in addition to his other duties.

6*th December* 1894.—No. 28.—Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, reported his return from the two months and 15 days' privilege leave granted him in Revenue Department Notification No. 352 (Forests), dated the 11th September 1894, on the forenoon of 21st November 1894, and took over charge ef the Myadaung subdivision from Mr. E. A. O'Bryen, Deputy Conservator of Forests, on the same date.

7*th December* 1894 —No. 465.—Mr. F. Ryan, Extra Assistant Conservator of Forests, is trsnsferred from the Myanaung Forest subdivision to the charge to South Tharrawaddy Forest subdivisfon .

8*th December* 1894.—No. 8.—With reference to Revenue Department Notification No. 448 (Forests), dated the 24th November 1894, Mr. J. Messer, Assistant Conservator of Forests, reported himself for duty at Toungoo on the 19th November 1894.

12*th December* 1894.—No. 475.—The following postings and transfers are ordered in the Forest Department:—

Mr. J. W. Oliver, Conservator of Forests, on return from leave to the charge of the Eastern Forest Circle, Upper Burma.

Mr. F. B. Dickinson, Conservator of Forests, on being relieved by Mr. J. W, Oliver from the charge of the Eastern Forest Circle to the charge of the Western Forest Circle, Upper Burma, *vice* Mr. A. L. Home, transferred to Assam.

12*th December* 1894.—No. 476.—Mr. J. W. Oliver, Conservator of Forests, received charge of the Eastern Circle, Upper Burma, from Mr. F. B. Dickinson on the 7th November 1894, afternoon.

12*th December* 1894.—No. 477.—Mr. F. B. Dickinson, Conservators of Forest, received charge of the Western Circle, Upper Burma, from Mr. A. L. Home on the 8th November 1894, afternoon.

12*th December* 1894.—No. 478.—The undermentioned officer has been granted by Her Majesty's Secretary of State for India permission to return to duty within the period of his leave:—

Mr. A. M. Burn-Murdoch, Assistant Conservator of Forests.

14*th December* 1894.—No. 480.—Under the provisions of Article 291 of the Civil Service Regulations, privilege leave for one month is granted to Mr. R. F. Lowis, Extra Assistant Conservator of Forests, in extension of the leave granted to him in this department Notification No. 401 (Forests), dated the 29th October 1894.

15*th December* 1894.—No. 481.—Mr. C. W. Allan, Extra Assistant Conservator of Forests, is appointed to the charge of the Kindat Revenue subdivision, of the Upper Chindwin Forest Division, as a temporary measure in addition to his other duties, with effect from the 1st December 1894.

No. 482.—The following transfers of officers of the Forest Department are ordered:—

Mr. W. J. Lane-Ryan, Extra Assistant Conservator of Forests, from Toungoo to the charge of the Kyauksè subdivision of the Mandalay Forest division.

Mr. C. W. B. Anderson, Extra Assistant Conservator of Forests, from Kyauksè to the charge of the Mogôk subdivision of the Ruby Mines Forest division.

19*th December* 1894.—No. 25.—With reference to Revenue Department Notification No. 428F., dated the 8th November 1894. Mr J. T. Jellicoe, Deputy Conservator of Forests, made over, and Mr H. Carter, officiating Deputy Conservator of Forests, assumed, charge of the Rangoon division on the afternoon of the 6th December 1894.

No 26.—With reference to Revenue Department Notification No. 429F., dated the 8th November 1894, Mr. H. Carter, officiating Deputy Conservator of Forests, relinquished charge of the Working Plans division on the forenoon of the 6th December 1894.

20*th December* 1894.—No. 484.—Mr. D. H. Allan, Extra Assistant Conservator of Forests, 4th grade, on probation, is confirmed in his appointment with effect from the date of this notification.

22*nd December* 1894.—No. 458.—The following temporary reversions and promotions are ordered in the Forest Department :—

(1) With effect from the 4th November 1894, consequent on the return of Mr. C. E. Muriel, Deputy Conservator, 4th, officiating 3rd, grade, from privilege leave:

Mr. A. F. Gradon, Depvty Conservator, 4th, officiating 3rd, grade, to revert to his substantive rank.

Mr. G. Q. Corbett, Deputy Conservator, 4th, officiating 3rd grade, to revert to his substantive rank.

Mr. W. T. T. McHarg, Assistant Conservator, 1st grade officiating Deputy Conservator, 4th grade, to revert to his substantive rank.

Mr. S. Carr, F.C.H, Assistant Conservator, 2nd, officiating 1st grade, to revert to his substantive rank.

(2) With effect from the 15th November 1894, consequent on the return of Mr H. Jackson, Deputy Conservator, 4th grade, from privilege leave:

Mr. W. F. L. Tottenham, Assistant Conservator, 1st grade, officiating Deputy Conservator 4th grade, to revert to his substantive rank.

Mr. H. H. Forteath, Assistant Conservator, 2nd, officiating 1st, grade, to revert to his susbtantive rank.

(3) With effect from the 30th November 1894, consequent on the return of Mr. C. W. Palmer, Deputy Conservator of Forests, 2nd grade, from furlough :

Mr. B B. Ward, Deputy Conservator, 3rd, officiating 2nd, grade, to revert to his subtantive rank.

Mr. C. E. Muriel, Deputy Conservator, 4th, officiating 3rd, grade, to revert to his substantive rank.

Mr. E. A. O'Bryen, Assistant Conservator, 1st grade, officiating Deputy Conservator, 4th grade, to revert to his substantive rank

Mr. J. Messer, Assistant Conservator, 2nd, officiating 1st, grade, to revert to his substantive rank.

(4) With effect from the 7th December 1894, consequent on the departure of Mr. J. T. Jellicoe, Deputy Conservator. 1st grade, on furlough:

Mr. F. W. Thelluson Deputy Conservator, 9nd, to officiate as Deputy Conservator, 1st grade.

Mr. H. B. Ward, Deputy Conservator, 3rd, ta officiate as Deputy Conservator, 2nd grade.

Mr C. E. Muriel, Deputy Conservator, 4th, to officiate as Deputy Conservator, 3rd grade.

Mr. E. A. O'Bryen, Assstant Conservator 1st grade, to officiate as Deputy Conservator, 4th grade.

Mr J Messer, Assistant Conservator, 2nd, to officiate as Assistant Csnservator, 1st grade.

27*th December* 1894.—No. 490.—The following promotions are ordered in the Forest Department :—

Mr. R. F. Lowis, Extra Assistant Conservator of Forests, 4th grade' to be Extra Assistant Conservator, 3rd grade.

Mr. P. W. Healy, Extra Assitant Conservator of Forests, 4th grade. to be Extra Assistant Conservator, 3rd grade,

Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, 4th grade, to be Extra Assistant Conservator, 3rd grade.

9.—ASSAM GAZETTE.

30*th November* 1894.—No. 8011.—In continuation of Notification No. 7844G., dated the 22nd November 1894, the Chief Commissioner directs, on the report of the Central Examination Committee, the publication of the results of the half-yearly examination held on the 5th, 6th, 7th and 9th November 1894 of the Forest Officers named below.

Name.	Subjects taken up by candidates		Subjects in which passed.		Compulsory subject in which required to pass.	
	Higher Standard	Lower Standard	Higher Standard	Lower Standard	Higher Standard	Lower Standard
Assistant Conservator Mr. F. E. B. Lloyd ...	Land Revenue ... Forest Law ...		Land Revenue ... Forest Law. ...		Assamese	...
Extra Assistant Conservator. Babu Upendra Nath Kanjilal	Land Revenue ...		Land Revenue ..		Assamese	...
,, Kripa Nath De	Procedure and Accounts.		Procedure and Accounts.		Forest Law.	
,, Nilkanto Mukharjee	Assamese ... ... Procedure and Accounts.		Assamese ... .. Procedure and Accounts.			...

NOTE.—The last two columns are not meant to embody an exhaustive list of all the subjects and standards in which officers are liable to pass, and do not relieve any officer liable to examination, whether mentioned in this notification or not, from the duty of ascertaining for himself the subjects nd standards in which he is required to pass.

10.—Berar Gazette.

1*st December* 1894.—No. 420.—Mr. R. M. Williamson, Assistant Conservator of Forests, attached to the Ellichpur Division, is transferred to the Buldana Division on special duty until further orders.

18*th December* 1894.—No. 447.—The Resident has been pleased, under Article 184 of the Civil Service Regulations, to appoint Mr. H. Calthrop, while officiating as Conservator of Forests in the Hyderabad Assigned Districts, to retain charge of the Ellichpur Forest Division from the forenoon of the 27th August to the forenoon of the 14th September 1894.

11.—Mysoore Gaztte.

11*th December* 1894.—No. 9545—G. 2253.—The following appointments and promotions of Forest Officers are made under the scheme for the re-organization of the Forest Department sanctioned in Government Proceeding No. 8961-70-R. 1339, dated 2nd December 1894 :—

Mr. C. E. M. Russell, to be Deputy Conservator, 2nd Class.
Mr. F. Abdul Karim, ditto 3rd Class.
Mr. C. Narayana Rao, to be Assistant Conservator, 1st Class.
Mr. S. A. Bapu Rao, ditto 2nd Class.
Mr. Y. Sitaramaiaya, ditto ditto
Mr. H. Muttappa, ditto ditto
Mr. M. Venkatanaranappa, ditto ditto
Mr. B. Ramaswami Iyer, ditto 3rd Class.
Mr. B. Srinivasa Rao, ditto ditto.
Mr. G. E. Ricketts, ditto ditto.
Mr. B Hirasing, to be Sub-Assistant Conservator.
Mr. C. Appaiya, ditto ditto.
Mr. M. G. Rama Rao, ditto ditto.
Mr. K. Shamaiengar, ditto ditto.
Mr. A. Theobald, ditto ditto *on probation.*

2. Mr. J. J. Monteiro, 1st Class Ranger, is appointed to be an Extra Assistant Conservator.

X.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

8th January, 1895.—No. 7-F.—With reference to the Notification of this Department, No. 1309-F., dated the 14th ultimo, Mr. Smythies, Officiating Conservator of Forests, Assam, reverted, on being relieved by Mr. Home, to his substantive appointment of Deputy Conservator, 2nd grade, North-Western Provinces and Oudh, with effect from 21st December, 1894, and resumed charge of the office of Deputy Director of the Imperial Forest School from Mr. J. Nisbet, Deputy Conservator, 1st grade, Burma, on the 24th idem.

11th January, 1895.—No 21-F.—Mr. J. Nisbet, Deputy Conservator of Forests, 1st grade, Burma, is placed on special duty under the Inspector-General of Forests at Dehra Dun, with effect from 24th December, 1894, and until further orders.

2.—Madras Gazette.

20th December, 1894.—No. 1.—Mr. J. W. Cherry, Conservator of Forests, Southern Circle, is granted privilege leave for two months, with effect from or after the 15th January 1895, under article 291 of the Civil Service Regulations, 2nd edition.

20th December, 1894.—No. 4.—Mr. J. G. F. Marshall, District Forest Officer, North Malabar, is granted privilege leave for six weeks, under article 291 of the Civil Service Regulations,

20th December, 1894. No. 11.—Appointments.

No.	Name of officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
1	Mr. E. D. M. Hooper.	Deputy Conservator of Forests, 1st Grade.	Conservator of Forests, 3rd Grade.	Acting ...	During the absence of Mr. Cherry on privilege leave, or until further orders.
2	M.R.Ry. C. M. Maduranayagam Pillay.	Sub-Assistant Conservator 2nd Grade, sub. *pro tem.*	Extra Assistant Conservator, 4th Grade.	Do. ...	During the absence on furlough of Mr. Eber-Hardie, Extra Assistant Conservator, 1st Grade. To take retrospective effect from the 28th June 1894.

20*th December*, 1894. No. 12—Postings.

No.	Name of officer.	District.	Nature of charge	Remarks.
1	Mr. E. D. M. Hooper	Southern Circle.	Conservator of Forests.	During the absence of Mr. Cherry on leave, or until further orders.
2	M.R.Ry. V. Alwar Chetti Garu.	Bellary	District Forest Officer.	During the absence of No. 1 on other duty, or until further orders.

19*th December*, 1894. No. 13.—

No.	Name of officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
1	Mr. H. A. Gass	Deputy Conservator, 2nd Grade.	Deputy Conservator, 1st Grade.	Acting	During the absence of Mr. R. W. Morgan on furlough, or until further orders.
2	Mr. C. E. Brasier	do 3rd Grade	do 2nd Grade	do.	
3	Mr. E.R. Murray	do 4th Grade	do 3rd Grade	do.	
4	Mr. F. Foulkes	Assistant Conservator, 1st Grade.	do 4th Grade	do.	Do. but with effect from 18th January 1895.

6*th November*, 1894.—To Ranger P. Venkatakrishnama Naidu, Salem District, for twenty days, without pay, from the 19th November 1894. under article 372 of the Civil Service Regulations.

26*th December*, 1894.—V. Kalyanramier, Forest Ranger, 5th Grade, D.D.R., to act as Ranger, 4th Grade, from 8th August 1894, *vice* Mr. McCay, resigned.

L. Hanumanthulu, Forest Ranger, 5th Grade, D.D.R., to act as Ranger, 4th Grade, from 11th September 1894, *vice* Eggia Sastry, deceased.

11*th January*, 1894. *Transfer*.—Mr. M. S. Noronha, Ranger on Rs. 60, from South Canara to Madura.

15*th January*, 1894.—No. 34.—Arni Ratna Mudali, late acting forester, 4th grade, Kurnool district, having been convicted of criminal breach of trust and dismissed from his appointment, is hereby declared ineligible for further employment in the public service.

19*th January*, 1894.—P. Venkatakrishnama Nayudu, Ranger, Salem District, is granted extention of leave on half pay, under article 369 of the Civil Service Regulations, for forty days, from 8th December 1894.

25th January, 1894.—No. 39.—Notification No. 4, granting six weeks privilege leave to Mr. J. G. F. Marshall, District Forest Officer, North Malabar, which was published at page 13 of Part I of the *Fort St. George Gazette*, dated 8th January 1895, is hereby cancelled.

25th January, 1895.—Mr. J. W. Ryan, Ranger on Rs. 50, North Malabar Division, is granted privilege leave for six weeks, from 22nd December 1894, under article 291 of the Civil Service Regulations.

3.—BOMBAY GAZETTE.

22nd January, 1895.—No. 514.—Mr. W. A. Wallinger, Divisional Forest Officer, Surat, passed an examination in Gujarati on 9th January 1895.

29th January, 1895.—No. 729.—Mr. W. A. Talbot, Deputy Conservator of Forests, Third Grade, and Divisional Forest Officer, N. D., Kanara, is allowed privilege leave of absence for three months from 25th February 1895,

4.—BENGAL GAZETTE.

11th January, 1895.—No. 199.—Mr. H. H. Davis, Deputy Conservator of Forests, Darjeeling Forest Division, is posted to the charge of the Tista Forest Division.

Mr. H. D. D. French, Deputy Conservator of Forests, Tista Forest to the charge of the Darjeeling Forest Division.

15th January, 1895.—No. 292.—In supersession of paragraph 1 of Notification No. 4808-For., dated the 1st November, 1894, Babu Kedar Nath Mozumdar, Extra-Assistant Conservator of Forests, Anglu Forest Division, is granted privilege leave for three months, under article 291 of the Civil Service Regulation, with effect from the date on which he was relieved.

29th January, 1895.—No. 591.—Mr. C. C. Hatt, Assistant Conservator of Forests, 1st grade, is posted, on return from deputation to the Mohurbhanj State, to the charge of the Direction Division, and appointed to be Personal Assistant to the Conservator of Forests, Bengal, *vice* Mr. C. A. G. Lillingston, Deputy Conservator of Forests, proceeding on furlough.

5.—N.-W P. AND OUDH GAZETTE.

11th January 1895.—No. 161.—Babu Karuna Nidhan Mukarji, Extra Assistant Conservator of Forests, from the Jaunsar to the Dehra Dun Forest Divison of the School Circle, as a temporary measure.

11th January 1895.—No. 169.—Pandit Sada Nand Gairola, Extra Assistant Conservator of Forests, Saharanpur Forest Division, School Circle, privilege leave for one month, with effect from the 5th January 1895.

14*th January*, 1895.—No. 200.—The following reversions in the Forest Department are notified for general information :—

Entry No.	With effect from—	Consequent on—	Name.	From—	To—
1	4th December 1894.	Col. Campbell's reversion as Deputy Conservator, 1st grade.	Mr. E. A. Down	Officiating Deputy Conservator. 1st grade.	Officiating Deputy Conservator, 2nd grade.
			,, A. G. Hobart-Hampden	Officiating Deputy Conservator. 2nd grade.	Officiating Deputy Conservator, 3rd grade.
			,, L. Mercer	Officiating Deputy Conservator 3rd grade.	Deputy Conservator, 4th grade.
			,, A. P. Grenfell	Officiating Deputy Conservator, 4th grade.	Assistant Conservator, 1st grade.
2	24th December 1894.	Mr. N. Hearle's return from furlough.	Mr. F. B. Bryant	Officiating Deputy Conservator, 2nd grade.	Deputy Conservator, 3rd grade.
			,, B. A. Rebsch	Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade.
			,, B. B. Osmaston	Officiating Deputy Conservator, 4th grade.	Assistant Conservator; 1st grade.
			,, F. A. Leete	Officiating Assistant Conservator. 1st grade.	Assistant Conservator, 2nd grade.
3	3rd January 1895.	Mr. E. McA. Moir's return from furlough.	Mr. W. Shakespear	Officiating Deputy Conservator, 1st grade.	Deputy Conservator, 2nd grade.
			Mr. E. A. Down	Officiating Deputy Conservator, 2nd grade.	Deputy Conservator, 3rd grade.
			,, A. G. Hobart-Hampden	Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade.
			,, M. Hill	Officiating Deputy Conservator, 4th grade.	Assistant Conservator, 1st grade.
			,, J. G. Tulloch	Officiating Assistant Conservator, 1st grade.	Assistant Conservator, 2nd grade.

22*nd January*, 1895.—No. 300.—Mr. B. B. Osmaston, Assistant Conservator of Forests, on being relieved of the charge of the Jaunsar Forest Division by Mr. E. McA. Moir, to the charge of Saharanpur Forest Division.

6.—PUNJAB GAZETTE.

15*th January*, 1895.—No. 33 —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. G. G. Minniken	Officiating Conservator ...	Deputy Conservator, 1st grade,	14th Decr. 1894.	Mr. Minniken reverts to his substantive appointment, *vide* Government of India Notification No. 1319F., dated 21st December 1894.
Mr. F. O. Lemarchand	Officiating Deputy Conservator, 1st grade.	Deputy Conservator, 2nd grade.	Ditto.	
Mr. J. H. Lace	Officiating Deputy Conservator, 2nd grade.	Deputy Conservator, 3rd grade.	Ditto.	
Mr. H. Calthrop	Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade.	Ditto.	
Mr. P. H. Clutterbuck	Officiating Deputy Conservator, 4th grade.	Assistant Conservator, 1st grade,	Ditto.	

17*th January*, 1895.—No. 39.—With reference to Government of India Notification No. 1186 F., dated 16th November 1894, Mr. A. M. Reuther, Deputy Conservator of Forests, returned to Punjab and was attached to the Direction Division with effect from the forenoon of the 30th idem.

22*nd January*, 1895.—No. 50.—Messrs, R. J. P. Pinder and G. G. Minniken, Deputy Conservators of Forests, respectively made over and received charge of the Bashahr Forest Division on the forenoon of the 27th December 1894 consequent on the latter's transfer from the Central Provinces *vide* Government of India Notification No. 1319 F., dated 21st December 1894.

22*nd January*, 1895.—No. 54.—Lála Daulat Rám, Extra Assistant Conservator of Forests, and Mr. R. J. P. Pinder, Deputy Conservator of Forests, respectively made over and received charge of the Chenab Forest Division on the forenoon of 3rd January 1895.

Lála Daulat Rám remains attached to the Chenab Division.

29th January, 1895.—No. 77.—Mr. A. L. McIntire, Deputy Conservator of Forests, Punjab, is granted furlough for seventeen months, under Article 340 (*b*) of the Civil Service Regulations, with effect from 1st May 1895 or such subsequent date as he may avail himself of it.

Punjab Government Notification No. 475, dated 22nd September 1894, is hereby cancelled.

7.—CENTRAL PROVINCES GAZETTE.

19th January 1995.—No. 403. Mr. P. H. Clutterbuck, Officiating Dy. Conservator of Forests, is placed in charge of the Pranhita-Godavery Sub-Division during the absence on leave of Mr. Ramchander, Exra-Assistant Conservator of Forests, or until further orders.

8.—BURMA GAZETTE.

21st December 1894. No. 30—With reference to Revenue Department Notification No. 437, dated the 20th November 1894, Mr. H. Jackson, Deputy Conservator of Forests, made over, and Mr. H. B. Anthony, Deputy Conservator of Forests, assumed, charge of the Southern Shan States Forest division on the afternoon of the 15th December 1894.

2nd January 1895.—No. I.—Under the provisions of Article 291 of the Civil Service Regulations, privilege leave for one month is granted to Mr. R. F. Lowis, Extra Assistant Conservator of Forests, in extension of the leave granted to him in this department Notification No. 480, dated the 14th December 1894.

2nd January 1895.—No. 2.—Mr. F. J. Rivett, Forest Ranger, is appointed to be an Extra Assistant Conservator of Forests, on probation, with effect from the date of the retirement of Maung Kale, and is transferred from Mandalay to the charge of the North Tharrawaddy Forest subdivision.

5th January 1895.—No. I.—With reference to Revenue Department Notification No 482 (Forests), dated the 14th December 1894, Mr. C. W. B. Anderson, Extra Assistant Conservator of Forests, made over, and Mr. W.J. Lane-Ryan, Extra Assistant Conservator of Forests, assumed, charge of the Kyaukse subdivision on the afternoon of the 12th December 1894.

10th January 1895.—No. 2.—With reference to Revenue Department Notification No. 457 (Forests), dated the 5th December 1894, Mr. C. R. Dun, Assistant Conservator of Forests, made over, and Mr. H. Jackson, Deputy Conservator of Forests, assumed, charge of, the Ruby Mines division on the afternoon of the 14th January 1895.

13th January 1895 —No. 1.—Mr. E B. Powell, Extra Assistant Conservator of Forests, availed himself on the forenoon of the 1st January 1895 of the privilege leave granted him in Revenue Department Notification No. 455, dated the 5th December 1894.

No. 2 —With reference to Revenue Department Notification No. 465F., dated the 7th December 1894, Mr. E. B. Powell, Extra Assistant Conservator of Forests, made over, and Mr. F. Ryan, Extra Assistant Conservator of Forests, assumed, charge of the South Tharrawaddy subdivision on the afternoon of the 31st December 1894.

21*st January* 1895.—No. 25.—The following alterations of rank are ordered in the Forest Department with effect from the 24th December 1894, on which date Mr. J. Nisbet, Deputy Conservator, 1st grade, was placed on special duty under the orders of the Inspector-General of Forests to the Government of India :—

Mr. T. H. Aplin, Deputy Conservator, 1st grade, substantive *pro tem.*, to be Deputy Conservator, 2nd grade, and to officiate as Deputy Conservator, 1st grade.

Mr. E. S. Carr, Deputy Conservator, 2nd grade, substantive *pro tem*, to be Deputy Conservator, 3rd grade, and to officiate as Deputy Conservator, 2nd grade.

Mr. H. B. Anthony, Deputy Conservator, 3rd grade, substantive *pro tem.*, to be Deputy Conservator, 4th grade, and to officiate as Deputy Conservator, 3rd grade.

Mr. F. J. Branthwaite, Deputy Conservator, 4th grade, substantive *pro tem.*, to be Assistant Conservator, 1st grade, and to officiate as Deputy Conservator, 4th grade.

Mr. C. R. Dun, Assistant Conservator, 1st grade, substantive *pro tem*, to be Assistant Conservator 2nd grade. and to officiate as Assistant Conservator, 1st grade.

9.—Assam Gazette.

11*th January* 1895.—No. 149G.—In consequence of the retirement of Mr. R. H. M. Ellis, Deputy Conservator of Forests, Second Grade, (Officiating First Grade), the following substantive and acting promotions are notified with effect from the 18th December 1894 :

Mr. J. L. Pigot, Deputy Conservator of Forests, Third Grade (Officiating Second Grade), to Deputy Conservator of Forests, Second Grade, and to officiate as Deputy Conservator of Forests, First Grade (seconded).

Mr. D. P. Copeland, Deputy Conservator of Forests, Fourth Grade (provisional Third Grade), to be Deputy Conservator of Forests, Third Grade (provisional Second Grade), and to officiate as Deputy Conservator of Forests, First Grade.

Mr. H. G. Young, Deputy Conservator of Forests, Fourth Grade (on furlough), to be Deputy Conservator of Forests, Third Grade (provisional).

Mr. T. J. Campbell, Deputy Conservator of Forests, Fourth Grade (Officiating Third Grade), to officiate as Deputy Conservator of Forests, Second Grade.

Mr. J. E. Barrett, Assistant Conservator of Forests, First Grade (provisional Deputy Conservator, Fourth Grade), to be Deputy Conservator Forests, Fourth Grade, and to officiate as Deputy Conservator of Forests, Third Grade.

Mr. W. F. Lloyd, Assistant Conservator of Forests, First Grade, to be Deputy Conservator of Forests, Fourth Grade (provisional).

Mr. H. S. Ker-Edie, Assistant Conservator of Forests, Second Grade (provisional First Grade), to be Assistant Conservator of Forests, first Grade), and to officiate as Deputy Conservator of Forests, Fourth Grade.

Mr. A. M Long, Officiating Assistant Conservator of Forests, First Grade, to be Assistant Conservator of Forests, First Grade (provisional,) and to officiate as Deputy Conservator of Forests, Fourth Grade.

X.—EXTRACTS FROM OFFICIAL GAZETTES.

2.—Madras Gazette.

1*st February*, 1895,—No. 55.—

No.	Name of Officer.	District.	Nature of charge.	Remarks.
...	H. Tireman, Assistant Conservator of Forests, 2nd Grade.	Nilgiris ...	..	To do duty under the District Forest Officer.

3*rd February* 1895.—*Departmental Test.*—The following is the result of the Departmental Test held in January 1895 :—

Name.	Appointment.	District.	Subjects in which passed.
K. Rajamannar ...	Temporary Forester	Nellore ...	Forest Act and Rules.
V. Tiruvengada Mudali	Forest Settlement Clerk, District Forest Office.	Do. ...	Code and Accounts.
A. Krishna Rao ...	Permit Clerk ...	Salem ...	Forest Act and Rules.
C. S. Arogyaswami Pillai ...	Forester, 4th grade	Do. ...	Code and Accounts.
Mohammad Abdul Ali Sahib ...	Do. 1st grade, acting.	North Arcot	Do.
C. Balaya Nayudu ...	Do. 4th grade	Cuddapah	Forest Act and Rules and Code and Accounts.
P. Sivaraja Mudaliar	Do. do. ...	Do.	Code and Accounts.
T. Muniswami Naicker ...	Do. do. ...	South Arcot	Forest Act and Rules and Code and Accounts.

7*th February*, 1895.—To Ranger Mr. W. H. Blacker, under Article 291 of the Civil Service Regulations, for one month from date of relief.

9*th February*, 1895.—V. P. Ramalingam Pillai, Ranger on Rs. 125, North Malabar Division, is granted furlough for three months on medical certificate, under Article 371 of the Civil Service Regulations, from 18th December, 1894.

Coimbatore, 20th January 1895.

9*th February*, 1895.—The four months' leave on medical certificate, under Article 369 of the Civil Service Regulations, granted to Mr. H. E. Kelly, Ranger on Rs. 50, South Coimbatore Division, from 15th July 1894, is extended by one year and three months.

Fort St. George, 12*th February*, 1895.—No. 70.—Mr. G. Hadfield, District Forest Officer, South Malabar, is granted privilege leave for two months and twenty-seven days with effect from 1st March 1895, under Article 291 of the Civil Service Regulations.

POSTING.

Fort St. George.—11*th February*, 1895.—*No.* 71—

No.	Name of officer.	District.	Nature of charge	Remarks.
1	Mr. C. A. Eber Hardie, Extra Assistant Conservator of Forests, 1st grade.	South Malabar	Acting District Forest Officer.	During the absence of Mr. G. Hadfield on leave, or until further orders. To join on return from furlough.

13*th February*, 1895.—To Ranger V. C. Doraiswami Pillai for two months, from 17th January 1895, under Article 369 of the Civil Service Regulations.

(1) Mr. W. R. Newman, 1st-grade Ranger, is transferred from Kurnool to Godavari.

(2) K. Rama Row, 5th grade Ranger, is transferred from Bellary to Kurnool.

(3) Eggia Narayana Sastri, Acting 5th grade Ranger, is transferred from Anantapur to Bellary.

12*th February*, 1895.—P. Ramasami Aiya, Forester, 1st grade, from 16th December 1894, during the absence on leave of Ranger Arokasami Pillai.

18*th February*, 1895.—Mr. W. H. Blacker, Ranger, from North Arcot, to South Arcot, in the interests of the public service. To join after expiry of privilege leave already granted.

3.—Bombay Gazette.

31*st January*, 1895.—Mr. E. G. Oliver, Deputy Conservator of Forests, who was granted privilege leave for one month in this Office No. 5709, dated 5th January 1895, delivered over charge of the Working Plans Division, Party No. 1, S. C., to Mr. Haripad Mitra, Extra Assistant Conservator of Forests, on the afternoon of the 27th January 1895.

8*th February*, 1895.—No. 1051.—Mr. C. Greatheed, Deputy Conservator of Forests, 3rd grade, and Divisional Forest Officer, East Thana, is allowed privilege leave of absence for two months and eleven days from 20th March 1895.

8*th February*, 1895.—In exercise of the power vested in Conservators of Forests under Government Resolution No. 2569, dated 3rd April 1889, in the Revenue Department, Mr. H. W. Keys, Deputy Conservator of Forests and Divisional Forest Officer of West Khandesh, was granted privilege leave of absence for one month, *viz.*, from 17th October to 10th November 1894, both days inclusive.

9th February, 1895.—Mr. Shesho Manju, Extra Assistant Conservator of Forests, who was allowed privilege leave of absence for three months in Government Resolution No. 10411, dated 18th December 1894, availed himself, of the same on the forenoon of the 21st January 1895, handing over charge of the Supa Sub-division to Mr. G. J. Rege, appointed acting Extra Assistant Conservator of Forests in Government Resolution No. 10550, 21st December 1894.

11th February, 1895.—No. 1137.—His Excellency the Governor in Council is pleased to appoint Mr. G. P. Millett to hold charge of the office of Divisional Forest Officer, East Thana, in addition to his own duties, during the absence of Mr. C. Greatheed on privilege leave or pending further orders.

23rd February, 1895.—No, 1552.—Mr. T. B. Fry, Deputy Conservator of Forests, 2nd grade, and Divisional Forest Officer, Dharwar, is allowed furlough for fourteen months.

23rd February, 1895.—No 1553.—Mr. H. Mainwaring, Deputy Conservator of Forests, 2nd grade, and Divisional Forest Officer, Bijapur, is allowed privilege leave of absence for two months with effect from 7th March 1895.

26th February 1895.—No. 1597.—His Excellency the Governor in Council is pleased to make the following appointments:—

Mr. G. K. Betham to do duty as Divisional Forest Officer, Dharwar, with effect from the date of Mr. Fry's departure on leave, pending further orders.

Mr. Dattatraya Manjunath Bijur to relieve Mr. Betham as Divisional Forest Officer, S. D., Kanara, till the close of the tour season, and thereafter Mr. E. G. Oliver to act as Divisional Forest Officer, S. D., Kanara, in addition to his other duties, pending further others, with headquarters at Dharwar.

4.—Bengal Gazette.

11th February, 1895.—No. 795.—The following officiating promotions are made among the officers on the Provincial List of the Indian Forest Service, with effect from the 22nd December 1894, during the absence, on three months' privilege leave, of Mr. G. A. Richardson, Officiating Deputy Conservator of Forests, 2nd grade, or until further orders :—

Mr. W. M. Green, Deputy Conservator of Forests, 3rd grade, to officiate in the 2nd grade of Deputy Conservators.

Mr. H. D. D. French, Deputy Conservator of Forests, 4th grade (provisional), to officiate in the 3rd grade of Deputy Conservators.

Mr. F. Trafford, Assistant Conservator of Forests, 1st grade, substantive *pro tempore*, to officiate in the 4th grade of Deputy Conservators.

12th February, 1895.—No. 798.—Babu Sridhur Chuckerbutty, Extra-Assistant Conservator of Forests, Puri Forest Division, is granted privilege leave for three months, under Article 291 of the Civil Service Regulations, with effect from the 15th February 1895, or any subsequent date on which he may be relieved.

Mr. E. E. Slane, Extra-Assistant Conservator of Forests, attached to the Sundarbans Forest Division, is posted to the charge of the Puri

Forest Division, during the absence, on leave, of Babu Sridhur Chuckerbutty, or until further orders.

22*nd February*, 1895.—No. 1031.—Mr. C. C. Hatt, Assistant Conservator of Forests, in charge of the Direction Division and Personal Assistant to the Conservator of Forests, Bengal, is temporarily posted to the charge of the Darjeeling Forest Division, with effect from the date on which he relieves Mr. H. D. D. French, Deputy Conservator of Forests, proceeding on furlough.

Mr. Hatt will retain charge of the Direction Division in addition to that of the Darjeeling Forest Division until further orders.

22*nd February*, 1895.—No. 1036.—Mr. R. L. Heinig, Deputy Conservator of Forests, in charge Sundarbans Forest Division, is granted three months' privilege leave under Article 291 of the Civil Service Regulations, with effect from the 22nd March 1895, or any subsequent date on which he is relieved of his duties.

Mr. G. A. Richardson, Deputy Conservator of Forests, is posted to the charge of the Sundarbans Forest Division, on return from the three months' privilege leave granted to him in Notification No. 5684-For., dated 18th December 1894.

5.—N.-W P. AND OUDH GAZETTE.

13*th February*. 1895.—No. 522.—Mr. E. L. Haslett, Extra Assistant Conservator of Forests, attached to the Naini Tal Forest Division of the Central Circle, leave on medical certificate for seven months, with effect from the 4th September 1894.

18*th February*, 1895.—No. 605.—On completion of the special duty to which he was appointed by Notification No. 3984, dated 6th December 1894, Mr. N. Hearle, Deputy Conservator of Forests, to the charge of the Pilibhit Forest Division of the Oudh Circle.

18*th February*, 1895.—No. 630.—Pandit Sada Nand Gairola, Extra Assistant Conservator of Forests, Saharanpur Forest Division. privilege leave for fifteen days in extension of that granted him by Notification No. 169, dated the 11th January 1895,

27*th February*, 1895.—No. 700.—Pandit Sadanand Gairola, Extra Assistant Conservator of Forests, in charge of the Shaharanpur Forest, Division of the School Circle, on return from leave to be attached to the Direction Division of the same Circle, as a temporary measure.

6.—PUNJAB GAZETTE.

1*st February*, 1895.—No. 93.—Mr. R. J. P. Pinder, Deputy Conservator of Forests, Chenab Division, is granted furlough for 18 months with effect from the 15th April 1895, or such subsequent date as he may avail himself of it.

9*th February*, 1895.—No. 115.—Babu Ladha Singh and Lala Daulat Ram, Extra Assistant Conservators of Forest, respectively made over and received charge of the Mooltan Forest Division, on the afternoon of the 20th January 1895, consequent on the former proceeding on 36 days' privilege leave.

12*th February*, 1895.—No. 123.—Mr. Fazl-ud-din II, Extra Assistant Conservator of Forests, is granted privilege leave of absence for two months, under Article 91, Civil Service Regulations, and availed himself of it with effect from the afternoon of the 31st January 1895.

7.—Central Provinces Gazette.

9*th February* 1895.—No. 723.—Privilege leave for twelve days, under Article 291 of the Civil Service Regulations, was granted to Mr. G. F. Taylor, Deputy Conservator of Forests, Saugor, from the 5th to the 16th November 1894 (both dates inclusive).

21*st February* 1895.—No. 908.—Mr. R. C. Milward, Assistant Conservator of Forests, Central Provinces, has been granted by Her Majesty's Secretary of State for India, furlough on medical certificate to the end of June 1895, in extension of the six months' furlough granted him by Order No. 4844, dated the 7th November 1894.

8.—Burma Gazette.

25*th January* 1895.—No. 1.—With reference to Revenue Department Notification No. 391 (Forests), dated the 11th October 1894, Mr. C. W. Allan, Extra Assistant Conservator of Forests, made over, and Mr. A. M. Burn-Murdoch, Assistant Conservator of Forests, received, charge of the Paungbyin subdivision, Upper Chindwin Forest division, on the forenoon of the 31st December 1894.

28*th January* 1895.—No. 32.—On being relieved of his duties in the Tharrawaddy division Mr. C. R. Dun, Assistant Conservator of Forests 2nd (Officiating 1st) grade, is posted to Fort White for special duty in the Chin Hills.

1*st February* 1895.—No. 3.—With reference to Revenue Department Notification No. 437, dated the 20th November 1894, Mr. C. R. Dun, Assistant Conservator of Forests, joined the Tharrawaddy division, for special duty, with effect from the afternoon of the 13th January 1895.

8*th February* 1895.—No. 45.—Mr. R. F. Lowis, Extra Assistant Conservator of Forests, on return from leave, is posted to the charge of the Revenue subdivision of the Mandalay Forest division.

18*th February* 1895.—No. 4.—With reference to Revenue Department Notification No. 2F, dated the 2nd January 1895, Mr. F. J. Rivett, Probationary Extra Assistant Conservator of Forests, assumed charge of the North Tharrawaddy subdivision from Maung Kale, Extra Assistant Conservator of Forests, on the forenoon of the 14th January 1895, from which date the latter officer retired from the public service.

9.—Assam Gazette.

11*th February* 1895.—No. 824G.—Babu Jogesvar Sur, Extra Assistant Conservator of Forests, on return from leave, is attached to the Lakh impur Forest Division.

10.—HYDERABAD RESIDENCY GAZETTE.

23*rd February* 1895.—No. 59.—With reference to *Residency Orders* Notification No. 99, dated the 22nd March 1894, Mr. W. G. J. Peake, Probationary Extra Assistant Conservator of Forests in Berar, is appointed to be an Extra Assistant Conservator of Forests of the 4th grade, with effect from the 20th January 1895.

11.—MYSORE GAZETTE.

26*th February*, 1895.—No. 15014.—G. 2910.—Under Article 172 of the Mysore Service Regulations, Mr. J. J. Monteiro, Extra Assistant Conservator of Forests, Shimoga District, has been granted casual leave of absence for twelve days with effect from the 16th February 1895.

X.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India

5th March, 1895.—No. 291-F.—With reference to the Notification of this Department, No. 280-46 (General), dated the 31st January last, Mr. H. C. Hill, Conservator of Forests, 1st grade, Central Circle, North-Western Provinces and Oudh, is appointed to officiate as Inspector General of Forests to the Government of India during Mr. Ribbentrop's absence on furlough, or until further orders. Mr. Hill assumed charge of the office of Inspector General of Forests from Mr. Ribbentrop on the afternoon of 18th February, 1895.

8th March, 1895.—No. 302-F.—Mr. J. Nisbet, Deputy Conservator of Forests, 1st grade, on special duty, is appointed to officiate as Conservator, 3rd grade, in charge of the Tenasserim Forest Circle, Lower Burma, during the absence on furlough of Lieutenant-Colonel C. T. Bingham, or until further orders.

15th March, 1895.—No 314-F.—The undermentioned officers, who have been appointed by Her Majesty's Secretary of State to the Forest Department of India, are appointed to be Assistant Conservators of the 2nd grade, with effect from the dates specified opposite their names, and are posted to the provinces noted below :—

Mr. B. O Coventry, Punjab, 23rd November, 1894.
Mr. H. E. Bartlett, Central Provinces, 22nd November, 1894.
Mr. H. A. Farrington, Bengal, 30th November, 1895.
Mr. A. St. V. Beechey, Central Provinces, 21st November, 1894.
Mr. J. W. A. Grieve, Bengal, 30th November, 1894.
Mr. H. M. Lawson, Assam, 26th October, 1894.

15th March, 1895.—No. 327-F.—In continuation of the Department, No. 291-F., dated the 5th instant, the following arrangements have been made during the period of Mr. Hill's appointment as Officiating Inspector General of Forests, or until further orders :—

(i) Mr. E. P. Dansey, Conservator, 2nd grade, Punjab, to officiate in the 1st grade with effect from 19th February, 1895, and to hold charge of the Central Forest Circle, North-Western Provinces and Oudh, with effect from 5th March, 1895.

(ii) Mr. P. J. Carter, Conservator, 3rd grade, Pegu Circle, Lower Burma, to officiate in the 2nd grade, with effect from 19th February, 1895.

(iii) Mr. C. E. Elliott, Deputy Conservator, Baluchistan, to officiate in the 3rd grade of Conservators, and to hold charge of the Punjab Forest Circle, with effect from 28th February, 1895.

(iv) Mr. A. M. Reuther, Deputy Conservator, Punjab, to hold charge of the Baluchistan Forests, with effect from 25th February, 1895,

(v) Colonel J. E. Campbell, I.S.C,, Deputy Conservator, North-Western Provinces and Oudh, officiated as Conservator, 3rd grade, in charge of the Central Forest Circle, from 10th February to 4th March, 1895, both dates inclusive,.

2.—MADRAS GAZETTE.

1*st March*, 1895.—*Errata.*—In the last column of the results of the Departmental Test published at page 129, Part II of the *Fort St. George Gazette*, dated 5th February, 1895, against C. Balaya Naidu, Forester, 4th grade Cuddapah, *for* "Forest Act and Rules and Code and Accounts" *read* "Code and Accounts," and against P. Sivaraja Mudaliar, Forester 4th grade, Cuddapah, *for* "Code and Accounts" *read* "Forest Act and Rules and Code and Accounts."

5*th March*, 1895.—No. 104.—M. D. Ponnaranga Mudaliar, late a Forester in the North Arcot district, having been convicted of an offence under section 409, Indian Penal Code, and dismissed from his appointment, is hereby declared ineligible for further employment in the public service.

13*th March*, 1895.—No. 106.—Mr. J W. Cherry, Conservator of Forests, Southern Circle, is granted extension of privilege leave for seven days, in continuation of the two months' leave notified at page 13, Part I of the *Fort St. George Gazette*, dated January 8, 1895.

22*nd March*, 1895.—No. 142.—

No.	Name of officer.	District.	Nature of charge.	Remarks.
1	Mr. P. M. Lushington, Deputy Conservator of Forests, 4th grade.	South Coimbatore.	Acting District Forest Officer.	During the absence of Mr. F. C. L. Cowley Brown on privilege leave, or until further orders.
3	Mr. J. L. MacC O'Leary, Assistant Conservator of Forests, 2nd grade.	Kistna.	Do.	During the absence of Mr. A. W. Lushington on privilege leave or until further orders.

25*th March*, 1895.—No. 138.—Mr. A. W. Lushington, District Forest Officer, Kistna, is granted privilege leave for two months and three days, with effect from or after the 9th April, 1895, under Article 291 of the Civil Service Regulations.

25*th March*, 1895.—No. 139.—Mr. F L C. Cowley-Brown, Acting District Forest Officer, South Coimbatore, is granted privilege leave for three months, with effect from or after the 1st April, 1895, under Article 291 of the Civil Service Regulations.

3.—BOMBAY GAZETTE.

4*th March*, 1895.—Mr. E. G Oliver, Deputy Conservator of Forests, who was on one month's privilege leave from 28th January, 1895, returned to duty and received charge of the Working Plans Division, Party No. I, S. C., from Mr. H. Mitra on the afternoon of the 27th February, 1895.

8*th March*, 1895.—W. A. Talbot, Deputy Conservator of Forests, proceeded on three months' privilege leave sanctioned in Government Resolution No 729, dated 29th January, 1895, on the forenoon of 1st

March, 1895, delivering over charge of the Northern Division of Kanara to Mr. H. Murray, Deputy Conservator and Divisional Forest Officer, Belgaum.

9th March, 1895.—No. 1959.—Mr. V. D. P. Rebeiro, L. C. E., Extra Assistant Conservator of Forests, 3rd grade, and Sub-Divisional Forest Officer, West Thána, was allowed privilege leave of absence for one month and fifteen days from 3rd January, 1895.

11th March, 1895.—Mr. Waman Ramchandra Gaunde, Extra Assistant Conservator of Forests, 1st grade, and sub-Divisional Forest Officer, Dáhánu, has been granted one month's privilege leave from 23rd February to 22nd March, 1895.

11th March, 1895.—Mr. Waman Ramchandra Gaunde, Extra Assistant Conservator of Forests, 1st grade, delivered over and Mr. Hasan Alli Mahomed Alli, Forest Ranger, 1st grade, received charge of the Dáhánu Sub-Division Forest Office on the forenoon of the 23rd February, 1895.

11th March, 1895.—Mr. V. P. Ribeiro, Extra Assistant Conservator of Forests, 3rd grade, who was granted one-and-a-half month's privilege leave from the 3rd of January to 17th February 1895, returned to duty on the 18th February, 1895, and resumed charge of the Bassein Sub-Division Forest Office in the forenoon.

16th March, 1895.—No. 2119.—His Excellency the Governor in Council is pleased to appoint Mr. G. R. Duxbury to act as Divisional Forest Officer, Násik, with effect from the date of Mr. Hight's departure on leave, pending other arrangements

22nd March, 1895.—Mr. H. Mainwaring, Deputy Conservator of Forests and Divisional Forest Officer, Bijápur, who was granted privilege leave of absence for two months in Government Resolution No. 1553, dated 23rd February, 1895, availed himself of the same on the forenoon of 12th March, 1895, handing over charge of the Bijápur Division to Mr. T. B. Fry, Divisional Forest Officer, Dhárwár.

23rd March, 1895.—In exercise of the power vested in Conservators of Forests under Government Resolution No. 2569, dated 3rd April 1889, in the Revenue Department, Mr. W. F. D. Fisher, Assistant Conservator of Forests and Divisional Forest Officer, Sholápur, has been granted privilege leave of absence for one month from the 9th March 1895.

23rd March, 1895.—Messrs. W. F. D. Fisher, Assistant Conservator of Forests, and G. S. Hinge, Extra Assistant Conservator of Forests, respectively delivered over and received charge of the Sholàpur Divison on the 8th March, 1895, after office hours.

23rd March, 1895.—Messrs. G. S. Hinge, Extra Assistant Conservator, and D. A. Thomson, Assistant Conservator of Forests, respectively delivered over and received charge of the Sub-Division Forest Office, Satára, on the 5th March 1895, in the afternoon.

23rd March, 1895.—No. 2377.—His Excellency the Governor in Council is pleased to order the following reversions on the return of Mr. J. M. Fernandez to British service :—

Mr. W. A. Wallinger to be 2nd grade Extra Assistant Conservator of Forests.

Mr. A. C. Robinson, L. C. E., to be 3rd grade Extra Assistant Conservator of Forests.

Mr. J. M. Fernandez to do duty as Extra Assistant Conservator of Forests, Ratnàgiri.

Mr. Balvant Ganesh Deshpande to do duty as Extra Assistant Conservator of Forests, Sind.

25th March, 1895.—Mr. C. Greatheed, Deputy Conservator of Forests, 3rd grade, delivered over, and Mr. G. P. Millett, Deputy Conservator of Forests, 4th grade, and Divisional Forest Officer, Working Plans, Northern Circle, received charge of, the East Thána Divisional Forest Office in the afternoon of the 19th March, 1895.

4.—Bengal Gazette.

1st March, 1895.—No. 1200.—Mr. J. P. Haslett, Forest Ranger, Central Provinces, is, on transfer to Bengal, attached to the Darjeeling Forest Division for ordinary duty until further orders; he is appointed to be an Extra-Assistant Conservator of Forests, 4th grade, (supernumerary), with effect from the 1st March, 1895.

8th March, 1895.—No. 1363.—In continuation of Notification, No. 795-For., dated the 11th February, 1895, Mr. C. G. Rogers, Deputy Conservator of Forests, 4th grade (seconded), is appointed to officiate in the 3rd grade of Deputy Conservator of Forests, during the absence, on privilege leave, of Mr. G. A. Richardson, or until further orders.

8th March, 1895.—No. 1366.—Mr. H. H. Haines, F. C. H., Assistant Conservator of Forests, 1st grade, Officiating Deputy Conservator, 4th grade, is promoted to officiate in the 3rd grade of Deputy Conservators with effect from the 27th January, 1895, during the absence, on furlough, of Mr. C. A. G. Lillingston, or until further orders.

8th March, 1895.—No. 1381.—The following reversion and promotion are made among the Officers on the Provincial List of the Indian Forest Service with effect from the 1st February, 1895, and until further orders, in consequence of the return from deputation to the Mohurbhunj State of Mr. C. C. Hatt, Assistant Conservator of Forests, 1st grade:—

Mr. F. Trafford, Assistant Conservator, 1st grade, substantive *pro tempore* and Officiating Deputy Conservator, 4th grade, to revert to Assistant Conservator, 2nd grade, but to continue to officiate in the 4th grade of Deputy Conservators

Mr. C. C. Hatt, Assistant Conservator of Forests, 1st grade (provisional), to officiate in the 4th grade of Deputy Conservators.

16th March, 1895.—No. 1513.—Mr. F. B. Manson, Deputy Conservator of Forests, is, on return to duty from leave, posted to the charge of the Darjeeling Forest Division, *vice* Mr. C. C. Hatt, Assistant Conservator of Forests, transferred.

Mr. C.C. Hatt, Assistant Conservator, on being relieved of the charge of the Darjeeling Forest Division, is re-appointed to be Personal Assistant to the Conservator of Forests, Bengal.

19th March, 1895.—No. 1536.—Mr E. G. Chester, Deputy Conservator of Forests, is, on return from leave, posted to the charge of the Singhbhum Forest Division.

Mr. W. H. Lovegrove, Officiating Deputy Conservator of Forests, is, on being relieved of the charge of the Singhbhum Forest Division, temporarily attached to that Division.

6.—PUNJAB GAZETTE.

19*th March*, 1895.—No. 178.—Lala Daulat Ram and Babu Ladha Singh, Extra Assistant Conservators of Forests, respectively made over and received charge of the Mooltan Forest Division on the afternoon of the 3rd March, 1895, consequent on the latter's return from 36 days' privilege leave.

2. Lala Daulat Ram is re-transferred to the Chenab Forest Division.

No. 180.—*Leave*.—Bhai Sadhu Singh, Extra Assistant Conservator of Forests, Jhelum Division, has been granted two months' privilege leave, under Article 291 of the Civil Service regulations, with effect from the afternoon of the 11th February, 1895.

26*th March*, 1895.—No. 194—A. L. No. 7.—Mr. A. V. Monro, Officiating Deputy Conservator of Forests, Punjab, is granted privilege leave of absence for 2 months and 25 days, under Articles 277 and 299 of the Civil Service Regulations, with effect from the 1st May, 1895, or such subsequent date as he may avail himself of it.

7.—CENTRAL PROVINCES GAZETTE.

19*th March*, 1895.—No. 1369.—The Chief Commissioner is pleased to invest all Forest Officers holding charge of Forest Divisions, with the powers defined in Section 71 of Act VII of 1878 (the Indian Forest Act) to be exercised within the limits of their respective Divisions.

19*th March*, 1895.—No 1383.—Mr. Ramchander Krishna, Extra-Assistant Conservator of Forests, Chanda Division, availed himself, on the afternoon of the 16th February, 1895, of the three months' privilege leave granted him by Order No. 5743, dated the 26th December, 1894, making over charge of the Pranhita-Godavery Sub-Division to Mr. P. H. Clutterbuck, Assistant Conservator of Forests, in addition to his other duties as Working-Plans Officer in the Chanda Division.

8.—BURMA GAZETTE.

23*rd February*, 1895.—No. 4.—With reference to Revenue Department Notification No. 1, dated the 2nd January, 1895, Mr. R. F. Lowis, Extra Assistant Conservator of Forests, reported his return from the one month's privilege leave granted him in extension of the two months' leave previously granted, on the afternoon of the 19th February, 1895, and took over charge of the Revenue subdivision of the Mandalay Forest division on the afternoon of the 20th idem.

27*th February*, 1895.—No. 5.—With reference to Revenue Department Notification No. 32, dated the 28th January 1895, Mr. C. R. Dun, Assistant Conservator of Forests, relinquished charge of his duties in the Tharrawaddy division on the forenoon of the 13th February, 1895.

7*th March*, 1895.—No. 5.—With reference to Revenue Department Notification No 482 (Forests), dated the 15th December 1894, Mr. C. W. B. Anderson, Extra Assistant Conservator of Forests, took over charge of the Mogok sub-division, Ruby Mines Forest division, from Mr. C. S. Rogers, Extra Assistant Conservator of Forests, on the afternoon of the 29th December, 1894.

11.—Mysore Gazette.

15*th March*, 1895.—No. 14947—R. 2164.—Mr. Percy Eden Benson, is appointed a Sub-Assistant Conservator of Forests in the Mysore Service, with effect from the 21st February, 1895, and is posted to the Mysore District.

X.—EXTRACTS FROM OFFICIAL GAZETTES

1.—Gazette of India

21*st March*, 1895.—No. 362-F.—Privilege leave for three months, under Articles 277 and 291 of the Civil Service Regulations, is granted to Mr. C. G. Rogers, Instructor at the Imperial Forest School, Dehra Dun, with effect from 1st April, 1895.

11*th April*, 1895.—No. 414-F.—The furlough for one year granted in the Notification of the Military Department, No. 99, dated the 1st February last, to Lieutenant-Colonel C. T. Bingham, I.S.C., Conservator of Forests, Burma, will take effect from the 1st May, 1895, or the subsequent date on which he may be permitted to avail himself of it

19*th April*, 1895.—No. 422-F.—With reference to the Notification of this Department No. 21-F., dated the 11th January last, the period of Mr. Nisbet's employment on special duty terminated on the 6th April, 1895 (afternoon.)

26*th April*, 1895.—No. 436-F.—With reference to the Notification of this Department No. 302-F., dated the 8th ultimo, Mr. Nisbet assumed charge of the Tenasserim Forest Circle from Lieutenant-Colonel Bingham on 19th April 1895 (forenoon).

2.—Madras Gazette.

27*th March*, 1895,—No. 146.—Mr. H. A. Gass, District Forest Officer, North Coimbatore, is granted privilege leave for one month and twenty-one days, with effect from or after the 17th April 1895, under Article 291 or the Civil Service Regulations.

27*th March*, 1895.—*Extension of leave on medical certificate*—To Ranger V. C Doraiswami Pillai for two months, *i.e.*, up to 16th May inclusive.

28*th March*, 1895.—Privilege leave—To Ranger T. Babu Rao for three months, from date of relief, under Article 291 of the Civil Service Regulations.

Transfer.—Extra Assistant Conservator, Mr. M. Rama Rao from South Arcot to Salem District.

28*th March*, 1895,—No. 149.—

No.	Name and designation of officer.	District	Nature of charge.	Remark.
1	Mr. H. A. Latham, Assistant Conservator of Forests, 2nd grade.	North Coimbatore.	Acting District Forest Officer.	During the absence of Mr. H. A. Gass on privilege leave, or until further orders.

30*th March*, 1895.—*Leave*—K. Aswatham Naidu, Forest Ranger, 5th grade, Kistna District, is granted three months' privilege leave on medical certificate, with effect from 2nd March 1895.

4th April, 1895.—No. 182.—

No.	Name and designation of officer.	District.	Nature of charge.	Remarks.
1	M. R. Ry. V. Alwar Chetty, B. A., Extra Assistant Conservator of Forests, 2nd grade.	North Arcot.	Acting District Forest Officer.	During the absence of Mr. C. D. McArthy on privilege leave, or until further orders.
2	Mr. S. Cox, Assistant Conservator of Forests, 2nd grade.	Ganjam ...	Do. ..	During the absence of Mr. J. S. Battie on privilege leave, or until further orders.

5th April, 1895.—No. 172.—M. J. S. Battie, District Forest Officer, Ganjam, is granted privilege leave for three months with effect from or after the 15th April, 1895, under Article 291 of the Civil Service Regulations.

5th April, 1895.—No. 173.—Mr. C. D. McArthy, District Forest Officer, North Arcot, is granted privilege leave for two months, with effect from or after the 27th April, 1895, under Article 291 of the Civil Service Regulations.

10th April, 1895.—The three months' furlough, from 18th December 1894, granted to V.P. Ramalingam Pillai, Ranger on Rs. 125, North Malabar Division, is commuted into leave on medical certificate, under Article 369 of the Civil Service Regulations, and the same is extended by three months.

16th April, 1895.—To Ranger A. N. Hanumantha Rao for three months under Article 370 of the Civil Service Regulations, from date of relief.

This cancels the notification published in the *Fort St. George Gazette*, dated 19th March 1895, Part II, page 416.

20th April, 1895.—No. 196.—Mr. F. A. Lodge, District Forest Officer, Kurnool, is granted privilege leave for one month and ten days, with effect from or after the 10th May 1895, under Article 291 of the Civil Service Regulations.

20th April, 1895.—No. 197.

No.	Name of officer.	District.	Nature of charge.	Remarks.
1	Mr. T. N. Hearsey, Extra Assistant Conservator, 3rd grade.	Kurnool ...	Acting District Forest Officer.	During the absence of Mr. F. A. Lodge on privilege leave or until further orders.

24th April, 1895.—No. 207.—Mr. A. W Peet, Conservator of Forests, Northern Circle, is granted special leave on urgent private affairs for six months, under Article 348 of the Civil Service Regulations, with effect from the 17th instant.

25*th April*, 1895.—*Leave on medical certificate*—To M. Jambunatha Sastri, Forest Ranger, 4th grade, Salem District, for one year, under Article 369 of the Civil Service Regulations, with effect from 16th April 1895. He will also be considered to have been on sick leave from 9th to 25th March 1895.

Erratum—In the 3rd line of notification regarding Ranger P. Venkatakrishnama Naidu's leave published at page 91, Part II of the *Fort St George Gazette*, dated 29th January 1895, *for* "8th December 1894" *read* "9th December 1894."

3.—Bombay Gazette.

26*th March*, 1895.—*Erratum.*—In this Office Notification, dated 8th December 1894, published at page 1245 of Part I of the *Bombay Government Gazette*, dated 13th December 1894, *for* "14th November 1894" *read* "15th November 1894."

28*th March* 1895.—Mr. Dattatraya M. Bijoor, Extra Assistant Conservator of Forests, who was appointed in Government Resolution No. 1597, dated 26th February 1895, to act as Divisional Forest Officer, S. D., Kanara, was relieved of his duties in this office as Personal Assistant to the Conservator of Forests, S. C., on the afternoon of 25th March 1895.

5*th April* 1895.—No. 138.—Messrs. G A. Hight, Deputy Conservator of Forests, and G. R. Duxbury, Assistant Conservator of Forests, respectively delivered over and received charge of, the Nasik Forest Division on the 25th March 1895, in the afternoon.

5*th April* 1895.—No. 173.—Messrs T. B. Fry and G. K. Betham, Deputy Conservators of Forests, respectively delivered over and received charge of the Dharwar Forest Division on the forenoon of 1st April 1895.

7*th April* 1895.—No. 172.—Mr. G. K. Betham, Deputy Conservator of Forests, delivered over and Mr. Dattatraya M. Bijoor, Extra Assistant Conservator of Forests, received charge of the Divisional Forest Office, S. D. Kanara, on the afternoon of the 27th March 1895.

7*th April* 1895.—No. 176.—Messrs. T. B. Fry and G. K. Betham, Deputy Conservators of Forests, respectively delivered over and received charge of the Divisional Forest Office, Bijapur, on the forenoon of the 1st April 1895.

10*th April* 1895.—No. 2823.—Mr. W. F. D. Fisher, Assistant Conservator of Forests and Divisional Forest Officer, Sholapur, is granted an extension by one day of the privilege leave of absence for one month allowed to him in Notification, dated 23rd March 1895, published at page 355 of the *Bombay Government Gazette* of the 28th idem, Part I, by the Conservator of Forests, C. C.

16*th April* 1895.—No. 2838.—Mr. Vaman Gopal Tumne, Extra Assistant Conservator of Forests, 4th grade, and Sub-Divisional Forest Officer, West Khandesh, is allowed privilege leave of absence for two months from 17th April 1895.

16*th April* 1894.—No. 399.—Mr. Nanabhai Dadabhai Sataravala, Extra Assistant Conservator of Forests, Working Plans Party No. II, S. C., is allowed privilege leave of absence for one month with effect from 2nd April 1895.

24th April 1895.—Mr. G. R. Duxbury, Assistant Conservator of Forests and Sub-Divisional Forest Officer, Nasik, passed an examination in Marathi according to the Higher Standard on the 5th April 1895.

26th April 1895.—No. 3135.—His Excellency the Governor in Council is pleased to appoint Mr. Abdul Rasul Khajbaksh to act as Extra Assistant Conservator of Forests, 4th grade, during the absence of Mr. Vaman Gopal Tumne, or pending further orders.

28th April 1895.—No. 668.—Messrs. B. G. Deshpande and J. M. Fernandez, Extra Assistant Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, Ratnagiri, on the afternoon of the 13th April 1895.

29th April 1895.—No 3175.—Mr. Waman Ramchandra Gaunde, Extra Assistant Conservator of Forests, 1st grade, and Sub-Divisional Forest Officer, Dáhánu, is allowed leave on medical certificate for two months from 23rd February 1895 in lieu of the privilege leave of absence for one month allowed to him in Notification, dated 11th March 1895, published at page 307 of the *Bombay Government Gazette* of the 21st idem Part I, by the Deputy Conservator of Forests, N. C.

29th April 1895.—No. 3176.—Mr. Haripad Mitra, L.C.E., Extra Assistant Conservator of Forests, 2nd grade, held charge of the Working Plans Division, Party No. 1, S. C., during the absence of Mr. E. G. Oliver on one month's privilege leave from 28th January to 27th February 1895,

30th April 1895.—No. 611.—Messrs. G. R. Duxbury, Assistant Conservator of Forests, and G. S. Hinge, Extra Assistant Conservator, respectively delivered over and received charge of the Sub-division office, Nasik, on the 22nd April 1895, in the afternoon.

1st May 1895.—No. 3263.—The undermentioned officers passed on the 8th April 1895 the examination in Law prescribed in Rule 4 of the rules published in Government Notification No. 2, dated 3rd January 1894, for the Examination of officers of the Forest Department :—

Passed with Credit.

Mr. C. G. Dalia, Sub-Divisioual Forest Officer, Surat.

Passed.

Mr. G. R. Duxbury, Assistant Conservator of Forests, and Sub-Divisional Forest Officer, Nasik.

4.—Bengal Gazette.

27th March, 1895.—No. 1700.—Mr, A. H. Mee, Extra-Assistant Conservator of Forests, is posted temporarily to the charge of the Sundarbans Forest Division. during the absence, on privilege leave, of Mr. R. L. Heinig or until further orders.

This cancels so much of Notification, No. 1036For., dated the 22nd February, 1895, as refers to the posting of the late Mr. G. A. Richardson to that Division.

23rd April, 1895,—No. 2168.—Mr. C. C. Hatt, Officiating Deputy Conservator of Forests and Personal Assistant to the Conservator of Forests, Bengal, is posted temporarily to the charge of the Tista Forest Division, rendered vacant by the death of Mr. H. H. Davis, Deputy Conservator of Forests, with effect from the 12th April 1895, in addition to his other duties, and until further orders.

5.—N.-W P. and Oudh Gazette.

23rd April 1895.—No. 1467.—Colonel J. E. Campbell, Deputy Conservator of Forests, in charge of the Garhwal Forest Division of the Central Circle, general leave in India for six months, with effect from the 26th April 1895.

23rd April 1895—No. 1468—Mr. F. B. Bryant, Deputy Conservator of Forests, attached to the Direction Division of the Central Circle, to hold charge of the Garhwal Forest Division in the same Circle, in addition to his other duties, during the absence on leave of Colonel J. E. Campbell, or until further orders.

23rd April 1895.—No. 1474—Mr. Keshavanand, Extra Assistant Conservator of Forests, attached to the Direction Division of the Oudh Circle as Working Plans Officer, privilege leave for three months with effect from the 1st May 1895.

23rd April 1895.—No. 1475—Lala Har Swarup, Extra Assistant Conservator of Forests, on special duty in the Kheri Forest Division of the Oudh Circle, to be attached to the same Circle, as Working Plans Officer, *vice* Mr. Keshavanand, granted privilege leave.

1st May 1895.—No. 1589—Babu Karuna Nidhan Mukarji, Extra Assistant Conservator of Forests, attached to the Dehra Dun Forest Division of the School Circle, is transferred to the Jaunsar Forest Division in the same Circle, to be employed on special duty on the selection and demarcation of the Chir forests of Tehri Garhwal.

2nd May 1895.—No. 1595—Babu Raghu Nath Pathak, Extra Assistant Conservator of Forests, from the Direction Division of the Central Circle, to the Garhwal Forest Division in the same Circle.

2nd May 1895.—No. 1596.—Notification No. 1468,—dated 23rd April 1895, appointing Mr. F. B. Bryant, Deputy Conservator of Forests, to hold charge of the Garhwal Forest Division of the Central Circle, is hereby cancelled.

4th May 1895—No. 1597—Babu Raghu Nath Pathak, Extra Assistant Conservator of Forests, attached to the Garhwal Forest Division of the Central Circle, to the charge of that Division, *vice* Colonel J. E. Campbell, granted leave.

6.—Punjab Gazette.

2nd April 1895.—No. 207.—With reference to *Punjab Government Gazette* Notification No. 282, dated 8th May 1894, the Lieutenant-Governor is pleased to re-appoint Mr. C. F. Rossiter to the 2nd grade of Extra Assistant Conservator of Forests, with effect from the 6th April 1895.

3rd April 1895.—No. 213.—Lala Daulat Ram, Extra Assistant Conservator of Forests, Chenab Division, has been granted one month's privilege leave of absence with effect from the afternoon of the 15th March 1895.

3rd April 1895.—No. 215—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.	Consequent on
Mr. F. O. Lemarchand	Deputy Conservator, 2nd grade.	Officiating Deputy Conservator, 1st grade.	28th February 1895.	The promotion of Mr. C. F. Elliott to officiate as Conservator,—*vide* Government of India Notification No. 327, dated 15th March 1895.
Mr. J. H. Lace ...	Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.	Ditto.	
Mr. H. Calthrop ...	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.	Ditto.	
Mr. P. H. Clutterbuck	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	Ditto.	

9th April 1895.—No. 241.—Consequent on the abolition of the Umballa Forest Division, Lala Jowala Parshad, Extra Assistant Conservator of Forests, made over the component parts of the Division as follows :—

Portion made over.	To	On the	Of
Kalesar Range and Jagadhri plantation.	Mr. G. S. Hart, Officiating Deputy Conservator of Forests, Simla Division.	Afternoon	31st January, 1895.
River Range, Phillour and Ludhiana Plantations.	Mr. G. G. Minniken, Deputy Conservator of Forests, Bashahr Division.	Forenoon	9th February, 1895.
Jullundar Plantation.	Munshi Fazl Din, Extra Assistant Conservator of Forests, Lahore Division.	Afternoon	21st February, 1895.

16*th April* 1894.—No. 252 —Mr. Fazl-ud-din II, Extra Assistant Conservator of Forests, reported his return from the privilage leave of absence granted to him in *Punjab Gazette* Notification No. 123, dated 12th February 1895, on the forenoon of the 1st April 1895, and was attached to the Direction Division from that date.

23*rd April* 1895.—No. 270.—Bhai Sadhu Singh, Extra Assistant Conservator of Forests, Jhelum Division, availed himself of the two months' privilege leave granted in Punjab Government Notification No. 180 of the 19th March 1895, with effect from the afternoon of the 10th February 1895 and not 11th February as stated therein. He returned to duty on the forenoon of the 11th April 1895.

30*th April* 1895.—No. 282.—Mr. R. J. P. Pinder, Deputy Conservator of Forests, and Mr. Fazl-ud-din II, Extra Assistant Conservator of Forests, respectively made over and received charge of the Chenab Forest Division on the afternoon of the 20th April 1895, consequent on the departure of the former on the furlough for 18 months granted him in Punjab Government Notification No. 93—A. L. No. 6.—dated 1st February 1895.

No. 286—Mr. J. H. Lace, Deputy Conservator of Forests, and Bhai Sadhu Singh, Extra Assistant Conservator of Forests. respectively made over and received charge of the Jhelum Forest Division on the afternoon of the 18th April 1895.

7.—Central Provinces Gazette.

29*th March* 1895.—No. 1579.—On return from the furlough granted him by Order No. 1226, dated the 8th March 1894, Mr. W. P. Thomas, Officiating Deputy Conservator of Forests, 1st grade, is reported to the Hoshangabad Forest Division.

29*th March* 1895.—No. 1581.—Mr. W. P. Thomas, Officiating Deputy Conservator of Forests, 1st grade, has been permitted, by Her Majesty's Secretary of State for India, to return to duty within the period of the furlough granted him by Order No. 1226, dated the 8th March 1894.

19*th April* 1895.—No. 1874.—Special leave on urgent private affairs for six months, under Article 348 of the Civil Service Regulations, is granted to Mr. A. M. F. Caccia, Officiating Deputy Conservator of Forests, in charge of the Hoshangabad Forest Division, with effect from the 18th March 1895, or the subsequent date on which he may avail himself of it.

18*th April* 1895.—No. 1875.—Mr. A. M. F. Caccia, Officiating Deputy Conservator of Forests, Hoshangabad, availed himself, on the forenoon of the 18th March 1895, of the special leave granted him by Order No 1874, dated the 18th April 1895, making over charge of his duties to the Deputy Commissioner, Hoshangabad.

18*th April*, 1895.—No. 1876.—Mr. A. M F. Caccia, Officiating Deputy Conservator of Forests, reported his departure from Bombay per P. and O. s. s. *Rosetta*. on the forenoon of the 22nd March 1895, on the special leave granted him by Order No. 1874, dated the 18th April 1895.

8.—BURMA GAZETTE.

1st April, 1895.—No. III.—Under the provisions of Article 340 (*b*) Civil Service Regulations, furlough for one year and four months is granted to Mr. G. Q. Corbett, Deputy Conservator of Forests, with effect from the 12th April 1895, or the subsequent date on which he may avail himself of it.

No. 114.—Under the provisions of Article 277 and 291 of the Civil Service Regulations privilege leave for two months and 13 days is granted to Mr. H. Slade, Deputy Conservator of Forests, with effect from the 10th April 1895. or the subsequent date on which he may avail himself of it.

Under the provisions of Article 282 (*a*) (ii) of the Civil Service Regulations Mr. Slade is permitted to overstay his leave by 15 days.

No 115.—Mr. J. Messer, Assistant Conservator of Forests, is appointed to the charge of the Tharrawaddy Forest division during the absence of Mr. H. Slade, on privilege leave or until further orders.

No 116.—Mr. E B Powell. Extra Assistant Conservator of Forests, on return from privilege leave, is posted to the charge of the Myanaung Forest subdivision of the Henzada Thongwa Forest division.

4th April 1895.—No 119.—The following postings and transfers are ordered in the Forest Department consequent on the grant of furlough to Mr. G. Q. Corbett, Deputy Conservator of Forests:—

Mr. A. Weston. Deputy Conservator of Forests, Kado division, is appointed to the temporary charge of the Salween-Attaran and Agency division in addition to his own duties. Mr. Weston will retain charge of the former until the arrival of Mr. G. F. R Blackwell, Deputy Conservator of Forests, and of the latter till further orders.

Mr. T. A. Hauxwell, Deputy Conservator of Forests, is transferred from Kawkareik to the charge of the Toungoo Forest division.

Mr. G.F.R. Blackwell, Deputy Conservator of Forests, is transferred from Tavoy to the charge of the Saween-Attaran division.

Mr. G. R. Long, Assistant Conservator of Forests, is transferred from Moulmein to the charge of the South Tenasserim Forest division.

13th April 1895.—No. 130.—The following alterations of rank are ordered in the Forest Department, with effect from the 7th April 1895, consequent on the termination on the afternoon of the 6th April the special duty under the Inspector-General of Forests to which Mr. J. Nisbet, Deputy Conservator 1st grade, was deputed on the 24th December 1894:—

Mr. F. W. Thellusson, Deputy Conservator, 2nd (officiating 1st) grade, to revert to his substantive rank.

Mr. H B. Ward, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive rank.

Mr. C. E. Muriel, Deputy Conservator, 4th (officiating 3rd) grade, to revert to his substantive rank.

Mr. E. A. O'Bryen, Assistant Conservator, 1st grade, officiating Deputy Conservator, 4th grade, to revert to his substantive rank.

Mr. J. Messer, Assistant Conservator. 2nd (officiating 1st) grade, to revert to his substantive rank.

15th April 1895.—No. I.—With reference to Revenue Department Notification No. 119, dated the 4th April 1895, Mr. T. A. Hauxwell, Deputy Conservator of Forests, made over, and Mr. A. Weston, Deputy Conservator of Forests, received, charge of the Salween-Attaran

and Agency Divisioss and Tenasserim Forest Surveys on the afternoon of the 5th April 1895.

15*th April* 1895.—No. 2.—Mr. G. Q. Corbett, Deputy Conservator of Forests, made over, and Mr. T. A. Hauxwell, Deputy Conservator of Forests, received, charge of the Toungoo Division on the afternoon of the 8th April 1895.

9.—ASSAM GAZETTE.

28*th March*.—No. 1694G.—Leave of absence on medical certificate for twelve months, under Article 266 and 369 of the Civil Service Regulations, is granted to Babu Tara Kisor Gupta, Extra Assistant Conservator of Forests, in commutation of the three months' privilege leave granted in Notification No. 5496G., dated the 2nd August 1894.

9*th April* 1895.—N. 1895G.—Babu Nilkanta Mukharji, Officiating Extra Assistant Conservator of Forests, 4th grade, will continue to officiate in that grade during the absence on leave, on medical certificate, of Babu Tara Kisor Gupta, Extra Assistant Conservator of Forests, or until further orders.

16*th April* 1895.—No. 2002G.—With effect from the 6th November, 1894, Babu Upendra Nath Kanjilal, Extra Assistant Conservator of Forests, 4th grade, is promoted substantively to the 3rd grade, and will continue to be seconded while on deputation at the Imperial Forest School, Dehra Dun.

11.—MYSORE GAZETTE.

1st April 1895.—No. 16091—R. 2289.—Under Article 226 of the Mysore Service Regulations, Mr. L. Ricketts, Inspector General of Forests and Plantations and Excise Commissioner in Mysore, is granted three months' privilege leave of absence from 1st April 1895, or from such other date as he may avail himself of it.

1*st April* 1895.—No. 16134—R. 2291.—Under Article 171 of the Mysore Service Regulations, Mr. B. Ramaswami Iyer, Assistant Conservator of Forests, Kolar District, was granted three days' casual leave of absence from the 18th to 20th March 1895 inclusive,

1*st April* 1895.—No. 16136—R. 2293.—Under Article 172 of the Mysore Service Regulations, Mr. M. Venkatanaranappa, Assistant Conservator of Forests, Tumkur District, is granted ten day's casual leave of absence from such date as he may avail himself of it.

6*th April* 1895.—No. 16792—R. 2349—Mr. C. M. Russell, Deputy Conservator of Forests, returned from the eight months' leave granted in Notification No. 1377—G. F. 13-93, dated 23rd July 1894, and resumed charge of the Forest office of the Kadur District on the forenoon of the 11th March 1895.

13*th April* 1895.—No. 17422—R. 2479—Mr. A. Theobald, Sub-Assistant Conservator of Forests, reported himself for duty on the forenoon of the 20th December 1894, and has been posted to the Mysore District.

13*th April* 1895.—No. 17424—R. 2481—Mr. J. J. Monteiro, Extra Assistant Conservator of Forests, has been posted for duty to the Shimoga District, with effect from 1st September 1894.

X.—EXTRACTS FROM OFFICIAL GAZETTES

1.—Gazette of India

1st May, 1895.—No. 465-F.—With reference to the Notification of this Department, No. 362-F., dated the 21st March 1895, Mr. C. G. Rogers, Instructor at the Imperial Forest School, Dehra Dun, availed himself of three months' privilege leave, with effect from the 5th ultimo (forenoon).

3rd May, 1895.—No. 475-F.—Mr. R. C. Milward, Assistant Conservator of Forests, 2nd grade, Central Provinces, is transferred, in the interests of the public service, to the North-Western Provinces and Oudh.

2.—Madras Gazette.

29th April 1895.—No. 223.—

No.	Name of Officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c
1	Mr. J. W. Cherry	Conservator of Forests 3rd grade.	Conservator, 2nd grade.	Acting ..	During the absence of Mr. Peet on leave, or until further orders.
2	Mr. E. D. M. Hooper ..	Deputy Conservator, 1st grade.	Conservator, 3rd grade.	Do. ..	*Vice* Mr. Cherry.
3	Mr. G. Hadfield	Deputy Conservator, 2nd grade.	Deputy Conservator, 1st grade.	Do. ..	*Vice* Mr. Hooper.
4	Mr. H. J. A. Porter ..	Deputy Conservator, 3rd grade	Deputy Conservator, 2nd grade.	Do. ..	*Vice* Mr. Hadfield.
5	Mr. P. M. Lushington ..	Deputy Conservator, 4th grade.	Deputy Conservator, 3rd grade.	Do. ..	*Vice* Mr. Porter.
6	Mr. F. C. L. Cowley Brown.	Assistant Conservator, 1st grade.	Deputy Conservator, 4th grade	Do. ..	*Vice* Mr. P. M. Lushington.

30th April 1895.—No. 224.—Posting.

No.	Name and designation of officer.	District.	Nature of charge.	Remarks.
1	Mr. E.D. M. Hooper, Deputy Conservator 1st grade.	Northern Circle.	Acting Conservator of Forests	During the absence of Mr. Peet on leave, or until further orders.
2	Mr. V. Alwar Chetty, Extra Assistant Conservator, 3rd grade.	Bellary.	Acting District Forest Officer.	*Vice* Mr. E. D M. Hooper on other duty, or until further orders..
3	Mr. T. M. Nallasawmy Naidu, Extra Assistant Conservator, 3rd grade.	North Arcot.	Do.	During the absence of Mr. C. D. McArthy on privilege leave, or until further orders

Note.—The above cancels Mr. V. Alwar Chetty's posting to North Arcot in Notification No. 182 of 4th April 1895 in the *Fort St. George Gazette*, dated 9th April 1895.

30*th April* 1895.—No. 225.—Posting.

No.	Name and designation of officer.	District.	Nature of charge.	Remarks.
1	Mr. H. F. A. Wood, Assistant Conservator of Forests, 2nd grade.	Nellore.	Acting District Forest Officer.	During the absence of Mr. J. H. B. Brougham on privilege leave, or until further orders.

29*th April* 1895.—C. Rajagopal Naidu, Forester, 2nd grade, acting 1st grade, to act as Ranger, 5th grade, during Ranger Jambunatha Sastri's absence on leave, or until further orders.

3*rd May* 1895.—Extra Assistant Conservator of Forests, Mr. T. M. Nallaswami Naidu from the Salem to the North Arcot District—to join at once.

4*th May* 1895.—No. 228.—Mr. J. H. B. Brougham, District Forest Officer, Nellore, is granted privilege leave for one month and twelve days, with effect from and after the 15th May, 1895, under Article 291 of the Civil Service Regulations.

8*th May* 1895.—No. 236.—

No.	Name and designation of officer.	District.	Nature of charge.	Remarks.
1	Mr. W. W. Batchelor, Assistant Conservator of Forests, 2nd grade.	Trichinopoly.	...	To do duty under the District Forest Officer.

10*th May*, 1895.—One month's leave on medical certificate is granted to Acting Ranger Eggianarayana Sastri from 27th April 1895.

11*th May* 1895.—Mr. Reginald O'Hara, Forester, 2nd grade, and Temporary Forester, 1st grade, to act as Ranger, 5th grade, from 1st May 1895, *vice* C. M. Parthasarady Naidu on leave, or until further orders.

17*th May*, 1895.—Erratum.—In the "Remarks" column of the Notification No. 142, dated 22nd March 1895, published at page 317 of Part I of the *Fort St. George Gazette*, dated 26th March 1895, *omit* the remarks entered against the name of Mr. P. M. Lushington, Deputy Conservator of Forests, 4th grade.

17*th May* 1895.—Postings. No. 260.—

No.	Name and designation of officer.	District.	Nature of charge.	Remarks.
1	Mr. H. A. Gass, Acting Deputy Conservator of Forests, 1st grade, and District Forest Officer, North Coimbatore.	South Coimbatore	District Forest Officer.	To join on return from privilege leave.
2	Mr. P. M. Lushington, Acting Deputy Conservator of Forests, 3rd grade, and Acting District Forest Officer, South Coimbatore.	North Coimbatore	Do.	To join on relief by Mr. Gass

11*th May*, 1895.—P. Ramasamiah, Acting Ranger, 5th grade, reverted to Forester, 1st grade, from 1st May 1895.

K. S. Krishnamachari, Forester, 2nd grade, and Acting Forester, 1st grade, to act as Ranger. 5th grade, from 1st May 1895, *vice* Arokiasami Pillai on leave, or until further orders.

21*st May* 1895.—To Ranger N. Balaji Singh, Nellore District, leave for twenty days, from 25th May 1895, under Article 291 of the Civil Service Regulation.

22*nd May* 1895.—To T. Shunmugam Mudaiiar, Forest Ranger, Nellore District, for two months, under Article 291 of the Civil Service Regulations, with effect from or after the 15th June 1895.

24*th May*—To C. Subramania Aiyar, Forest Ranger, Cuddapah District, for fifteen days, with effcet from the 26th May 1895, under Article 291 of the Civil Service Regulations.

3.—Bombay Gazette.

1*st May*, 1895.—No. 713.—Mr. Shesho Manju, Extra Assistant Conservator of Forests, received charge of the Sub-divisional Forest Office, Supa, from Mr. G. J. Rege, Acting Extra Assistant Conservator, on the afternoon of the 17th April 1895.

2*nd May*, 1895.—No. 711.—Mr. G. S. Hinge, Extra Assistant Conservator of Forests, delivered over and Mr. W. F. D. Fisher, Assistant Conservator of Forests, received charge of the Divisional Forest Office, Sholapur, on the forenoon of the 17th April, 1895.

4*th May*, 1895.—No. 761.—Messrs. V. G. Tumne, Extra Assistant Conservator of Forests, and H. W. Keys, Deputy Conservator of Forests, respectively delivered over and received charge of the Sub-divisional Forest Office, West Khandesh, on the 10th April 1895, before noon.

4th May, 1895.—No. 261.—Mr. Shaik Hasanalli Mahomedalli, Acting Extra Assistant Conservator of Forests, 4th grade, delivered over and Mr. Waman Ramchandra Gaunde, Extra Assistant Conservator of Forests, 1st grade, received charge of the Dahanu Sub-division Forest Office on the forenoon of the 23rd April, 1895.

10th May, 1895.—No. 3540.—Mr. N. D. Sataravala, L. C. E., Extra Assistant Conservator of Forests, 2nd grade, in charge Working Plans Party No. II, S. C., is granted an extension by one month of the privilege leave of absence for one month allowed to him in Notification No. 399, dated 16th April, 1895, published at page 485 of the *Bombay Government Gazette* of the 25th idem, Part I, by the Conservator of Forests, S. C.

11th May, 1895.—No. 3655.—His Excellency the Governor in Council is pleased to appoint—

Mr. W. A. Talbot to be Divisional Forest Officer, Southern Division, Kanara, and

Mr. E. G. Oliver to be Divisional Forest Officer, Northern Division, Kanara.

15th May, 1895.—No. 971.—Messrs. H. W. Keys, Deputy Conservator of Forests, and Abdul Rasul Khajbax, Acting Extra Assistant Conservator of Forests, respectively delivered over and received charge of the Sub-division Forest Office, West Khandesh, on the forenoon of the 8th May, 1895.

19th May, 1895.—No. 1090.—Messrs. G. K. Betham and H. Mainwaring, Deputy Conservators, respectively delivered over and received charge of the Divisional Forest Office, Bijapur Division, on the afternoon of the 11th May 1895.

19th May, 1895.—No. 3808.—Mr. A. Stewart, Deputy Conservator of Forests, 3rd grade, and Divisional Forest Officer, Panch Mahals, is allowed privilege leave of absence for three months.

22nd May, 1895.—No. 3863.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. W. A. Wallinger to act Divisional Forest Officer, Panch Mahals, with effect from the date of Mr. Stewart's departure on leave.

Mr. Chunilal Gulabchand Dalia, L. C. E., to act as Divisional Forest Officer, Surat, pending further orders.

28th May, 1895.—No. 3978.—His Excellency the Governor in Council is pleased to appoint Mr. W. F. D. Fisher to hold charge of the Forest Divisional Office, Ahmednagar, in addition to his own duties, during the absence of Mr. S. Hornidge, Assoc. M. Inst. C. E., or pending further orders.

28th May, 1895.—No. 3980.—Mr. S. Hornidge, Assoc. M. Inst, C. E. Deputy Conservator of Forests, 4th grade, and Divisional Forest Officer, Ahmednagar, is allowed privilege leave of absence for three months with effect from 14th June, 1895.

4.—Bengal Gazette.

2nd May, 1895.—No. 2286.—Mr. C. C. Hatt, Officiating Deputy Conservator of Forests, in charge of the Direction and Tista Forest Divisions, and Personal Assistant to the Conservator of Forests, Bengal,

is granted three months' privilege leave under Article 291, Civil Service Regulations, with effect from the 29th April 1895, or any subsequent date on which he may avail himself of it.

Mr. F. B. Manson, Deputy Conservator of Forests, in charge of the Darjeeling Forest Division, will take charge of the Direction and Tista Forest Divisions in addition to his other duties, during the absence on leave of Mr. Hatt, or until further orders.

6th May, 1895.—No. 61.—The following permanent promotions are ordered among the officers on the Provincial List of the Indian Forest Service in Bengal, with effect from the 6th March 1895, *vice* Mr. G. A. Richardson, Deputy Conservator of Forests, 3rd grade, and officiating, 2nd grade, deceased :—

Mr. H. D. D. French, Deputy Conservator of Forests, 4th grade (Provisional), is confirmed in that grade, but will continue to officiate in the 3rd grade of Deputy Conservators.

Mr. H. H. Haines, F. C. H., Assistant Conservator of Forests, 1st grade, and Officiating Deputy Conservator of Forests, 3rd grade, to be Deputy Conservator of Forests, 4th grade (Provisional), and to cease to officiate in the 3rd grade of Deputy Conservators

Mr. C. C. Hatt, Assistant Conservator of Forests. 1st grade (Provisional), and Officiating Deputy Conservator of Forests, 4th grade, is confirmed in the 1st grade of Assistant Conservators, and to continue to officiate in the 4th grade of Deputy Conservators.

Mr. F. Trafford, Assistant Conservator of Forests, 2nd grade, and Officiating Deputy Conservator of Forests, 4th grade, to be Assistant Conservator of Forests, 1st grade (Provisional), and to continue to officiate in the 4th grade of Deputy Conservators.

6th May 1895.—No. 62. —Mr. H. H. Haines, F. C. H, Deputy Conservator of Forests, 4th grade (Provisional), is promoted to officiate in the 3rd grade of Deputy Conservators, with effect from the 11th March 1895, during the absence, on furlough, of Mr. H. D. D. French, or until further orders.

6th May 1895.—No. 63.—Consequent on the return, on the 25th March 1895, of Mr. E G. Chester, Deputy Conservator of Forests, 2nd grade, from the furlough granted him in Notification No 2918-For., dated 1st June 1894, the following reversions among the officers on the Bengal Provincial List of the Indian Forest Service are ordered from that date :—

Mr. C. G. D. Fordyce, Deputy Conservator of Forests, 3rd and officiating 2nd grade, to the 3rd grade of Deputy Conservators.

Mr. R. L. Heinig, Deputy Conservator of Forests, 4th and officiating 3rd grade, to the 4th grade of Deputy Conservators.

Mr. F. Trafford, Assistant Conservator of Forests, 1st grade (Provisional), and Officiating Deputy Conservator of Forests, 4th grade, to the 1st grade (Provisional) of Assistant Conservators.

6th May 1895.—No. 64.—Consequent on the return to duty, on the forenoon of the 25th March 1895, of Mr. F. B. Manson, Deputy Conservator of Forests, 2nd grade, from the furlough granted him in Notification No. 2369-For., dated 19th June 1893, the following reversions among the officers on the Bengal Provincial List of the Indian Forest Service are ordered with effect from that date :—

Mr. W. M. Green, Deputy Conservator of Forests, 3rd and officiating 2nd grade, to the 3rd grade of Deputy Conservators.

Mr. C. G. Rogers, F. C. H., Deputy Conservator of Forests, 4th and officiating 3rd grade (on deputation to the Imperial Forest School, Dehra Dun, seconded), to the 4th grade of Deputy Conservators.

Mr. H. H. Haines, F. C. H., Deputy Conservator of Forests, 4th grade (Provisional), and officiating 3rd grade, to the 4th grade (Provisional) of Deputy Conservators.

6th May 1895.—No. 65.—The following permanent and temporary promotions are made among the officers on the Bengal Provincial List of the Indian Forest Service, with effect from the 11th April 1895, *vice* Mr. H. H. Davis, Deputy Conservator of Forests, 1st grade, deceased :—

Mr. E. G. Chester, Deputy Conservator of Forests, 2nd grade, to the 1st grade, of Deputy Conservators.

Mr. C. G. D. Fordyce, Deputy Conservator of Forests, 3rd grade, to the 2nd grade of Deputy Conservators.

Mr. C. A. G. Lillingston, Deputy Conservator of Forests, 4th grade, on furlough, to the 3rd grade of Deputy Conservators.

Mr. H. H. Haines, Deputy Conservator of Forests, 4th grade (Provisional), is confirmed in that grade.

Mr. W. H Lovegrove, Assistant Conservator of Forests, 1st grade, and Officiating Deputy Conservator of Forests, 4th grade, to be Deputy Conservator of Forests, 4th grade (Provisional).

Mr. R. L. Heinig, Deputy Conservator of Forests, 4th grade, to officiate in the 3rd grade of Deputy Conservators, *vice* Mr. Lillingston, on furlough.

Mr. F. Trafford, Assistant Conservator of Forests, 1st grade, to officiate in the 4th grade of Deputy Conservators, *vice* Mr. Heinig.

6th May 1895.—No. 66.—Consequent on the grant of three months' privilege leave to Mr. R. L. Heinig, Deputy Conservator, 4th grade, with effect from the afternoon of the 15th April 1895, the following temporary promotions are made among the officers on the Bengal Provincial List of the Indian Forest Service, with effect from the 16th idem :—

Mr. C. G. Rogers, F.C.H., Deputy Conservator, 4th grade, on deputation to the Forest School (seconded), to officiate as Deputy Conservator, 3rd grade.

Mr. H. H. Haines, F. C. H., Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade, *vice* Mr. C. G. Rogers, seconded.

18th May 1895.—No. 2564.—The Lieutenant-Governor is pleased to order, with effect from the 1st May 1895, the constitution of the Sonthal Parganas Forest Division, with head-quarters at Dumka. The Division will for the present comprise all the forests declared "Protected Forests" by this Department Notification No. 4844-For., dated the 2nd November 1894, published at page 1115, Part I of the *Calcutta Gazette* of the 9th idem.

Mr. W. H. Lovegrove, Officiating Deputy Conservator of Forests, attached to the Singhbhum Forest Division, is posted to the charge of the Sonthal Parganas Forest Division.

5.—N.-W P. and Oudh Gazette.

8*th May*, 1895.—No. 1644.—Mr. J. M. Blanchfield, Extra Assistant Conservator of Forests, was, on being relieved by Mr. N. Hearle of the charge of the Pilibhit Forest Division, Oudh Circle, attached to the Bahraich Forest Division of the same Circle.

8*th May*, 1895.—No. 1677.—Pandit Sadanand Gairola, Extra Assistant Conservator of Forests, from the Direction to the Jaunsar Division of the School Circle.

8*th May*, 1895.—No. 1928.—Notification No. 1589, dated 1st May, 1895, regarding Babu Karuna Nidhan Mukarji, Extra Assistant Conservator of Forests, is hereby cancelled.

16*th May*, 1895.—No. 437.—The undermentioned Officers, who appeared at the Departmental Examination of Junior Officers held on the 22nd October, 1894, and following days, passed as specified below:—

V.—Forest Law.

By the Higher Standard.

Mr. H. G. Billson.
Pandit Keshavanand.
Lala Har Swarup.

VI.—Land Revenue Systems.

By the Lower Standard.

Pandit Sadanand Gairola.
Mr. H. G. Billson.

VII.—Forest Procedure and Accounts.

By the Higher Standard.

Mr. H. G. Billson.
Pandit Keshavanand.
Lala Har Swarup.

6.—Punjab Gazette.

3*rd May*, 1895,—No. 294.—Messrs. A. L. McIntire and J. H. Lace, Deputy Conservators of Forests, respectively made over and assumed charge of the Chamba Forest Division at Lahore on the afternoon of the 22nd April 1895, consequent on the departure of the former on the 17 months' furlough granted him in Punjab Government Notification No. 77, of the 29th January, 1895.

10*th May*, 1895.—No. 311.—Lala Daulat Ram, Extra Assistant Conservator of Forests, is transferred from the Chenab Division to the Hazára Division, where he assumed charge of his duties on the afternoon of the 22nd April 1895.

10*th May*, 1895.—No. 316.—Messrs. A. V. Monro, Officiating Deputy Conservator of Forests, and E. M. Coventry, Assistant Conservator 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 1st May, 1895, consequent on the departure of the former on the privilege leave of absence granted to him in *Punjab Government Gazette* Notification No. 194, dated 26th March, 1895.

13*th May* 1895.—No. 320.—Mr. Fazl-ud-din, II, Extra Assistant Conservator of Forests, 4th grade, passed the Departmental Examination

in Forest Law, Procedure and Accounts, and Nagri, and with credit in Land Revenue at the examinations held on the 10th April, 1895, and 1st May, 1895.

14th May 1895.—No. 323.—The following changes have taken place in the List of Forest Officers in the Associated Provinces with effect from the dates specified against each :—

Name.	Present grade.	Grade to which promoted or reverted.	With effect from.	Remarks.
Mr. F. O. Lemarchand	Officiating Deputy Censervator, 1st grade.	Deputy Conservator, 2nd grade.	16th March, 1895 ...	Consequent on the return of Mr. Thomas from furlough.
Mr. J. H. Lace ...	Officiating Deputy Conservator, 2nd grade.	Deputy Conservator, 3rd grade.	Ditto ...	
Mr. H. Calthrop ...	Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade.	Ditto ...	
Mr. P. H. Clutterbuck	Officiating Deputy Conservator, 4th grade.	Assistant Conservator, 1st grade.	Ditto ...	
Mr. P. H. Clutterbuck	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	21st April, 1895 ...	Consequent on Mr. Pinder's departure on furlough.
Mr. H. Calthrop ...	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.	23rd April, 1895 ...	Consequent on Mr. McIntire's departure on furlough.
Mr. C. S. Smith ...	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	Ditto ...	
Mr. E. M. Coventry	Provincial Assistant Conservator, 1st grade.	Provincial Assistant Conservator, 1st, Officiating Deputy Conservator, 4th grade.	2nd May, 1895 ...	Consequent on Mr. Monro's departure on privilege leave.

23rd May 1895.—No. 335.—With reference to Punjab Government Notification No. 213 of the 3rd April 1895, Lála Daulat Rám, Extra Assistant Conservator of Forests, returned from privilege leave on the afternoon of the 15th idem.

27th May 1895.—No. 338.—Mr. Fazl-ud-din, Extra Assistant Conservator of Forests, was transferred from the Direction and attached to the Chenab Forest Division with effect from the forenoon of the 12th April, 1895.

7.—Central Provinces Gazette.

7th May 1895.—No. 2181.—Mr. W. B. Thomas, Officiating Deputy Conservator of Forests, 1st grade, who was granted furlough for one year by Order No 1226, dated the 8th March 1894, reported his arrival at Bombay on the forenoon of the 16th March 1895, and assumed charge of the Hoshangabad Forest Division for the Deputy Commissioner on the forenoon of the 23rd March 1895.

9th May 1895.—No. 1.—The following passed stipendiary students of the Imperial Forest School, Dehra Dun, having complied with the conditions laid down in Section 29 (1) of the Forest Department Code, 4th Edition, are appointed as Forest Rangers, 6th grade, on probation, on a salary of Rs. 50 each per mensem, with effect from the 1st April 1895, and are posted to the Forest Divisions noted against their names :—

Mr. F. J. Langhorne ... ... Chanda.
Mr. Nirmal Chander Chatterjee ... ... Bhandara.

16th May 1895.—No. 2316.—Furlough for seven months, under Article 371 of the Civil Service Regulations, is granted to Khan Sahib Muhammad Ghouse, Extra-Assistant Conservator of Forests and Forest Divisional Officer, Raipur, with effect from the first June 1895.

16th May 1895.—No. 2317.—Mr. A. W. Blunt, Officiating Deputy Conservator of Forests and Forest Divisional Officer, Bilaspur, is transferred in the same capacity to Raipur.

16th May 1895.—No. 2318.—Mr. N. C. McLeod, Extra-Assistant Conservator of Forests and Working-Plans Assistant, Bhandara, is transferred to Bilaspur as Forest Divisional Officer.

24th May 1895.—No. 2417.—Mr. R. C. Milward, Assistant Conservator of Forests, Central Provinces, has been granted, by Her Majesty's Secretary of State for India, furlough on medical certificate for six months in extension of the furlough granted him by Order No. 908, dated the 21st February 1895 ; the period subsequent to the 19th October 1895 will be extraordinary leave without pay.

24th May 1895.—No. 2474 —On return from the three months' privilege leave granted him by Order No. 5743, dated the 26th December 1894, Mr. Ramchandra Krishna, Extra-Assistant Conservator of Forests in charge of the Pranhita-Godavari Sub-Division in the Chanda Forest, Division, is posted to the Balaghat Forest Division as Working-Plans Assistant.

8.—Burma Gazette.

29th April 1895.—No. 7.—Mr. E. B. Powell, Extra Assistant Conservator of Forests, reported his return, on the afternoon of the 1st April, 1895, from the privilege leave granted him in Revenue Department Notification No. 455, dated the 5th December 1894.

29th April 1895.—No. 8.—With reference to Revenue Department Notification No. 116F., dated the 2nd April, Mr. E. B Powell, Extra Assistant Conservator of Forests, assumed charge of the Myanaung sub-division of the Henzada-Thongwa division on the afternoon of the 11th April 1895.

20th May 1895.—No. 170.—Under the provisions of Articles 277 and 291 of the Civil Service Regulations, privilege leave for three months and 15 days is granted to Mr. C. W. A. Bruce, Assistant Conservator

of Forests, with effect from the 7th June 1895, or the subsequent date on which he may avail himself of it.

20th May 1895.—No. 171.—Mr. A. M. Burn-Murdoch, Assistant Conservator of Forests, in charge of the Paungbyin subdivision, is appointed to the charge of that division, in addition to his own duties, during the absence of Mr. C. W. A. Bruce on privilege leave, or until further orders.

21st May 1895.—No. 174.—Mr. C. R. Dun, Assistant Conservator of Forests, on special duty in the Chin Hills, is transferred from Fort White to Rangoon as Personal Assistant to the Conservator of Forests, Pegu Circle.

23rd May, 1895.—No. 176.—Under the provisions of Articles 277 and 291 of the Civil Service Regulations, privilege leave for two months and seven days is granted to Mr. D. H. Allan, Extra Assistant Conservator of Forests, with effect from the 7th June, 1895, or the subsequent date on which he may avail himself of it.

24th May.—No. 178.—Mr. W. J. Lane-Ryan is promoted from the 3rd grade to the 2nd grade of Extra Assistant Conservators of Forests, with effect from the date of this notification.

9.—ASSAM GAZETTE.

22nd May, 1895.—No. 2833G.—On the report of the Central Examination Committee, the Chief Commissioner directs the publication, for general information, of the results of the Half-yearly Examination of Assistant Commissioners, Extra Assistant Commissioners, and others held on the 6th, 7th, 8th, 9th, and 10th May 1895 :—

Name.	Subjects taken up by Candidates.		Subjects in which passed.		Compulsory subjects in which still required to pass.	
	Higher Standard	Lower. Standard.	Higher Standard.	Lower Standard.	Higher Standard.	Lower Standard
FOREST OFFICERS.						
Mr. F. E. B. Lloyd, Assistant Conservator.	...	Assamese	...	...	Assamese	...
Mr. A. H. M. Lawson, Assistant Conservator.	Forest Law. Procedure and Accounts.		...	...	Assamese	... Forest Law. Land Revenue. Procedure and Account.
Babu Jogesvar Sur, Extra Assistant Conservator.	Procedure and Accounts.		Procedure and Accounts.		...	...
Babu Kripa Nath De, Extra Assistant Conservator,	Forest Law.		——		Forest Law.	

28*th May*, 1895.—No. 2965G.—Privilege leave of absence for three months, under Article 291 of the Civil Service Regulations, is granted to Mr. A. M. Long, Officiating Deputy Conservator of Forests, in charge of the Garo Hills Forest Division, with effect from the 23rd June 1895, or the subsequent date on which he may avail himself of it.

28*th May*, 1895.—No. 2966G.—Mr. T. J. Campbell, Deputy Conservator of Forests, in charge of the Goalpara Forest Division, is placed in charge of the Garo Hills Forest Division, in addition to his own duties during the absence on leave of Mr. A. M. Long, or until further orders.

10.—Hyderabad Residency Gazette.

30*th April*, 1895.—No. 152.—The Resident is pleased to declare that at the Departmental Examination held at Amraoti on the 1st and 2nd April 1895 under section 72 of the Forest Department Code, the undermentioned Forest Officers in the Hyderabad Assigned Districts passed in the subjects specified against their names:—

Mr. R.M. Williamson, Assistant Conservator	Marathi by the higher standard.
Mr. B. Bhukan, Extra Assistant Conservator.	Land Revenue.
Mr. S. Srinivasulu Naidu, Extra Assistant Conservator.	Land Revenue. Forest Law. Procedure and Accounts (with great credit).
Mr. W. J. Peake, Extra Assistant Conservator.	Forest Law. Procedure aod Accounts.

11.—Mysore Gazette.

30*th April* 1895.—No. 18940—R. 2733.—Under Article 172 of the Mysore Service Regulations, Mr. C. Narayan Rao, Assistant Conservator of Forests, Shimoga District, was granted 15 days' casual leave of absence from the 13th April 1895.

2. Mr. B. Srinivasa Rao, Assistant Conservator of Forests, Shikarpur Sub-division, was in charge of the Shimoga District Forest Departmen, during the absence of Mr. C. Narayan Rao on leave.

3. Mr. C. Appaiya, Sub-Assistant Conservator, Shimoga District, was in charge of the Shikarpur Sub-Division during the absence of Mr. Srinivasa Rao on other duty.

6*th May* 1895.—No. 19666—R. 2831,—Mr. K. Shamaiengar, Sub-Assistant Conservator of Forests, Mysore, was granted three days' casual leave from the 15th April 1895, on urgent private affairs.

13*th May* 1895.—No. 20548—R. 2928,—Under Article 172 of the Mysore Service Regulations, Mr. S. A. Babu Rao, Assistant Conservator of Forests and Head-quarter Assistant to the Inspector General of Forests was granted seven days' casual leave on urgent affairs from the 2nd May 1895.

23*rd May*, 1895.—No. 21362—R. 3075.—Under Article 172 of Mysore Service Regulations, Mr. M. G. Rama Rao, Sub-Assistant Conservator of Forests, Heggaddevankote, is granted casual leave for eight days from 5th May 1895 or such other date as he may avail himself of the same.

X.—EXTRACTS FROM OFFICIAL GAZETTES

1.—Gazette of India

13th June, 1895.—No. 645—164-6-F.—Mr. W. F. Lloyd, Deputy Conservator of Forests, 4th grade (provisional), Assam, is transferred in the interests of the public service to Bengal.

13th June, 1895.—No. 648—136-5-F.—Furlough for two years, under Article 340 (*b*) of the Civil Service Regulations, is granted to Mr. P. J. Carter, Conservator of Forests, 3rd (Officiating 2nd) grade, Pegu Circle, Lower Burma, with effect from the 27th July 1895, or the subsequent date on which he may be permitted to avail himself of it.

19th June, 1895.—No. 658—193-5-F.—Privilege leave for three months, under Articles 277 and 291 of the Civil Service Regulations, is granted to Mr. S. Eardley-Wilmot, Conservator of Forests, 2nd grade, Oudh Circle, North-Western Provinces and Oudh, with effect from 25th June 1895.

The following temporary promotions are ordered during Mr. Wilmot's absence, or until further orders :

Mr. J. A. McKee, Conservator, 3rd grade, Central Provinces, to officiate in the 2nd grade.

Colonel J. E. Campbell, I.S.C., Deputy Conservator, 1st grade, North-Western Provinces and Oudh, to officiate as Conservator, 3rd grade, in charge of the Oudh Circle.

2.—Madras Gazette.

29th May, 1895.—The leave on medical certificate granted to Acting Ranger Eggianarayana Sastri in Office order No. 142, dated 10th May, 1895, is extended to the 26th July 1895.

30th May, 1895.—To P. Venkatakrishnama Naidu, Forest Ranger, 5th grade, Salem, leave for six days, from 22nd to 27th April 1895 inclusive, under Article 369 of the Civil Service Regulations.

30th May, 1895.—No. 289.—

No.	Name of officer.	District.	Nature of charge.	Remarks.
1	Mr. F. C. L. Cowley Brown, acting Deputy Conservator of Forests 4th grade.	South Coimbatore.	Assistant to the District Forest Officer.	With effect from the 18th April 1895, or until further orders.

30th May, 1895.—G. Arulanandam Pillai, Forest Ranger on Rs. 50, Nilgiri District, is granted furlough for eleven months and eleven days, with effect from the 15th May 1895, or from date of relief.

31*st May*, 1895.—No. 290.—His Excellency the Governor in Council is pleased to order the following transfer with effect from the 31st July 1894:—

Name & designation of officer.	From	To	Remarks.
Mr. S. Cox, Assistant Conservator of Forests, 2nd grade.	Kistna District.	Kurnool District.	To do duty under the immediate supervision of the District Forest Officer.

This notification does not affect Notification No. 182, published on page 371 of Part I of the *Fort St. George Gazette*, dated April 9, 1895.

2*nd June*, 1895.—The one month's leave on medical certificate, under Article 369 of the Civil Service Regulations, granted in this office S. O. No. 27 of 1895 to Mr. J. W. Ryan, Ranger on Rs. 50, North Malabar, is extended by one month.

6*th June*, 1895.—The twenty days' privilege leave granted to Ranger N. Balaji Singh, Nellore District, will take effect from the 26th May 1895, instead of the 25th as already notified.

11*th June*, 1895.—Two months' leave on medical certificate is granted to M. Balaji Singh, Forest Ranger, from date of relief.

20*th June*.—C. S. Venkatramana Iyer, Ranger on Rs. 50, North Malabar, is granted leave on medical certificate, under Article 369 of the Civil Service Regulations, for three weeks, from 9th June 1895.

3.—Bombay Gazette.

30*th May*, 1895.—No. 1397.—Mr. Dattatraya M. Bijoor, Extra Assistant Conservator of Forests, delivered over and Mr. E. G. Oliver, Deputy Conservator of Forests and Divisional Forest Officer, Working Plans Party No. I., S. C., received charge of the Southern Division of Kánara, on the forenoon of 20th May, 1895.

30*th May*, 1895.—No. 1398.—Mr. Dattatraya M. Bijoor, Extra Assistant Conservator of Forests, on being relieved of the charge of the Southern Division of Kánara, reported himself for duty as Personal Assistant to the Conservator Southern Circle on the forenoon of 20th May 1895.

3rd *June*, 1895.—No 1439.—Messrs. E. G. Oliver and W. A. Talbot, Deputy Conservators of Forests, respectively delivered over and received charge of the Southern Division of Kanara on the forenoon of 28th May, 1895.

6*th June*, 1895.—No. 546.—Mr. G. P. Millett, Deputy Conservator of Forests, 4th grade, delivered over, and Mr. C. Greatheed, Deputy Conservator of Forests, 3rd grade, received, charge of the East Thana Division on the forenoon of the 31st May 1895.

6*th June* 1895.—No. 1526—Messrs. H. Murray and E. G. Oliver, Deputy Conservators of Forests, respectively delivered over and received charge of the Northern Division of Kánara on the 30th of May 1895, after office hours.

11*th June* 1885.—No. 1646—Mr. N. D. Satarawala, Extra Assistant Conservator of Forests, Working Plans Party II, Southern Circle, who was on two months' privilege leave from 1st April 1895, returned to duty on the 1st of June 1895, in the forenoon.

18*th June* 1895.—No. 4565.—Mr. R. S. F. Fagan, Deputy Conservator of Forests, 3rd grade, and Divisional Forest Officer, Satara, is allowed privilege leave of absence for three months from 10th July 1895, or such subsequent date as he may avail himself of it.

18*th June* 1895.—No. 653—Mr. W. A. Wallinger, Extra Assistant Conservator of Forests, 2nd grade, delivered over and Mr. C. G. Dalia, Extra Assistant Conservator of Forests, 4th grade, received charge of the Surat Division on the afternoon of the 11th June 1895.

2. Mr. A. Stewart, Deputy Conservator of Forests, 3rd grade, delivered over, and Mr. W. A. Wallinger, Extra Assistant Conservator of Forests, 2nd grade, received, charge of the Panch Mahals Division on the 12th June 1895, in the afternoon.

18*th June* 1895.—No. 1804.—Messrs. S. Hornidge, Deputy Conservator of Forests, and W. F. D. Fisher, Assistant Conservator of Forests, respectively delivered over and received charge of the Ahmednagar Forest Division on the 13th June 1895, in the afternoon.

19*th June*, 1895.—No. 1832—Messrs. Abdul Rasul Khajbax, Acting Extra Assistant Conservator of Forests, and V. G. Tumne, Extra Assistant Conservator of Forests, respectively delivered over and received charge of the West Khandesh Forest Sub-Division on the 14th June 1895, before office hours.

24*th June* 1895.—No. 4731.—Mr. G. P. Millett, Acting Deputy Conservator of Forests, 3rd grade, and Divisional Forest Officer, Working Plans, N. C., is allowed privilege leave of absence for three months from 10th July 1895.

24*th June*, 1895.—No. 4775—His Excellency the Governor in Council is pleased to appoint Mr. D. A. Thomson, to act as Divisional Forest Officer, Satara, during the absence of Mr. R. S. F. Fagan on privilege leave or pending further orders.

4.—Bengal Gazette.

18*th June* 1895.—No. 2986—Mr. W. F. Lloyd, Deputy Conservator of Forests, 4th grade (provisional), is, on transfer from Assam, posted to the charge of the Direction Division and appointed to be Personal Assistant to the Conservator of Forests, Bengal, during the absence, on privilege leave, of Mr. C. C. Hatt, or until further orders.

6.—Punjab Gazette.

3*rd June* 1895.—No. 355.—Mr. Barker, Deputy Conservator of Forests, 3rd grade, returned from sick leave on the 22nd November 1894 and not on the 11th November as stated in Notification No. A, L. 602, dated 7th December, 1894. Consequently the reversion of Mr. Hicks from Officiating Deputy Conservator of Forests, 3rd grade, to Deputy Conservator of Forests, 4th grade, and of Mr. Caccia from Officiating Deputy Conservator of Forests 4th grade, to Assistant Conservator of Forests, 1st grade, will have effect from the former date.

3*rd June* 1895.—No. 359.—In Notification No. 323, dated 14th May 1895, *for* "16th March" *read* "23rd March," *for* "2nd May" *read* "1st June" for "provincial" *read* "provisional."

8*th June* 1895.—No. 375.—The furlough to Europe granted to Mr. H. A. Hoghton, Deputy Conservator of Forests, in the Notification of the Chief Commissioner, Central Provinces, No. 2624, dated 5th June 1894, has been extended by Her Majesty's Secretary of State for India by a period of five months.

10*th June* 1895.—No. 380.—Mr. B. O. Coventry, Assistant Conservator of Forests, Punjab, passed the prescribed Departmental Examination in Hindnstani by the lower Standard on the 27th May 1895.

24*th June* 1895.—No. 403.—Mr. J. H. Lace, Deputy Conservator of Forests, on return from furlough was attached to the Direction Division, Punjab, the 27th October to 31st October 1894, both dates inclusive.

26*th June* 1895.—No. 413.—Lala Jawala Pershad, Extra Assistant Conservator of Forests, was attached to the Bashahr Division from the afternoon of 21st February 1895.

7.—CENTRAL PROVINCES GAZETTE.

6*th June* 1895.—No. 2632.—Mr. Ramchandra Krishna, Extra Assistant Conservator of Forests, returned from the three months' privilege leave granted him by Order No. 5743, dated the 26th December 1894, and assumed charge of the duties of Working-Plans Assistant in the Balaghat Forest Division on the afternoon of the 16th May 1895.

6*th June* 1895.—No. 2633.—Mr. Syed Ali Muttaki, Forest Ranger, 2nd grade, in charge of the Damoh Forest Division, having been appointed to officiate as a Tahsildar in the Jubbulpore Division—*vide* General Department Order No. 3620, dated the 10th May 1895—made over charge of his duties, on the forenoon of the 13th idem, to Mr. Muhammad Kadar Baksh, Extra Assistant Conservator of Forests, in charge of the Narsinghpur Forest Division.

6th *June* 1895.—No. 2634.—Mr. Muhammad Kadar Baksh, Extra Assistant Conservator of Forests, in charge of the Narsinghpur Forest Division, took over charge of the Damoh Forest Division from Mr. Syed Ali Muttaki, Forest Ranger, on the forenoon of the 13th May 1895, in addition to his own duties and as a temporary measure, or until such time as he may be relieved of the charge of one of the Divisions.

13*th June*, 1895.—No. 2696.—With reference to Order No. 2318, dated the 16th May 1895, Mr. N. C. McLeod, Extra Assistant Conservator of Forests, made over charge of the duties of Working-Plans Assistant in the Bhandara Forest Division on the afternoon of the 21st ultimo, and assumed charge of the Bilaspur Forest Division from Mr. A. W. Blunt, Officiating Deputy Conservator of Forests, on the forenoon of the 27th ultimo.

8*th June*, 1895.—No. 1.—Mr. R. N. Thompson, a passed private student of the Imperial Forest School, Dehra Dun, having complied with the conditions laid down in Section 29 (1) of the Forest Department Code, 4th Edition, is appointed as Officiating Forest Ranger, 5th grade, on Rs. 60 per mensem, with effect from the forenoon of the 7th June 1895.

Mr. Thompson is temporarily attached to the Direction Division until further orders.

20*th June*, 1895.—No. 2753.—Khan Sahib Munshi Muhammad Ghouse, Extra Assistant Conservator of Forests, Raipur, availed himself,

on the afternoon of tee 31st ultimo, of the seven months' furlough granted him by Order No. 2316, dated the 16th May 1895, making over charge of his duties to Mr. A. W. Blunt, Officiating Deputy Conservator of Forests.

8.—BURMA GAZETTE.

29th May 1595.—No, 181.—Mr. C. R. Dun, Assistant Conservator of Forests, on special duty in the Chin Hills, is transferred from Fort White to the charge of the Southern Shan States Forest Division.

This Department Notification No. 174, dated the 21st May 1895, is hereby cancelled.

29th May 1895.—No. 182.—Mr. H. B. Anthony, Deputy Conservator of Forests is transferred from Fort Stedman to the charge of the Bassein, Myaungmya Forest Division, during the absence on privilege leave of Mr. H. B. Ward or until further orders,

29th May 1895 —No. 182.—In exercise of the power conferred by section 2 of the Upper Burma Forest Regulation, 1887, and section 3 of the Burma Forest Act, 1881, the Chief Commissioner appoints Mr. F. J. Rivett, Extra Assistant Conservator of Forests to discharge the functions of a Forest Officer, and to exercise all the powers conferred on Sub-Assistant Conservators by the rules hitherto made under the enactments in question.

30th May 1895.—No. 184.—This department Notification No. 130, dated the 10th April 1895, ordering certain reversions in the Forest Department, is hereby cancelled.

No. 185.—The following alterations of rank are ordered in the Forest Department:—

(1) With effect from the 5th March 1895:

Mr. H. B. Anthony, Deputy Conservator, 4th (officiating 3rd) grade, is confirmed in the latter grade.

Mr. A. F. Gradon, Deputy Conservator, 4th grade, *seconded*, is appointed to officiate as Deputy Conservator 3rd grade.

Mr. G. Q. Corbett, Deputy Conservator, 4th grade, is appointed to officiate as Deputy Conservator, 3rd grade.

(2) With effect from the 7th April 1895, consequent on the termination on the afternoon of the 6th April of the special duty under the Inspector-General of Forests, on which Mr. J. Nisbet, Deputy Conservator, 1st grade, was deputed on the 24th December 1894:

Mr. F. W. Thellusson, Deputy Conservator, 2nd (officiating 1st) grade, to revert to his substantive rank,

Mr. H. B. Ward, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive rank.

Mr. A. F. Gradon, Deputy Conservator, 4th (officiating 3rd) grade, *seconded*, to revert to his substantive rank.

Mr. G. Q. Corbett, Deputy Conservator, 4th (officiating 3rd) grade to revert to his substantive rank.

Mr. E. A. O'Bryen, Assistant Conservator, 1st grade, officiating Deputy Conservator, 4th grade, to revert to his substantive rank.

Mr. J. Messer, Assistant Conservator, 2nd (officiating 1st) grade, to revert to his substantive rank.

(3) With effect from the 9th April, 1895, consequent on the grant of furlough for 16 months to Mr. G. Q. Corbett, Deputy Conservator, 4th grade:

Mr. E. A. O'Bryen, Assistant Conservator, 1st grade, to officiate as Deputy Conservator, 4th grade.

Mr. J. Messer, Assistant Conservator, 2nd grade, to officiate as Assistant Conservator, 1st grade.

(4) With effect from the 19th April 1895, consequent on the grant of furlough for one year to Lieutenant-Colonel C. T. Bingham, Conservator, Tenasserim Circle, and the appointment by the Government of India of Mr. J. Nisbet to officiate as a Conservator, 3rd grade.

Mr. F. W. Thellusson, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade

Mr. H. B. Ward, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. A. F. Gradon, Deputy Conservator, 4th grade, *seconded*, to officiate as Deputy Conservator, 3rd grade.

Mr. H. Jackson, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. W. F. L. Tottenham, Assistant Conservator, 1st grade, to officiate as Deputy Conservator, 4th grade.

Mr. H. Forteath, Assistant Conservator, 2nd grade, to officiate as Assistant Conservator, 1st grade.

(5) With effect from the 21st April 1895, consequent on the grant of privilege leave to Mr. H Slade, Deputy Conservator, 2nd grade :

Mr. A. Weston, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. G. F. R. Blackwell, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. W. T. T McHarg. Assistant Conservator, 1st grade, to officiate, as Deputy Conservator, 4th grade.

Mr. G. R. Long, Assistant Conservator, 2nd grade, to officiate as Assistant Conservator, 1st grade.

28*th May*, 1895.—No. 3.—In accordance with the orders contained in Revenue Department Notification No. 119 (Forests), dated the 4th April 1895, Mr. G. R. Long, I.F.S, Assistant Conservator of Forests, was relieved of the charge of the Agency and Ataran-Ye subdivision of the Sal-South Tenasserim division from Mr. G. F. R. Blackwell, I.F. S., Deputy Conservator of Forests, on the afternoon of 15th May 1895.

28*th May*, 1895.—No. 4.—In accordance with the orders contained in Revenue Department Notification No. 119 (Forests), dated the 4th April 1895, Mr. G. F. R. Blackwell, I F S., Deputy Conservator of Forests, received charge of the Salween-Ataran division from Mr. A. Weston, I.F.S., Deputy Conservator of Forests, on the afternoon of the 22nd May 1895.

14*th June*, 1895.—No. 2.—With reference to Revenue Department Notification No 176 (Forests), dated the 23rd May 1895, Mr. D. H. Allan, Extra Assistant Conservator of Forests, made over, and Mr. T. H Aplin, Deputy Conservator of Forests, received, charge of the Alon Revenue subdivision, Lower Chindwin Forest division, on the afternoon of the 10th June, 1895.

17*th June*, 1895.—No. 200.—The services of Mr. R. F. Lowis, Extra Assistant Conservator of Forests, are placed at the disposal of the Government of India, Home Department.

19*th June*, 1895.—No. 119.—At the departmental examination held at Rangoon on the 3rd and 4th June 1895 the following officer passed in Burmese by the standard specified below:—

Higher Standard.

Mr. F. Ryan, Extra Assistant Conservator of Forests.

20*th June*, 1895.—No. 201.—Under the provisions of Article 282 (*a*) (1) privilege leave for three months and fifteen days is granted to Mr. S. Carr, Assistant Conservator of Forests, with effect from the 3rd July 1895, or the subsequent date on which he may avail himself of it.

9.—ASSAM GAZETTE.

7*th June*, 1895.—No. 3179G.—The following postings and transfers of officers are ordered in consequence of the transfer of Mr. W. F. Lloyd, Deputy Conservator of Forests, in charge of the Lakhimpur Division, to Bengal:

Mr. F. E. B. Lloyd, Assistant Conservator of Forests, from the Sibsagar Division to the charge of the Darrang Division.

Mr. D. P. Copeland, Deputy Conservator of Forests, from the Darrang Division to the charge of the Lakhimpur and Sibsagar Divisions.

11.—MYSORE STATE GAZETTE.

29*th May*, 1895.—No. 22119.—R. 3216, Mr. S. A. Bapu Rao Assistant Conservator, attached to head-quarter office, is transferred to Hassan, and will be in charge of the Hassan District Forest Office during the employment of Mr. Mootappa on other duty or until further orders.

11*th June*, 1895.—No. 22929—R. 3336, Under Article 173 of the Mysore Service Regulations, Mr. C. E. M. Russell, Deputy Conservator of Forests, Kadur District, was granted casual leave of absence on urgent private affairs for fifteen days from the 10th May, 1895.

12*th June*, 1895.—No. 22927—R. 3334, Mr. B. Ramaswami Iyer, Assistant Conservator of Forests, Kolar District, was granted five days' casual leave of absence on urgent private affairs from the 17th May 1895.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES

2.—Madras Gazette.

28th June, 1895.—K. Aswatham Naidu, Forester, 2nd grade, and Acting Ranger, 5th grade, to be Ranger, 5th grade.

1st July, 1895.—Mr. A. Srinivasa Chamberlain, Forester on Rs. 40, South Coimbatore, is appointed to act as Ranger on Rs. 50 during the absence of G. Arulanandam Pillai, Ranger on Rs. 50, on furlough for eleven months and eleven days, from 28th May, 1895, or until further orders.

3rd July, 1895. No. 360.—Mr. H. B. Bryant, District Forest Officer, Tinnevelly, is granted privilege leave for three months, from or after the 8th July, 1895.

4th July, 1895. No. 361.—Leave granted to Mr. J. H. B. Brougham, District Forest Officer, Nellore, in Notification No. 228, published at page 508, Part I of the *Fort St. George Gazette*, dated 7th May, 1895, is extended by fifteen days

9th July 1895.—The Board resolves to sanction the grant of fifteen days' privilege leave to Mr. T. N. Hearsey, Extra Assistant Conservator of Forests, Kurnool, with retrospective effect from the 26th June, 1895, under Article 291 of the Civil Service Regulations.

11th July, 1895.—Mr. C. A. Eber-Hardie, Extra Assistant Conservator of Forests, is transferred from South Malabar to Madura for duty under the orders of the District Forest Officer.

Coimbatore, 9th July 1895. The following transfers are ordered in the Southern Circle :—

Mr H. O'Neil, Acting Extra Assistant, on Rs. 165, from Madura to South Coimbatore.

V. P. Ramalingam Pillai, Ranger on Rs. 125, from North Malabar. to Madura.

Mr W. P. Rego, Ranger on Rs. 100, from South Malabar to North Malabar A. R. Rama Row, Ranger on Rs. 50, from South Coimbatore to South Canara.

15th July, 1895.—Upon resumption of charge of the North Arcot District by Mr. C. D. McArthy, Mr. T. M. Nallaswami Naidu. Extra Assistant Conservator, is transferred to the Salem District.

19th July, 1895. No. 394.—Mr. H. J. A. Porter, District Forest Officer, Trichinopoly, is granted privilege leave for one month and twenty-nine days, with effect from or after the 1st August, 1895, under Article 291 of the Civil Service Regulations.

3.—Bombay Gazette.

9th July, 1895. No 5178.—His Excellency the Governor in Council is pleased to appoint Mr. R. C. Wroughton to hold charge of the office of Divisional Forest Officer, Working Plans, N. C. Thana, in addition to his own duties, during the absence of Mr. G. P. Millett on privilege leave or pending further orders.

15*th July*, 1895. No. 912.—Mr. G. P. Millett, acting Deputy Conservator of Forests, 3rd grade, and Divisional Forest Officer, Working Plans, delivered over charge of the office to the undersigned* on the afternoon of the 12th July, 1895, and proceeded on three months privilege leave granted to him in Government Resolution No. 4731, dated 24th ultimo.

16*th July*, 1895. No 2603.—Messrs. R. S. F. Fagan, Deputy Conservator of Forests, and D. A. Thomson, Assistant Conservator of Forests, respectively delivered over and received charge of the Satára Forest Division on the 10th July, 1895, afternoon.

17*th July*, 1895. No. 2672.—Mr. J. M. Fernandez, Extra Assistant Conservator of Forests, delivered over charge of the Ratnagiri Division to Mr. Drew, Collector of Ratnagiri, on the 6th instant, before office hours.

24*th July*, 1895. No. 5601.—Mr. C. M. Hodgson, Divisional Forest Officer, West Thana, passed an examination in Marathi according to the Lower Standard on the 8th July, 1895.

Mr. W. E. Copleston, Assistant Conservator of Forests, Belgaum, passed an examination in Kanarese according to the Lower Standard on the 8th July, 1895.

4.—Bengal Gazette.

1*st July*, 1895. No. 3910A.—The report of the Central Examination Committee having been received, the result of the half-yearly departmental examination of Assistant Magistrates and others held on the 6th May, 1895, and the following two days, is published for general information :—

The following Forest Officers have passed in the subject or subjects noted against their names :—

1.	Mr. W. F. Perree	...	Procedure and Accounts.
2.	„ J. P. Haslett	...	Ditto.
3.	„ T. J. Pocock	...	Ditto.
4.	Babu Kedar Nath Mozumdar	..	Forest Law and Land Revenue Systems.

20*th July*, 1895. No 3502.—Mr. E. E. Slane, Extra Assistant Conservator of Forests, is granted privilege leave for one day, under Article 291 of the Civil Service Regulations, in extension of the leave granted to him in Notification No. 1685-For., dated the 27th March, 1894.

23*rd July*, 1895. No. 3549.—Mr. J. W. A. Grieve, Assistant Conservator of Forests, attached to the Darjeeling Forest Division, is granted three months' Examination leave, under section 69 of the Forest Department Code, with effect from the 15th July, 1895, or from any subsequent date on which he may avail himself of it.

5.—N.-W. P. and Oudh.

29*th June*, 1895. No. 2312.—Mr. H. G. Billson, Assistant Conservator of Forests, from the Kheri to the Gorakhpur Forest Division of the Oudh Circle.

*Gazette does not say who the "undersigned" is!

5*th July*, 1895. No. 2383—Pandit Sadanand Gairola, Extra Assistant Conservator of Forests, from the Jaunsar to the Direction Division of the School Circle.

5*th July*, 1895. No. 2395.—Mr. J. C. Tulloch, Assistant Conservator of Forests, in charge of the Gorakhpur Forest Division of the Oudh Circle, privilege leave for three months with effect from the 20th July, 1895.

5*th July*, 1895. No. 2396.—Mr. H. G. Billson, Assistant Conservator of Forests, attached to the Gorakhpur Forest Division of the Oudh Circle, to the charge of that division, *vice* Mr. J. C. Tulloch, granted privilege leave.

6*th July*, 1895. No. 2400.—In Notification No. 1597, dated the 2nd May, 1895, appointing Babu Raghu Nath Pathak, Extra Assistant Conservator of Forests, to the charge of the Garhwal Forest Division, *for the words* "granted leave" *read* "on deputation,"

17*th July*, 1895. No. 2505.—Mr. W. Shakespear, Deputy Conservator of Forests, in charge of the Kumaun Division, Central Circle, privilege leave for two months and twenty-eight days with effect from the 6th August, 1895.

17*th July*. 1895. No. 2511.—Mr. A. G. Hobart-Hampden, Deputy Conservator of Forests, in charge of the Ganges Division, Central Circle, privilege leave for three months with effect from the 22nd July 1895.

17*th July*, 1895. No. 2506.—Mr. F. B. Bryant, Deputy Conservator of Forests, Working Plans Officer, Direction Division, to hold charge of the Kumaun Division of the Central Circle in addition to his other duties during the absence on leave of Mr. W. Shakespear or until further orders.

17*th July*, 1895. No. 2512,—Lala Har Swarup, Extra Assistant Conservator of Forests, attached to the Direction Division of the Oudh Circle, to hold charge of the Ganges Division in the Central Circle, *vice* Mr. A. G. Hobart-Hampden, granted leave.

6.—PUNJAB GAZETTE.

3*rd July*, 1895. No. 420.—On transfer to Biluchistan, Mr. Reuther, Deputy Conservator of Forests, made over charge of his duties in connection with the Kalachitta Working Plan to Mr. Dansey, Conservator of Forests, Punjab, on the forenoon of the 15th February, 1895.

11*th July*, 1895 No. 444—Mr. R. M. Williamson, Assistant Conservator, 2nd grade, is promoted to the 1st grade (provisionally), with effect from 30th April, 1895, consequent on his having passed all the examinations prescribed in section 72 of the Forest Department Code.

11*th July*, 1895. No 448.—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. E. Lowrie	Provisional Deputy Conservator, 4th grade ..	Deputy Conservator, 4th grade.	27th March, 1895.	Consequent on the death of Mr. Moore, Deputy Conservator, 4th grade.
Mr. G. S. Hart ..	Assistant Conservator, 1st grade, and Officiating Deputy Conservator, 4th grade	Provisional Deputy Conservator, 4th grade.	Ditto ..	Ditto.
Mr. E M. Coventry ..	Provisional Assistant Conservator, 1st grade	Assistant Conservator, 1st Grade.	Ditto ..	Ditto.
Mr. F. O. Lemarchand ..	Deputy Conservator, 2nd grade.	Officiating Deputy Conservator. 1st grade	8th May, 1895.	Consequent on the departure of Mr. Rind, Officiating Deputy Conservator, 1st grade, on one year's sick leave
Mr. J. H. Lace ..	Deputy Conservator, 3rd grade ..	Officiating Deputy Conservator, 2nd grade.	Ditto ..	
Mr. F. C. Hicks ..	Deputy Conservator, 4th grade ..	Officiating Deputy Conservator, 3rd grade.	Ditto ..	
Mr. R. M. William	Provisional Assistant Conservator, 1st grade,	Officiating Deputy Conservator, 4th grade.	Ditto ..	
Mr. E. Dobbs ..	Provisional Deputy Conservator, 2nd grade ..	Deputy Conservator, 2nd grade.	29th May, 1895.	Consequent on the retirement of Mr. Ballantine, Deputy Conservator, 2nd grade.
Mr. W. King ..	Officiating Deputy Conservator, 2nd grade ..	Provisional Deputy Conservator, 2nd grade.	Ditto ..	
Mr. F. S. Barker	Provisional Deputy Conservator, 3rd grade ..	Deputy Conservator, 3rd grade.	Ditto ..	
Mr. G. F. Taylor	Officiating Deputy Conservator, 3rd grade.	Provisional Deputy Conservator, 3rd grade.	Ditto ..	
Mr. G. S Hart ..	Provisional Deputy Conservator, 4th grade	Deputy Conservator, 4th grade.	Ditto ..	
Mr. C. P. Fisher	Officiating Deputy Conservator, 4th grade.	Provisional Deputy Conservator, 4th grade.	Ditto ..	
Mr. R.M Williamson ..	Provisional Assistant Conservator, 1st grade, and Officiattng Deputy Conservatrr, 4th grade.	Aseistant Conservator, 1st grade, and Officiating Deputy Conservator, 4th grade.	Ditto ..	

7.—CENTRAL PROVINCES GAZETTE.

29*th June*, 1895.—No. 2.—Dinkar Vishnu Paranjpe, a passed private student of the Imperial Forest School, Dehra Dun, having complied with the condition laid down in Section 29 (1) of the Forest Department

Code, 4th Edition, is appointed as Forest Ranger, 5th grade, on Rs. 60 per mensem on the permanent establishment, with effect from the forenoon of the 27th June, 1895.

Dinkar Vishnu Paranjpe is temporarily attached to the Direction Division until further orders.

11*th July*, 1895.—No. 3009.—Consequent on the transfer to Coorg of Mr. A. E. Lowrie, Deputy Conservator of Forests, Chanda, Mr. P H. Clutterbuck, Officiating Deputy Conservator of Forests and Working-Plans Officer, Chanda, is posted to the charge of the Chanda Forest Division.

11*th July*, 1895.—No. 3010.—With reference to Order No. 3009, dated the 11th instant, Mr. P. H. Clutterbuck, Officiating Deputy Conservator of Forests, assumed charge of the Chanda Forest Division from Mr. A. E. Lowrie on the forenoon of the 17th June, 1895.

11*th July*, 1895,—No. 3012—Leave on medical certificate for one year, under Article 369 of the Civil Service Regulations, is granted to Mr. L. A. W Rind, Deputy Conservator of Forests, Seoni.

11*th July*, 1895.—No. 3013.—With reference to Order No. 3012, dated the 11th July, 1895, Mr. L. A. W. Rind, Deputy Conservator of Forests, made over charge of the Seoni Forest Division to Mr. F. Linnell, Assistant Conservator of Forests, on the afternoon of the 7th May, 1895, and departed from Bombay on the 25th idem.

11*th July*, 1895.—No. 3014.—The following transfers and appointments are ordered, consequent on the departure of Mr. L. A. W. Rind, Deputy Conservator of Forests, on one year's leave on medical certificate, or until further orders :—

Mr. F. S. Barker, Deputy Conservator of Forests, from Chhindwara to Seoni.

Mr. Ramchandra Krishna, Extra-Assistant Conservator of Forests and Working-Plans Assistant, Balaghat Forest Division, is posted to the charge of the Chhindwara Forest Division.

11*th July*, 1895.—No. 3015.—With reference to Order No. 3014, dated the 11th July, 1895, Mr. Ramchandra Krishna, Extra-Assistant Conservator of Forests and Working-Plans Assistant, Balaghat Forest Division, made over charge of his duties at Balaghat on the afternoon of the 22nd June, 1895.

15*th July*, 1895.—No. 3064.—With reference to Order No. 3014, dated the 11th instant, Mr Ramchandra Krishna, Extra-Assistant Conservator of Forests, assumed charge of the Chhindwara Forest Division from Mr. F S. Barker, Deputy Conservator of Forests, on the forenoon of the 8th July, 1895.

8.—Burma Gazette.

18*th June*, 1895.—No. 4.—With reference to Revenue Department Notification No. 171 (Forests), dated the 20th May, 1895, Mr. C. W. A. Bruce, Assistant Conservator of Forests, made over, and Mr. A. M. Burn-Murdoch, Assistant Conservator of Forests, received, charge of the Upper Chindwin division on the afternoon of the 8th June, 1895, in addition to his own duties.

18*th June*, 1895.—No. 5.—Mr. C. W. A. Bruce, Assistant Conservator of Forests, Upper Chindwin division, availed himself on the

forenoon of the 19th June, 1895, of the three months and 15 days' privilege leave granted him in Revenue Department Notification No. 170 (Forests), dated the 20th May 1895.

20*th June*, 1895.—No. 490.—Mr. R. F. Lowis, Extra Assistant Conservator of Forests, Burma, is appointed to officiate as 8th Assistant Superintendent, Port Blair, *vice* Mahomed Ashiq Ali Khan, who was appointed in Home Department Notification No. 472, dated the 14th June, 1895, to officiate as 7th Assistant Superintendent, during the absence on furlough for one year of Mr. E. H. Man, C.I.E., Deputy Superintendent, or until further orders.

25*th June*, 1895.—No. 7.—With reference to Revenue Department Notification No. 200 (Forests), dated the 17th June, 1895, Mr. R. F. Lowis, Extra Assistant Conservator of Forests, relinquished charge of the Revenue Subdivision of the Mandalay Forest division on the afternoon of the 19th inem.

25*th June*, 1895.—No. 8.—With reference to Revenue Department Notification Nos. 181 and 182, Mr. H. B. Anthony, Deputy Conservator of Forests, made over, and Mr. C. R. Dun, Assistant Conservator of Forests, received, charge of the Southern Shan States division on the afternoon of the 24th June, 1895.

27*th June*, 1895.—No. 204.—Mr. W. J. Lane-Ryan, Extra Assistant Conservator of Forests, in charge of the Kyaukse subdivision of the Mandalay division, is temporarily transferred to the Pyinmana division.

27*th June*, 1895.—No. 205.—Under the provisions of Article 282 (*a*) (i) of the Civil Service Regulations privilege leave for three months and seven days is granted to Mr. H. B. Ward, Deputy Conservator of Forests, with effect from the 22nd July, 1895, or the subsequent date on which he may avail himself of it.

Mr. Ward is permitted to overstay his leave by eight days under Article 282 *(a)* (ii) of the Civil Service Regulations.

27*th June*, 1895.—No. 206.—Mr. H. B. Ward, Deputy Conservator of Forests, on being relieved by Mr. H. B. Anthony, Deputy Conservator of Forests, is transferred from Bassein to Rangoon as Personal Assistant to the Conservator of Forests, Pegu Circle.

27*th June*, 1895.—No. 207.—Under the provisions of Articles 282 (*a*) (i) and 291 of the Civil Service Regulations privilege leave for three months and 15 days is granted to Mr. W. T. T. McHarg, Assistant Conservator of Forests, with effect from the 18th July, 1895, or the subsequent date on which he may avail himself of it.

27*th June*, 1895.—No. 208.—Mr. H. N. Thompson, Assistant Conservator of Forests, in charge of the Mingin subdivision of the Lower Chindwin division, is posted to the charge of the Minbu division during the absence on leave of Mr. McHarg, or until further orders.

3*rd July*, 1895.—No. 213.—The following transfers are ordered in the Forest Department :—

Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, from Tigyaing to the North Tharrawaddy subdivision, Tharrawaddy Forest division, Zigon.

Mr. E. B. Powell, Extra Assistant Conservator of Forests, from Myanaung to the Myadaung subdivision, Katha Forest division, Tigyaing.

4th July, 1895.—No. 214.—This department Notification No. 208, dated the 27th June, 1895, posting Mr. H.N. Thompson, Assistant Conservator of Forests, to the charge of the Minbu Forest division, is hereby cancelled.

4th July, 1895.—No. 215.—In consequence of the death of Mr. T. H. Aplin, Deputy Conservator of Forests Mr. H. N. Thompson, Assistant Conservator of Forests, in charge of the Mingin subdivision, is appointed to the charge of the Lower Chindwin Forest division, in addition to his other duties, until further orders.

4th July, 1895.—No. 216.—Mr. H. H. Forteath, Assistant Conservator of Forests, in charge of the Gangaw subdivision, Yaw Forest division; is posted to the charge of the Minbu Forest division during the absence of Mr. W. T. T. McHarg, on privilege leave, or until further orders.

8th July, 1895.—No. 9.—With reference to Revenue Department Notification No. 204 (Forests), dated the 27th June, 1895, Mr. W. J. Lane-Ryan, Extra Assistant Conservator of Forests, relinquished charge of the Kyaukse subdivision of the Mandalay division on the afternoon of the 1st July, 1895, and reported himself for duty at Pyinmana on the afternoon of the 2nd instant.

9th July 1895.—No. 9.—With reference to Revenue Department Notification No. 206F., dated the 27th June, 1895, Mr. H. B. Ward, Deputy Conservator of Forests, made over, and Mr. H. B. Anthony, Deputy Conservator of Forests, received, charge of the Bassein-Myaungmya division on the afternoon of the 6th July, 1895.

10th July, 1895,—No. 10.—With reference to Revenue Department Notification No. 206 (Forests), dated the 27th June, 1895, Mr. H. B. Ward, Deputy Conservator of Forests, assumed charge of his duties as Personal Assistant to the Conservator of Forests on the forenoon of the 10th July, 1895.

11th July, 1895.—No. 220.—Under the provisions of Article 282 (*a*) (i) of the Civil Service Regulations privilege leave for three months and 15 days is granted to Mr. J. Messer, Assistant Conservator of Forests, with effect from the 26th July, 1895, or the subsequent date on which he may avail himself of it.

11th July, 1895.—No. 6 —In accordance with Revenue Department Notification No. 215, dated the 4th July, 1895, Mr. H. N. Thompson, Assistant Conservator of Forests, Mingin subdivision, assumed charge of the Lower Chindwin Forest Division on the forenoon of the 6th July, 1895.

15th July, 1895.—No. 10.—Mr. S. Carr, Assistant Conservator of Forests, relinquished charge of the Yamethin subdivision, of the Pyinmana division, on the afternoon of the 5th instant, and availed himself on the same date of the privilege leave granted him in Revenue Department Notification No. 201 (Forests), dated the 20th June last.

9.—ASSAM GAZETTE.

12th July, 1895.—No. 3983G.—In consequence of the transfer to Bengal of Mr. W. F. Lloyd, Assistant Conservator of Forests, 1st grade, and substantive provisional Deputy Conservator of Forests, 4th grade, the following promotions are made with effect from the 2nd June, 1895.

Mr. H. S. Ker-Edie, Assistant Conservator of Forests, 1st grade, and Officiating Deputy Conservator of Forests, 4th grade, to be Deputy Conservator of Forests, 4th grade (provisional).

Mr. A. M. Long, Assistant Conservator of Forests, 2nd grade, (provisional 1st grade), and Officiating Deputy Conservator of Forests, 4th grade, to be Assistant Conservator of Forests, 1st grade, and to continue to officiate in the 4th grade of Deputy Conservators.

18*th July*, 1895.—No. 4082G.—In consequence of the transfer to Bengal of Mr. W. F. Lloyd, Deputy Conservator of Forests, Mr. D. P. Copeland, Deputy Conservator of Forests, Darrang Division, is placed in charge of the Lakhimpur Division in addition to his own duties

Notification No. 3179G., dated the 7th June, 1895, is hereby cancelled.

18*th July* 1895.—No. 4084G.—Mr. H. G. Young, Deputy Conservator of Forests, Assam, has been granted by Her Majesty's Secretary of State for India an extension of one week's furlough, and permission to return to duty, as advised in list, dated 21st June, 1895.

10.—HYDERABAD RESIDENCY GAZETTE.

8*th July* 1895—No. 253.—Mr. W. J. Peake, an Extra Assistant Conservator of Forests of the 4th grade in Berar, has been granted privilege leave for two months, with effect from the 25th June, 1895, or the subsequent date on which he may avail himself of it.

11.—MYSORE GAZETTE.

28*th June*, 1895.—No. 24853—*R.* 3655.—Mr. Appaiya, Sub-Assistant Conservator of Forests, is transferred to the Office of the Inspector General of Forests for duty during the absence of Mr. Bapu Rao, transferred to Hassan or until further orders.

8*th July*, 1895.—No. 292—13.—Mr. C. Appaiya, Sub-Assistant Conservator of Forests, reported himself to the Inspector General of Forests for duty on the morning of the 18th June, 1895.

9*th July* 1895.—No. 324—15.—Mr. Shamaiengar, Sub-Assistant Conservator of Forests, French Rocks Sub-Division, was granted five days' casual leave from the 10th June, 1895.

16*th July* 1895.—No. 675—28.—Under Article 173 of the Mysore Service Regulations, Mr. A. G. R. Theobald, Sub-Assistant Conservator of Forests, Mysore District, is granted six days' casual leave from the 1st instant, or from such other date as he may avail himself of the same.

18*th July* 1895.—No. 840—43.—Mr. K. Shamaiengar, Sub-Assistant Conservator of Forests, doing duty in the French Rocks Sub-Division, is posted to the Chitaldrug District,

Mr. A. G. R. Theobald, Sub-Assistant Conservator of Forests, with his head-quarters at Mysore, will do the Forest work of the French Rocks Sub-Division.

19*th July*, 1895.—No. 750—34.—The following promotions are ordered with effect from 1st July, 1895:—

Mr. C. E. M. Russell, Deputy Conservator of Forest, 2nd Class, to be Deputy Conservator of Forests, 1st Class, the house rent of Rs. 50 now drawn by him being abolished.

Mr. T. Abdul Karim, Deputy Conservator of Forests, 3rd Class, to be Deputy Conservator of Forests, 2nd Class.

Mr. C. Narayan Rao, Assistant Conservator of Forests, 1st Class to be Deputy Conservator of Forests, 3rd Class.

Mr. S. A. Bapu Rao, Assistant Conservator of Forests, 2nd Class, to be Assistant Conservator of Forests, 1st Class.

Mr. H. Muttappa, Assistant Conservator of Forests, 2nd Class, to be Assistant Conservator of Forests, 1st Class.

Mr. G. E. Ricketts, Assistant Conservator of Forests, 3rd Class, to be Assistant Conservator of Forests, 2nd Class.

Mr. B. Hira Singh, Sub-Assistant Conservator of Forests on Rs. 150 to be Assistant Conservator of Forests, 3rd Class.

Mr. C. Appaiya, Sub-Assistant Conservator of Forests on Rs. 150 to be Assistant Conservator of Forests, 3rd Class.

Mr. K. Shamaiengar, Sub-Assistant Conservator of Forests on Rs. 100 to be Sub-Assistant Conservator of Forests on Rs. 150.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES

1.—Gazette of India.

30th July, 1895.—No. 813—136-10-F.—In supersession of the Notification of this Department, No. 648-F., dated the 13th ultimo, furlough for two years, under Article 340 (*b*) of the Civil Service Regulations, is granted to Mr. P. J. Carter, Conservator of Forests, 3rd (officiating 2nd) grade, Pegu Circle, Lower Burma, with effect from 19th July, 1895.

The following temporary arrangements are made during Mr. Carter's absence, or until further orders:

(i) Mr. J. A. McKee, Conservator, 3rd grade, Central Provinces, to officate in the 2nd grade, with effect from 19th July, 1894.

(ii) Mr. J. Nisbet, officiating Conservator, 3rd grade, Tenasserim Circle, Burma, to be in charge of the Pegu Circle, with effect from 19th July, 1895.

(iii) Mr. G. F. Prevost, Deputy Conservator, Coorg, to officiate as Conservator, 3rd grade, in charge of the Tenasserim Circle, with effect from 18th July, 1895.

(iv) Mr. A. E. Lowrie, Deputy Conservator, Central Provinces, is transferred to Coorg, with effect from 2nd July, 1895.

30th July, 1895.—No. 817—193-7-F.—In supersession of the orders contained in the Notification of this Department, No. 658-F., dated the 19th ultimo, privilege leave for three months, under Articles 277 and 291 of the Civil Service Regulations, is granted to Mr. S. Eardley-Wilmot, Conservator of Forests, 2nd grade, Oudh Circle, North-Western Provinces and Oudh, with effect from 24th July, 1895.

The following temporary promotions are made during Mr. Wilmot's absence, or until further orders, with effect from the same date:

(i) Mr. F. B. Dickinson, Conservator, 3rd grade, Burma, to officiate in the 2nd grade.

(ii) Colonel J. E. Campbell, I. S. C., Deputy Conservator, 1st grade, North-Western Provinces and Oudh, to officiate as Conservator, 3rd grade, in charge of the Oudh Circle.

15th August, 1895.—No. 879—239-4-F.—Privilege leave for two months and twenty-one days, under Articles 277 and 291 of the Civil Service Regulations, is granted to Mr. J. S. Gamble, Conservator of Forests, 1st grade, School Circle, North-Western Provinces and Oudh, and Director of the Imperial Forest School, Dehra Dun, with effect from the 6th August, 1895.

The following temporary arrangements are made during Mr. Gamble's absence, or until further orders:

(i) Mr. J. W. Oliver, Conservator, 2nd grade, Burma, to officiate in the 1st grade.
(ii) Mr. A. Smythies, Deputy Director of the Forest School, to officiate as Conservator, 3rd grade, in charge of the School Circle and as Director of the Forest School.
(iii) Mr. A. F. Gradon, Instructor at the Forest School, to officiate as Deputy Director.

} With effect from 6th August, 1895.

(iv) Mr. B. B. Osmaston, Assistant Conservator, North-Western Provinces and Oudh, to officiate as Instructor at the Forest School, with effect from 9th August, 1895.

30th August, 1895.—No. 903—258-4-F.—Mr. J. Nisbet, Officiating Conservator of Forests, 3rd grade, Pegu Circle, Lower Burma, is granted privilege leave for forty six days, under Articles 277 and 291 of the Civil Service Regulations, together with fifteen days' overstay under Article 282 (*a*) (ii), with effect from 23rd August, 1895.

From the same date Mr. F. W. Thellusson, Deputy Conservator, 3rd grade, in charge of the Pegu Circle, during Mr. Nisbet's absence, or until further orders.

2.—Madras Gazette.

22nd July, 1895.—No. 396 :—

No.	Name and designation of Officer.	District.	Nature of charge.	Remarks.
1	Mr. S. C. Moss, Extra Assistant Conservator, 2nd grade.	Tinnevelly	Acting District Officer.	During the absence of Mr. H. B. Bryant on privilege leave, or until further orders.
2	Mr. C. J. Woutersz, Extra Assistant Conservator, 3rd grade.	Trichinopoly *cum* Tanjore.	Do.	During the absence of Mr. H. J. Porter on privilege leave, or until further orders.
3	Mr. C. A. Eber Hardie, Extra Assistant Conservator, 1st grade.	Bellary.	Do.	*Vice* Mr. E. D. M. Hooper on other duty, or until further orders.

23rd July, 1895.—Ranger T. Babu Row from the Salem to the North Arcot District.

25th July, 1895.—No. 399 :—

No.	Name and designation of officer.	District.	Nature of charge.	Remarks.
1	Mr. R. McIntosh, Deputy Conservator of Forests, 4th grade, and District Officer, Cuddapah.	Ganjam	District Forest Officer.	To join on or after the 15th August.
2	Mr. J. S. Battie, Deputy Conservator of Forests, 3rd grade, and District Forest Officer, Ganjam.	South Canara.	Do.	To join on relief by Mr. McIntosh.
3	Mr. F. Foulkes, Acting Deputy Conservator, 4th grade, and District Forest Officer, Canara.	Cuddapah	Do.	To join on relief by Mr. Mr. Battie.

3rd August, 1895.—The six months' leave on medical certificate, under Article 369 of the Civil Service Regulations, granted in Service Order 46 of 1895, to V. P. Ramalingan Pillai, Ranger on Rs. 125, from 18th December, 1894, is extended by one month.

4th August, 1895.—Forest Ranger Viswanatham Panthulu is transferred from Godavari to Kurnool.

9th August, 1895.—The following transfer is ordered with effect from date of relief of District charge of Bellary :—

Mr. V. Alwar Chetty, Extra Assistant Conservator, 2nd grade, from the Northern Circle for duty under the District Officer, Madura.

7th August, 1895.—The three weeks' leave on medical certificate, under Article 369 of the Civil Service Regulations, granted to C. S. Venkataramana Iyer, Ranger on Rs. 50, North Malabar Division, in Service Order 91 of 1895, is extended by three months.

10th August, 1895.—The following promotions are ordered in the Southern Circle, with effect from 28th March, 1895 :—

Name.	District.	Present grade.	Nature of promotion.	Remarks.
Mr. A. G. Van Haeften.	Nilgiris ...	Ranger on Rs. 100 and Acting Ranger on Rs. 125.	Ranger on Rs. 125.	*Vice* Mr. W. R. Newman, of the Northern Circle, reduced to Ranger on Rs. 100.
N. Armuga Mudaliar	South Coimbatore.	Do. Do.	Acting Ranger on Rs. 125.	*Vice* Mr. O'Neill, Acting Extra Assistant Conservator up to 15th October 1895, (inclusive).
Mr. W. P. Rego.	South Malabar (under transfer to North Malabar).	Ranger on Rs. 100.	Do.	*Vice* V. P. Ramalingam Pillai on leave up to 17th July, 1895, (inclusive).

16*th August*, 1895.—No. 436.—

No.	Name of officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
1	Mr. E. D. M. Hooper	Deputy Conservator, 1st grade and Acting Conservator, 3rd grade.	Conservator, 3rd grade.	Acting.	During the absence of Mr. J. W. Cherry on leave, or until further orders.
2	Do.	Acting Conservator, 3rd grade.	Conservator, 2nd grade.	Do.	During the absence of Mr. Peet on leave, or until further orders.
3	Mr. H. A. Gass	Deputy Conservator, 2nd grade, and Acting Deputy Conservator, 1st grade.	Conservator, 3rd grade.	Do.	*Vice* No. 2.
4	Mr. A. W. C. Stanbrough.	Deputy Conservator, 2nd grade.	Deputy Conservator, 1st grade.	Do.	*Vice* No. 3.
5	Mr. A. W. Lushington	Deputy Conservator, 3rd grade.	Deputy Conservator, 2nd grade.	Do.	*Vice* No. 4.
6	Mr. C. D. McArthy.	Deputy Conservator, 4th grade.	Deputy Conservator, 3rd grade.	Do.	*Vice* No. 5.

16*th August*, 1895,—No. 437.—

No.	Name and designation of officer	District.	Nature of charge.	Remarks.
1	Mr. H. A. Gass, Acting Conservator, 3rd grade.	Southern Circle.	Acting Conservator of Forests.	During the absence of Mr. Peet on leave. or until further orders.
2	Mr. F. C. L. Cowley-Brown, Acting Deputy Conservator, 4th grade.	South Coimbatore.	Acting District Forest Officer.	*Vice* Mr. Gass on other duty, or until further orders.

17*th August*, 1895.—No. 434.—Mr. C. duPre Thornton, District Forest Officer, Vizagapatam, is granted privilege leave for one month and five days, with effect from or after the 19th August, 1895, under Article 291 of the Civil Service Regulations.

17*th August*, 1895.—No. 452.—Mr. J. W. Cherry, Conservator of Forests, Southern Circle, is granted furlough for eighteen months, with effect from or after the 15th August, 1895, under Article 340 (*b*) of the Civil Service Regulations.

20*th August*, 1895.—To P. Venkatakrishnama Naidu, Ranger, 5th grade, Salem District, for four months and four days, from 23rd June, 1895, under Article 369 of the Civil Service Regulations.

20*th August*, 1895.—R. Venkatesa Mudali, Forest Ranger, 5th grade, Godavari District, is granted six months' leave on medical certificate from 8th August, 1895.

20*th August*, 1895.—N. S. Anantha Charlu, Acting Forest Ranger, Anantapur District, is granted three months' privilege leave from 23rd May to 22nd August 1895 inclusive.

22*nd August*, 1895.—The two months' leave on medical certificate, under Article 369 of the Civil Service Regulations, granted in Service Order Nos. 27 and 80 of 1895, to Mr. J. W. Ryan, Ranger, on Rs. 50, North Malabar Division, is extended by fifteen days.

22*nd August*, 1895 —Mr. J. W. Ryan, Ranger on Rs. 50, North Malabar, is granted leave on medical certificate, under Article 369 of the Civil Service Regulations for one and a half months, from the date of availing himself of the same.

3.—Bombay Gazette.

31*st July*, 1895.—No. 5811.—Mr. W. R. Woodrow, Deputy Conservator of Forests, 3rd grade, has been allowed by Her Majesty's Secretary of State for India, an extension of furlough for five months.

14*th August*, 1895.—No. 6164.—His Excellency the Governor in Council is pleased to appoint Mr. Ganpat Jayavant Rege to act as Extra Assistant Conservator of Forests, 4th grade, during the absence of Mr. J. M. Fernandez or pending further orders.

20*th August*, 1895.—Mr. J. M. Fernandez, Extra Assistant Conservator of Forests, 1st grade, is allowed privilege leave of absence for two months and fifteen days from 6th July, 1895.

28*th August*, 1895.—No. 6566.—His Excellency the Governor in Council is pleased to appoint Mr. A. Stewart, on return from leave, to be Divisional Forest Officer, Surat.

4.—Bengal Gazette.

25*th July*, 1895.—No. 3590.—Mr. C. C. Hatt, Assistant Conservator of Forests and Officiating Deputy Conservator of Forests, 4th grade, on return from the leave granted to him in Notification No. 2286-For, dated the 2nd May, 1895, is posted to the charge of the Puri Forest Division.

2. Mr. E. E. Slane, Extra Assistant Conservator of Forests, on being relieved of the charge of the Puri Forest Division, is transferred to the Singhbhum Forest Division, for general duty.

3. Mr. E. P. Stebbing, Assistant Conservator of Forests, attached to the Singhbhum Forest Division, is transferred to the charge of the Tista Forest Division.

4. Babu Sreedhur Chuckerbutty, Extra Assistant Conservator of Forests, attached to the Tista Forest Division, on being relieved, is transferred to the Sundarbans Forest Division.

29th July, 1894.—No. 3636.—Mr. H. A. Farington, Assistant Conservator of Forests attached to the Jalpaiguri Forest Division, is granted one month's Examination leave, under Section 69 of the Forest Department Code, with effect from any subsequent date on which he may avail himself of it.

17th August, 1895.—No. 4799A.—In continuation of the notification No. 3910A., dated the 1st July, 1895, it is hereby notified that the following Forest Officers have passed in Hindustani by the higher standard at the Departmental Examination of Assistant Magistrates and others, held in May, 1895:—

Mr. J. P. Haslett. | Mr. E. P. Stebbing

5.—N.-W. P. AND OUDH.

17th August, 1895.—No. 2876:—The following temporary promotions in the Forest Department are notified for general information:—

Entry No.	With effect from—	Consequent on—	Name	From—	To—
1	23rd July, 1895.	Mr. A. G. Hobart-Hampden's departure on privilege leave.	Mr. M. Hill	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.
			Mr. F. A. Leete.	Assistant Conservator, 2nd grade.	Officiating Assistant Conservator, 1st grade.
2	24th July, 1895.	Col. J. E. Campbell's appointment as Offg. Conservator, 3rd grade.	Mr. W. Shakespear,	Deputy Conservator, 2nd grade.	Officiating Deputy Conservator, 1st grade.
			Mr. E. A. Down.	Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.
			Mr. A. G. Hobart-Hampden, on privilege leave.	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.
			Mr. B. A. Rebsch.	Ditto.	Ditto.
			Mr. B. B. Osmaston,	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.
			Mr. J. C. Tulloch, on privilege leave.	Assistant Conservator, 2nd grade.	Officiating Assistant Conservator, 1st grade.

20th August, 1895.—No. 2893.—Pandit Sadanand Gairola, Extra Assistant Conservator of Forests, attached to the Direction Division of the School Forest Circle, to the charge of the Saharanpur Division of the same circle, *vice* Mr. B. B. Osmaston, on deputation.

29th August, 1895.—3007.—Mr. N. Hearle, Deputy Conservator of Forests, from the Pilibhit Division of the Oudh Circle to the Direction Division of the Central Circle.

29th August, 1895 — 3008.—Mr. J. M. Blanchfield, Extra Assistant Conservator of Forests, attached to the Bahraich Division of the Oudh Circle, to the charge of the Pilibhit Division of that Circle.

29th August, 1895.—No. 3009.—Mr. Keshva Nand, Extra Assistant Conservator of Forests, on return from leave, to be attached to the Bahraich Division of the Oudh Circle.

6.—PUNJAB GAZETTE.

8th August, 1895.—No. 458.—Mr. Gisborne Smith, Deputy Conservator of Forests, Hazara Division, is granted privilege leave for one month and twenty-three days with effect from 15th August, or such subsequent date as he may avail himself of it.

15th August, 1895.—No. 480.—The following changes have taken place in the List of Forest Officers in the Associated Provinces, with effect from the dates specified against each :—

Name	Present Grade.	Grade to which promoted or reverted.	With effect from.	REMARKS.
Mr. F. S. Gisborne Smith.	Deputy Conservator, 2nd grade.	Officiating Deputy Conservator, 2nd grade.	18th July, 1895.	Consequent on Mr. Prevost officiating as Conservator, Tenasserim Circle, Burma.
Mr. A. E. Lowrie.	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.	18th July, 1895.	

21st August, 1895.—No. 493—.Mr. A. V. Monro, Deputy Conservator of Forests, on return from the privilege leave granted him in Punjab Government Notification No. 194, dated 26th March, 1895, reported his arrival on the afternoon of the 8th August, 1895, and was attached to the Hazara Division from the same date.

24th August, 1895.—No. 603.—At an examination in the Punjabi language held at Meean Meer on the 10th of January 1895, Mr. G. S. Hart, Deputy Conservator of Forests, Punjab, has been declared by the Committee of Examination to have passed by the Higher Standard.

28th August 1895.—No. 504.—The following changes have taken place in the List of Forest Officers in the Associated Provinces, with

effect from the dates specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from.	Remarks.
Mr. F. S. Barker.	Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.	2nd Aug., 1895.	Consequent on the departure of Mr. King, Deputy Conservator, of Forests, on two years' furlough.
Mr. G. S. Hart.	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.	2nd Aug., 1895.	

7.—CENTRAL PROVINCES GAZETTE.

31*st July*, 1895.—No. 3344.—With reference to Order No. 3014, dated the 11th July, 1895, Mr. F. S. Barker, Deputy Conservator of Forests, assumed charge of the Seoni Forest Division from Mr. F. Linnell, Assistant Conservator of Forests, on the forenoon of the 17th July, 1895.

7*th August*, 1895.—No. 3448.—Privilege leave for one month, under Article 291 of the Civil Service Regulations, is granted to Mr. F. O. Lemarchand, Deputy Conservator of Forests, 2nd grade, in charge of the Balaghat Forest Division, with effect from the 15th instant, or the subsequent date on which he may avail himself of it.

28*th August*, 1895.—No. 3759.—Furlough for two years, under Article 340 (*b*) of the Civil Service Regulations, is granted to Mr. W. King, Deputy Conservator of Forests, Mandla, with effect from the date on which he may avail himself of it.

No. 3760—Mr. R. C. Thompson, Extra-Assistant Conservator of Forests and Working-Plans Assistant, Saugor, is posted to the charge of the Mandla Forest Division during the absence of Mr. W. King on furlough, or until further orders.

No. 3761.—Mr. W. King, Deputy Conservator of Forests, Mandla, availed himself on the afternoon of the 1st August, 1895, of subsidiary leave preparatory to the two years' furlough granted him by Order No. 3759, dated the 27th instant, making over charge of the Mandla Forest Division to the Deputy Commissioner.

No. 3762.—Mr. W. King, Deputy Conservator of Forests, reported his departure from Bombay, per s. s. *Pekin*, for Europe, on the afternoon of the 9th instant.

8.—BURMA GAZETTE.

20*th July*, 1895.—No. 11.—With reference to Revenue Department Notification No. 213 (Forests), dated the 3rd July, 1895, Mr. E. B. Powell, Extra Assistant Conservator of Forests, relinquished charge of the Myanaung subdivision on the forenoon of the 12th July, 1895.

22nd July, 1895.—No. 7.—With reference to Revenue Department Notification No. 216, dated the 4th July, 1895:—

Mr. H. H. Forteath, Assistant Conservator of Forests, made over, and Mr. C. L. Toussaint, Deputy Conservator of Forests, received, charge of the Gangaw subdivision, Yaw Forest division, on the afternoon of the 13th July 1895.

Mr. W. T. T. McHarg, officiating Deputy Conservator of Forests, availed himself of the three months and 15 days' privilege leave granted to him in Revenue Department Notification No. 207 (Forests), dated Rangoon, the 27th June 1895, and made over charge of the Minbu Forest division to Mr. H. H. Forteath, Assistant Conservator of Forests, on the afternoon of the 17th July, 1895.

23rd July, 1895.—No. 12.—On resignation of his appointment as Extra Assistant Conservator of Forests, Mr. F. J. Rivett relinquished charge of the North Tharrawaddy subdivision, of the Tharrawaddy division, on the afternoon of the 20th July 1895.

23rd July, 1895.—No. 229.—Mr. C. W. Allan, Extra Assistant Conservator of Forests, is transferred from Kindat to the charge of the Paungbyin subdivision of the Upper Chindwin Forest division.

29th July, 1895.—No. 240.—Under the provisions of Article 282 (*a*) (i) of the Civil Service Regulations privilege leave for three months is granted to Mr. E. A. O'Bryen, Assistant Conservator of Forests, with effect from the 12th August, 1895, or the subsequent date on which he may avail himself of it.

Mr. O'Bryen is permitted to overstay his leave by 15 days under Article 282 (A) (ii), of Civil Service Regulations.

29th July, 1895.—No. 241.—Mr. H. Jackson, Deputy Conservator of Forests, Ruby Mines division, is appointed to the charge of the Katha Forest division in addition to his own duties during the absence of Mr. E. A O'Bryen on privilege leave or until further orders.

30th July, 1895.—No. 11.—With reference to Revenue Department Notification No. 213 (Forests), dated the 3rd July 1895, Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, made over and Mr. E. B. Powell, Extra Assistant Concervator of Forests, received charge of the Myadaung subdivision of the Katha Forest Division on the afternoon of the 22nd July, 1895.

31st July 1895.—No. 13.—Mr. H. Slade, Deputy Conservator of Forests, on return from the privilege leave granted him in Revenue Department Notification No. 114 (Forests), dated the 2nd April, 1895, resumed charge of the Tharrawaddy division from Mr. J. Messer. Assistant Conservator of Forests, on the forenoon of the 25th July, 1895.

31st July 1895.—No. 14.—Mr. J. Messer, Assistant Conservator of Forests, on relinquishing charge of his duties in the Tharrawaddy division, availed himself on the afternoon of the 26th instant of the privilege leave granted him in Revenue Department Notification No. 220F., dated the 11th July, 1895.

31st July 1895.—No. 15.—Mr. H. B. Ward, Deputy Conservator of Forests, relinquished charge of his duties as Personal Assistant to the Conservator of Forests, Pegu Circle, on the afternoon of the 25th July, 1895, and availed himself of the privilege leave granted him in Revenue Department Notification No. 205, dated the 27th June, 1895.

2nd August, 1895.—No. 16.—With reference to Revenue Department Notification No. 213 (Forests), dated the 3rd July, 1895, Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, reported his arrival at Tharrawaddy subdivision on the afternoon of the same day.

8th August 1895.—No. 250.—In supersession of Notification No. 229, dated the 23rd July 1895, Mr. C. W. Allan, Extra Assistant Conservator of Forest, is transferred from Kindat to Pakokku for general duty, with effect from the 18th July 1895, and is appointed to take charge of the Yaw division during the absence on privilege leave of Mr. C. L. Toussaint.

8th August, 1895—No. 251.—Under the provisions of Article 282 (*a*) (i) of the Civil Service Regulations privilege leave for one month and 14 days is granted to Mr. C. L. Toussaint, Deputy Conservator of Forests, with effect from the 6th August 1895, or the subseqnent date on which he may avail himself of it.

Mr. Toussaint is permitted to overstay his leave by 15 days under Article 282 (*a*) (ii) of the Civil Service Regulations.

16th August, 1895.—No. 12.—Mr. E. A. O'Bryen, Deputy Conservator of Forests, availed himself on the afternoon of the 12th August, 1895, of the three months and 15 days' privilege leave granted him in Revenue Department Notification No. 240 (Forests), dated the 29th July, 1895.

No. 13.—With reference to Revenue Department Notification No. 241 (Forests), dated the 29th July, 1895, Mr. E. A. O'Bryen, Deputy Conservator of Forests, made over and Mr. H. Jackson, Deputy Conservator of Forests, received charge of the Katha Forest division on the afternoon of the 12th August, 1895.

19th August, 1895.—No, 263.—Mr. J. Messer, Assistant Conservator of Forests, 2nd (officiating 1st) grade, was placed on special duty in the office of the Deputy Conservator of Forests, Tharrawaddy division, on the 25th and 27th July 1895.

No. 264—Under the provisions of Articles 282(a) (i) and 291 of the Civil Service Regulations leave for three months and 15 days is granted to Mr. W. J. Lane-Ryan, Extra Assistant Conservator of Forests, with effect from the 13th August 1895, or the subsequent date on which he may avail himself of it.

19th August 1895.—No. 265.—Mr. C. S. Rogers, Extra Assistant Conservator of Forests, is transferred from Mongmit to special duty in the Pyinmana Forest division.

22nd August, 1895.—No. 266.—Under the provisions of Articles 277 and 291 of the Civil Service Regulations privilege leave for one month and 15 days is granted to Mr. J. Nisbet, officiating Conservator of Forest, Pegu Circle, with effect from the 23rd August, 1895, or later date on which he may avail himself of it.

Mr. Nisbet is allowed to overstay his leave by 15 days under Article 282 (*a*) (ii) Civil Service Regulations.

22nd August, 1895.—No. 267.—Mr. F. W. Thellusson, Deputy Conservator of Forests, 2nd grade, is transferred, with the approval of the Government of India, from Thayetmyo to Rangoon to officiate as Conservator of Forests in charge of the Pegu Circle during the absence on privilege leave of Mr. J. Nisbet or till further orders.

22nd August, 1895.—No. 268.—Mr. F. J. Branthwaite, Assistant Conservator, 1st (officiating Deputy Conservator, 4th) grade, is appointed to hold charge of the Thayetmyo division in addition to his other duties during the absence on deputation of Mr. F. W. Thellusson or till further orders.

10.—BERAR GAZETTE.

24th July, 1895.—No. 268.—Mr. Misri Prasadh, a Forest Ranger of the 4th grade, is appointed as a temporary measure to officiate as an Extra Assistant Conservator of the 4th grade during the absence of Mr. Ahmed Ali on furlough, or until further orders.

11.—MYSORE GAZETTE.

30th July 1895.—No. 1307.—Ft.—Under Article 188 of the Mysore Service Regulations, Mr. B. Srinivasa Rao, Assistant Conservator of Forests, Shikarpur Sub-Division, is granted one month's privilege leave of absence, from such date as he may avail himself of the same.

Mr. Monteiro, Extra Assistant Conservator of Forests, will be in charge of the Shikarpur Sub-division, during the absence of Mr. Srinivasa Rao on leave or until further orders.

10th August, 1895.—No. 1746—Ft. 96.—Under Article 218 of the Mysore Service Regulations Mr. G. E. Ricketts, Assistant Conservator of Forests in charge of Plantations, is granted leave on medical certificate for six months with effect from the 20th August, 1895, or from such other date as he may avail himself of the same.

Mr. C. Appaiya, Assistant Conservator of Forests, attached to the Inspector General's Office, will be in charge of the Plantation during the absence of Mr. G. E. Ricketts on leave or until further orders.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES

1.—Gazette of India.

6th September, 1895.—No. 927—238-4-F.—Mr. C. Bagshawe, Conservator of Forests. 1st grade, Berar, is granted privilege leave for seventeen days, with effect from the 3rd September, 1895.

From the same date, Mr. H. Calthrop, Deputy Conservator, 4th (officiating 3rd) grade, Berar, is appointed to officiate as Conservator, 3rd grade, Berar, in charge of the Berar Forests Circle in addition to his own duties, during Mr. Bagshawe's absence, or until further orders.

2.—Madras Gazette.

29th August, 1895.—That portion of S. O. No. 102 of 1895, dated 11th July, 1895, relating to the transfer of Mr. W. P. Rego, Ranger, on Rs. 100, from South Malabar to North Malabar, is hereby cancelled.

4th September, 1895.—The leave on medical certificate granted in Service Order Nos. 46 and 120 of 1895, to V. P. Ramalingam Pillai, Ranger on Rs. 125, on transfer from North Malabar to Madura, is further extended by six months.

5th September, 1895.—The following transfers are ordered:—

Mr. R. O'Hara, Acting Forest Ranger, from Vizagapatam to Godavari.

Mr. H. J. McLaughlin, Forest Ranger, from Godavari to Vizagapatam on relief by Mr. O'Hara.

6th September, 1895.—Extra Assistant Conservator of Forests Mr. W. Carroll, upon return from furlough, is posted to the North Arcot district to do duty under the District Forest Officer.

7th September, 1895.—To Ranger T. Arumuga Mudaliar, North Arcot District, for thirteen days, from 8th to 20th August, 1895, inclusive under Article 291 of the Civil Service Regulations.

16th September, 1895.—No. 517.—Mr. A. W. Peet, Conservator of Forests, Madras, has been permitted by the Right Honourable the Secretary of State for India to return to duty within the period of his leave.

3.—Bombay Gazette.

31st August, 1895.—No. 6678.—Mr. A C. Robinson, L. C. E., Extra Assistant Conservator of Forests, 3rd grade, and Sub-divisional Forest Officer, Kolaba, is allowed privilege leave of absence for two months from 5th September, 1895.

20th September, 1895.—No. 4158.—Mr. W. F. D. Fisher, Actg. Deputy Conservator of Forests delivered over, and Mr. S. Hornidge, A. M. I. C. E., Deputy Conservator of Forests, received, charge of the Ahmednagar Division on the forenoon of 16th September, 1895.

25th September, 1895.—His Excellency the Governor in Council is leased to make the following appointments:—

Mr. W. G. Clabby to be Extra Assistant Conservator of Forests, 1st grade, vice Mr J. M. Fernandez deceased, continuing to serve in the Rajpipla State. Mr. Clabby's lien on his British appointment is suspended.

Mr. W. A. Wallinger to be Extra Assistant Conservator of Forests, 1st grade, vice Mr. W. G. Clabby, seconded.

Mr. A. C Robinson, L. C. E., to be Extra Assistant Conservator of Forests, 2nd grade, vice Mr. Wallinger.

Mr. Bhagvandas Harkisandas Dalal, L. C. E., to be Extra Assistant Conservator of Forests, 3rd grade, vice Mr. Robinson.

Mr. Ganpat Jayavant Rege to be substantive *pro tem.*, 4th grade, Extra Assistant Conservator of Forests as a temporary measure.

26th September, 1895.—No. 1567.—Mr. C. G. Dalia, L. C. E., Extra Assistant Conservator of Forests, 4th grade, delivered over and Mr. A. Stewart, Deputy Conservator of Forests, 3rd grade, received, charge of the Surat Forest Division on the forenoon of the 17th September, 1895.

4.—BENGAL GAZETTE.

4th *September*, 1895—No. 4140.—Mr. H. A. Farrington, Assistant Conservator of Forests, is granted one month's Examination leave, under section 69 of the Forest Department Code, in extension of the leave granted to him under the orders contained in Notification No. 3636-For., dated the 29th July, 1895.

9th September, 1895—No. 4190.—On return from the privilege leave granted to him in Notification No. 2286-For., dated the 2nd May, 1895, Mr. C. C. Hatt, Officiating Deputy Conservator of Forests, was attached to the Direction Division from the 29th July to the 10th August, 1895, both days inclusive.

10th September, 1895.—No. 4208 —Consequent on return, on the forenoon of the 15th July, 1895, of Mr. R. L. Heinig, Deputy Conservator of Forests, 4th grade, and officiating 3rd grade, from the privilege leave granted to him in Notification No. 66 T.-R., dated the 6th May, 1895, the following reversions among the officers on the Bengal Provincial List of the Indian Forest Service are ordered from that date :—

Mr. C. G. Rogers, F. C. H., Deputy Conservator of Forests, 4th grade, and officiating 3rd grade, on deputation to the Imperial Forest School, Dehra Dun (seconded), to the 4th grade of Deputy Conservators.

Mr. H. H Haines, F. C. H., Deputy Conservator of Forests, 4th grade and officiating 3rd grade, to the 4th grade of Deputy Conservators.

16th September, 1895.—No. 4260.—Consequent on the return, on the 29th July, 1895, of Mr C. C. Hatt, Officiating Deputy Conservator of Forests, 4th grade, from the leave granted to him in Notification No. 2286.-For., dated the 2nd May, 1895, Mr. F. Trafford, Assistant Conservator of Forests, 1st grade (provisional), and Officiating Conservator of Forests, 4th grade, ceased to officiate in the 4th grade of Deputy Conservators from the date.

17th September, 1895.—No. 4279.—In Notification No. 65 T.-R., dated the 6th May, 1895. *for* "Mr. F. Trafford, Assistant Conservator of Forests, 1st grade," *read* "Mr. F. Trafford, Assistant Conservator of Forests, 1st grade (provisional)."

17*th September*, 1895.—No. 4282.—The position of Mr. W. F. Lloyd on the Bengal Provincial List, of the Indian Forest Service with effect from the 2nd June, 1895, the date on which he ceased to be borne on the Assam List will be Assistant Conservator of Forests, 1st grade, and Officiating Deputy Conservators of Forests 4th grade. His name will appear at the top of the list of Assistant Conservator of Forests, 1st grade.

24*th September*, 1895—No. 4365.—The services of Mr. W.F. Lloyd, Officiating Deputy Conservator of Forests, Bengal, are placed at the disposal of the Government of India in the Revenue and Agricultural Department, for employment in the Andamans during the absence, on leave, of Mr. Fordyce, Deputy Conservator of Forests in the Andamans, or until further orders.

6.—PUNJAB GAZETTE.

6*th September*, 1895.—No. 516.—Messrs. L. G. Smith and A. V. Monro, Deputy Conservators of Forests, respectively, made over and received charge of the Hazara Forest Division on the afternoon of the 19th August, 1895, consequent on the former's departure on privilege leave for one month and twenty-three days.

16*th September*, 1895.—No. 536.—The following changes have occurred in the list of Forest Officers of the Associated Provinces from the date noted against each :—

Name of Officer.	Present grade.	Grade to which promoted.	With effect from	REMARKS.
Mr. G. F. Taylor ...	Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.	20th August, 1895.	Consequent on the departure on 1 month and 23 days' privilege leave of Mr. Gisborn Smith.
Mr. C. P. Fisher ...	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.	Ditto.	
Mr. E. Dobbs ...	Deputy Conservator, 2nd grade.	Officiating Deputy Conservator, 1st grade.	2nd September, 1895.	Consequent on the departure of Mr. Lemarchand on one month's privilege leave.
Mr. H. Calthrop ...	Officiating Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.	Ditto.	
Mr. A. V. Monro ...	Provincial Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.	Ditto.	

18*th September*, 1895.—No. 542.—*Leave.*—Lala Jowala Pershad, Extra Assistant Conservator of Forests, is granted privilege leave for forty days, with effect from the 5th September, or such subsequent date as he may avail himself of it.

27*th September*, 1895.—No. 560.—The following changes have taken place in the list of Forest Officers of the amalgamated Provinces from the date noted against each:—

Name.	Present grade.	Grade to which promoted.	Date from which promotion takes effect.	Remarks.
Mr. W. King ...	Provisional Deputy Conservator, 2nd grade.	Deputy Conservator, 2nd grade.	8th July, 1895.	Consequent on the death of Mr. Rind, Deputy Conservator, 2nd grade.
Mr. A. M. Reuther ...	Officiating Deputy Conservator, 2nd grade.	Provisional Deputy Conservator, 2nd grade.	Ditto.	
Mr. G. F. Taylor ...	Provisional Deputy Conservator, 3rd grade.	Deputy Conservator, 3rd grade.	Ditto.	
Mr. A. L. McIntire ...	Deputy Conservator, 4th grade (on furlough).	Provisional Deputy Conservator, 3rd grade (on furlough).	Ditto.	
Mr. C. P. Fisher ...	Provisional Deputy Conservator, 4th grade.	Deputy Conservator, 4th grade.	Ditto.	
Mr. A. V. Monro ...	Officiating Deputy Conservator, 4th grade (on privilege leave).	Provisional Deputy Conservator, 4th grade.	Ditto.	
Mr. H. Calthrop ...	Officiating Deputy Conservator, 2nd grade.	Officiating Conservator.	3rd September, 1895.	Consequent on Mr. Calthrop officiating as Conservator of Forests, Berar.
Mr. F. C. Hicks ...	Officiating Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.	Ditto.	
Mr. A. W. lunt ...	Officiating Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.	Ditto.	

30th September, 1895.—No.567.—The Hon'ble the Lieutenant-Governor of the Punjab is pleased to make the following promotions, under the provisions of Section 45 of the Forest Department Code, with effect from the 1st September, 1895 :—

Babu Ladha Singh, Extra Assistant Conservator of Forests, from 3rd grade to 2nd grade ;

Mr. Fazl Din, Extra Assistant Conservator of Forests, from 4th to 3rd grade.

7.—CENTRAL PROVINCES GAZETTE.

9th September, 1895.—No. 4010.—With reference to Order No. 3760, dated the 27th ultimo, Mr. R. C. Thompson, Extra Assistant Conservator of Forests and Working-Plans Assistant of the Saugor Forest Division, relinquished charge of his duties at Saugor on the afternoon of the 7th August, 1895, and assumed charge of the Mandla Forest Division from the Deputy Commissioner of Mandla on the forenoon of the 19th idem.

16th September, 1895.—No. 4131.—Mr. F. O. Lemarchand, Deputy Conservator of Forests, Balaghat, availed himself, on the forenoon of the 2nd instant, of the one month's privilege leave granted him by Order No. 3448, dated the 7th August, 1895, making over charge of the Balaghat Forest Division to the Deputy Commissioner.

21st September, 1895.—No. 96.—Under the authority conferred on him by the *Central Provinces Gazette* Notification No. 3555. dated the 12th June, 1890, the Conservator of Forests, Southern Circle, appoints Mr. Ganga Pershad, Forest Ranger, to exercise the powers described in Section 67 of Act VII of 1878 (as modified up to the 1st December, 1894).

8.—BURMA GAZETTE.

22nd August, 1895.—No. 8.—With reference to Revenue Department Notification No. 250 (Forests), dated the 8th August, 1895, Mr. C. W. Allan, Extra Assistant Conservator of Forests, made over, and Mr. A. M. Burn-Murdoch, Assistant Conservator of Forests, received, charge of the Kindat Revenue subdivision on the forenoon of the 16th July, 1895.

No. 9.—Mr. D. H. Allan, Extra Assistant Conservator of Forests, reported his return from two months and seven days' privilege leave granted to him in the Revenue Department Notification No. 176 (Forests), dated the 23rd May, 1895, and resumed charge of the Alon Revenue subdivision from Mr. H. N. Thompson, Assistant Conservator of Forests, on the forenoon of the 19th August, 1895.

23rd August, 1895.—No. 17.—With reference to Revenue Department Notification No. 268 (Forests), dated the 22nd instant, Mr. F. W. Thellusson, Deputy Conservator of Forests, made over, and Mr. F. J. Branthwaite, Deputy Conservator of Forests, received, charge of the Thayetmyo division on the forenoon of the 21st August, 1895.

27th August, 1895.—No. 14.—Mr. W. J. Lane-Ryan, Extra Assistant Conservator of Forests, availed himself on the forenoon of the

8th August, 1895, of the three months and 15 days privilege leave granted him in Revenue Department Notification No. 264, dated the 20th August, 1895

27th August, 1895.—No. 277.—Mr. F. Ryan, Extra Assistant Conservator of Forests, 4th grade, is appointed to be an Extra Assistant Conservator of Forests, 3rd grade, with effect from the 4th June, 1895.

14th September, 1895.—No. 10—With reference to Revenue Department Notification No 250 (Forests), dated the 8th August, 1895, Mr. C. L. Toussaint, Deputy Conservator of Forests, made over charge of the Yaw Forest Division to Mr. C. W. Allan, Extra Assistant Conservator of Forests, on the afternoon of the 11th September, 1895, and availed himself of the one month and 14 days' privilege leave granted to him in the Revenue Department Notification No. 251 (Forests), dated the 8th August 1895.

17th September, 1895.—No. 291.—The following alterations in rank are ordered in the Forest Department:—

(1). With effect from the 19th June, 1895, consequent on the departure on privilege leave of Mr. C. W. A. Bruce, Assistant Conservator of Forests, 1st grade:—

Mr. A. M. Burn-Murdoch, Assistant Conservator of Forests, 2nd grade, to officiate as Assistant Conservator, 1st grade.

(2). With effect from the 4th July, 1895, consequent on the death of Mr. T. H. Aplin, Deputy Conservator, 2nd (officiating 1st) grade:—

Mr. H. Slade, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade.

Mr. E. S. Carr, Deputy Conservator, 3rd (officiating 2nd) grade, to be Deputy Conservator, 2nd grade.

Mr. C. H. Hobart-Hampden, Deputy Conservator, 4th grade, to be Deputy Conservator, 3rd grade.

Mr. F. J. Branthwaite Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to be Deputy Conservator, 4th grade.

Mr. C. R. Dun, Assistant Conservator, 2nd (officiating 1st) grade, to be Assistant Conservator, 1st grade, and to officiate as Deputy Conservator, 4th grade, during the absence of Mr. C. W. A. Bruce.

Mr. T. A. Hauxwell, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade, during the absence of Mr. H. Slade on privilege leave.

Mr. J. C. Murray, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade, *vice* Mr. T. A. Hauxwell.

Mr. C. L Toussaint, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade, *vice* Mr. J. C. Murray.

Mr. C. W. A. Bruce, Assistant Conservator, 1st grade, to officiate as Deputy Conservator, 4th grade, *vice* Mr. C. L. Toussaint.

Mr. Samuel Carr, F. C. H., Assistant Conservator, 2nd grade, to officiate, as Assistant Conservator, 1st grade, *vice* Mr. C. R. Dun.

(3). With effect from the 18th July, 1895, consequent on the departure of Mr. W. T. T. McHarg on privilege leave:—

Mr. H. N. Thompson, Assistant Conservator, 2nd (officiating 1st) grade, to officiate as Deputy Conservator, 4th grade.

(4). With effect from the 25th July, 1895, consequent on the return of Mr. H. Slade from privilege leave

Mr. T. A Hauxwell, Deputy Conservator, 2nd (officiating 1st) grade, to revert to his substantive rank.

Mr. J. C. Murray Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive rank.

Mr. C. L. Toussaint. Deputy Conservator, 4th (officiating 3rd) grade to revert to his substantive rank.

Mr. H. N. Thompson, Assistant Conservator, 2nd (Officiating Deputy Conservator 4th) grade, to officiate as Assistant Conservator, 1st grade.

(5). With effect from the 27th July, 1895, consequent on the departure of Mr. H. B. Ward on privilege leave:—

Mr. J. C. Murray, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. C. L. Toussaint, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. H. N. Thompson, Assistant Conservator, 2nd (officiating 1st) grade, to officiate as Deputy Conservator, 4th grade.

(6) With effect from the 13th August, 1895, consequent on the departure of Mr. E. A. O'Bryen on privilege leave:—

Mr. J. Messer, Assistant Conservator, 2nd (officiatiug 1st) grade to officiate as Deputy Conservator, 4th grade.

Mr. H. H. Forteath, Assistant Conservator, 2nd (officiating 1st) grade, to officiate as Deputy Conservator, 4th grade, during the absence of Mr. J. Messer, or until further orders.

(7) With effect from the 23rd August, 1895, consequent on the departure of Mr. J. Nisbet on privilege leave and the appointment of Mr. F. W. Thellusson to officiate as a Conservator:—

Mr. T. A. Hauxwell, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade.

Mr. J. Copeland, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. F. J. Branthwaite, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. G. R. Long, Assistant Conservator, 2nd (officiating 1st) grade, to officiate as Deputy Conservator, 4th grade.

10.—Hyderabad Residency Gazette.

17th August, 1895.—No. 299.—Mr. B. Bhukhan, Extra Assistant Conservator of Forests, 4th grade, and Divisional Forest Officer, Buldana, has been granted privilege leave for two months and six days, with effect from the 26th August, 1895, or the subsequent date on which he may avail himself of it.

Mr. W. G. J. Peake, Extra Assistant Conservator of Forests, will, on return from the privilege leave granted to him in *Residency Orders* Notification No. 253, dated the 8th July, 1895, hold temporary charge of the Buldana Forest Division during the absence of Mr. Bhukhan on privilege leave, or until further orders.

9th August, 1895.—No. 29—Forest Ranger Bisseswar Singh is appointed as Tahsildar of Melghat on a salary of Rs. 120 per mensem, with effect from the forenoon of the 17th August, 1895.

11.—Mysore Gazette.

30*th August*, 1895.—No. 2500—Ft. 128,—Mr. H. Muttappa, Assistant Conservator of Forests, Hassan District, reported himself at the head-quarters on the forenoon of the 29th July, 1895, for duty in connection with the preparation and classification of sandalwood in the several Kothis in the Province.

30*th August*, 1895.—No. 2502—Ft. 130,—Mr. H. Muttappa, Assistant Conservator of Forests, delivered over, and Mr. S. A. Bapu Rao, Assistant Conservator of Forests, received, charge of the Hassan District Forest office, on the afternoon of the 19th July, 1895.

4*th September*, 1895.—No. 2693—Ft. 144—The fourteen days' casual leave of absence granted to Mr. Venkatanaranappa, Assistant Conservator of Forests, Tumkur District, in Government Notification Nos. 16136—R. 2293, and 24971—R. 3699, dated 1st April and 29th June, 1895, respectively, is hereby extended by one day.

7*th September*, 1895.—No. 2954—Ft. 177.—Under Article 173 of the Mysore Service Regulations, Mr. P. E. Benson, Sub-Assistant Conservator of Forests, Mysore District, was granted casual leave of absence for thirteen days from the 9th to the 21st July, 1895.

16*th September*, 1895.—No. 3268—Ft. 195—Under Article 173 of the Mysore Service Regulations, the six days' casual leave of absence granted to Mr. A. G. R. Theobald, Sub-Assistant Conservator of Forests, Mysore District, in Notification No. 675—Ft. 28, dated 16th July, 1895, is hereby extended by two days.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES

1.—Gazette of India.

11th October, 1895.—No. 1045—238-12-F.—The privilege leave granted to Mr. Bagshawe, Conservator of Forests, Berar, in the notification of the Department, No. 927—238-4-F., dated the 6th ultimo, was extended by nine days, and that officer resumed charge of the Berar Forest Circle on the forenoon of the 29th ultimo, relieving Mr. Calthrop, Officiating Conservator, who reverted to his substantive appointment of Deputy Conservator in Berar.

18th October, 1895.—No. 1083 —301-2-F.—Mr. C. G. D. Fordyce, Deputy Conservator of Forests, 2nd grade, Bengal (Andamans), is appointed to officiate as Assistant Inspector General of Forests and Superintendent of Working-Plans, during the absence on privilege leave of Mr. J. L. Pigot, or until further orders, with effect from the 12th October 1895.

Mr. W. F. Lloyd, officiating Deputy Conservator, 4th grade, Bengal, is transferred to the Andamans, *vice* Mr. Fordyce, from whom he assumed charge on the afternoon of the 3rd October, 1895.

2.—Madras Gazette.

25*th September*, 1895.—Mr. C. P. Howell, Sub-Assistant Conservator of Forests (old scale) on Rs. 150, is transferred from Madura to South Canara—to report himself for duty to the District Forest Officer with the least possible delay.

13*th October*, 1895.—The following reversions and promotions are ordered in the Subordinate staff of the Southern Circle :—

Name.	Present grade.	Grade to which reverted or promoted.	Remarks.
N. Armuga Mudaliar	Acting Ranger on Rs. 150	Ranger on Rs. 100 ..	With effect from 16th October 1895, the date of Mr. O'Neill's reversion from the Extra Assistant Conservator's grade.
R. Sundram Pillai	Do. on ,, 100	Do. on ,, 80 ..	
Mr. M. S. Noronha	Do. on ,, 80	Do on ,, 60 ..	
Mr. A. F. X. Saldana	Do. on ,, 60	Do. on ,, 50 ..	
Mr. A. B. Myers ..	Do. on ,, 50	Forester on ,, 40 ..	
Mr. W. P. Rego ..	Do. on ,, 125	Ranger on ,, 100 ..	With effect from 16th October 1895, consequent on the reversion of their seniors from higher grades.
Mr. N. M. Rego ..	Do. on ,, 100	Do. on ,, 80 ..	
Mr. E. C. M. Mascurenhas ..	Do. on ,, 80	Do. on ,, 50 ..	
Mr. E. A. Monisse	Do. on ,, 50	Forester on ,, 40 ..	
N. Armuga Mudaliar	Ranger on Rs. 100 ..	Acting Ranger on Rs. 125	During the absence of M. R. Ry. V. P. Ramalingam Pillai Ranger on Rs. 125 on leave—to take effect from 16th October 1895 to 17th January 1896 (inclusive).
R. Sundram Pillai	Do. on ,, 80 ..	Do. on ,, 100	
Mr. M. S. Noronha	Do. on ,, 60 ..	Do. on ,, 80	
Mr. A. B. Myers ..	Forester on Rs. 40 ..	Do. on ,, 50	During the absence of Mr. H. E. Kelly, Ranger on Rs. 50—to have effect from 16th October 1895, to 14th February 1896 inclusive).

21*st October* 1895.—No. 558.

No.	Name and designation of officer.	Circle.	Nature of charge.	Remarks.
...	Mr. E. D. M. Hooper, Acting Conservator of Forests, 3rd grade.	Southern Circle.	Acting Conservator of Forests.	*Vice* Mr. Cherry on leave or until further orders, with effect from the date of Mr. Peet's return to duty.

24*th October* 1895.—The following transfer is ordered :—

Mr. S. C. Moss, Extra Assistant Conservator of Forests Tinnevelly District, from the Southern to the Central Circle.

28*th October* 1895.—To P. Venkatakrishnama Naidu, Ranger, 5th grade, Salem District, for three months, from the 27th October 1895, under article 372 of the Civil Service Regulations.

Madras, 25th October 1895.

Mr. S. C. Moss, Extra Assistant Conservator of Forests, to the Salem District.

3.—BOMBAY GAZETTE.

9*th October*, 1895.—No. 8081.—Mr. D. A. Thomson, Assistant Conservator of Forests, Satara, passed an examination in Marathi according to the Lower Standard on the 9th October 1895.

No. 8083.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. Savalyaram Balvant Ranade, L. C. E., to be Extra Assistant Conservator of Forests, 4th grade, and to be attached to the Northern Circle.

Mr. Vaman Ramchandra Gaundi to be Extra Assistant Conservator of Forests, Central Circle.

Mr. Ganpat Jayavant Rege to revert as Ranger from date of Mr. Ranade taking charge.

Mr. D. A. Thomson, on relief by Mr. R. S. F. Fagan, to be Assistant Conservator of Forests, Kanara.

15*th October*, 1895.—No. 1720.—Mr. G. P. Millett having returned from the privilege leave granted to him under Government Notification No. 4731 of 24th June 1895, took over charge of the Divisional Forest Office, Working Plans, on the 12th instant, in the forenoon.

21*st October*, 1895.—No. 8817.—The privilege leave for two months granted to Mr. A. C. Robinson, L. C. E., Extra Assistant Conservator of Forests, 2nd grade, and Sub-Divisional Forest Officer, Kolaba, in Government Notification No. 6678, dated 31st August, 1895, published at page 924 of the *Bombay Government Gazette* of the 5th September 1895 is hereby cancelled.

29*th October*, 1895.—No. 8417.—His Excellency the Governor in Council is pleased to allow Mr. R. S. F. Fagan, Divisional Forest Officer, Satara, and Mr. A. D. Wilkins, Divisional Forest Officer, Poona, to exchange Divisions at their own request.

30*th October*, 1895.—No. 8455.—Messrs. O. H. L. Napier, Assistant Conservator of Forests, passed an examination in Baluchi on the 7th October, 1895.

Mr. B. G. Deshpande, Extra Assistant Conservator of Forests, Sind Circle, passed an examination in Sindhi according to the Lower Standard on the 10th October 1895.

30*th October*, 1895.—No. 9479.—Mr. Vaman Gopal Tumne, Extra Assistant Conservator of Forests, 4th grade, and Sub-Divisional Forest Officer, West Khandesh, passed with credit on the 11th October, 1895, the examination in Law prescribed in Rule 4 of the Rules published in Government Notification No. 2, dated 3rd January, 1894, for the examination of officers of the Forest Department.

22*nd October*, 1895.—No. 4645.—Mr. Ganpat Jayavant Rege reported himself on duty as acting Extra Assistant Conservator of Forests (Government Resolution No. 6164 of the 14th August 1895) in the forenoon of the 17th August, 1895.

26*th October* 1895.—No. 4847.—Messrs. D. A. Thomson, Assistant Conservator of Forests, and S. R. Arthur, Second Assistant Collector, respectively delivered over and received charge of the Satara Divisional Forest Office on the 7th October 1895, in the afternoon.

Messrs. S. R. Arthur, Second Assistant Collector, and R. S. F. Fagan, Deputy Conservator of Forests, respectively delievered over and received charge of the Divisional Forest Office, Satara, on the 9th October 1895, in the forenoon.

4.—Bengal Gazette.

14*th October*, .895.—No. 4535.—Mr. E. P. Stebbing, Assistant Conservator of Forests, 2nd grade, is promoted to officiate in the 4th grade of Deputy Conservator of Forests, with effect from the 8th May and up to the 14th July, 1895, both days inclusive, and in the 1st grade of Assistant Conservators from the 15th idem, until further orders.

5.—N.-W. P. and Oudh.

2*nd October*, 1895.—No. 3260.—Mr. E. L. Haslett, Extra Assistant Conservator of Forests, from the Naini Tal to the Kumaun Division of the Central Circle.

6.—Punjab Gazette.

18th October 1895.—No. 585.—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.
A. M. F. Caccia ...	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	24th September 1895.	Consequent on his return from special leave.
H. Calthrop	Officiating Conservator.	Officiating Deputy Conservator, 2nd grade.	29th September 1895.	Consequent on the return of Mr. Bagshawe, Conservator of Forests, Berar, from privilege leave.
F. E. Hicks	Officiating Deputy Conservator, 2nd grade.	Officiating Deputy Conservator, 3rd grade.	Ditto.	
A. W. Blunt	Officiating Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 4th grade.	Ditto.	
E. Dobbs ...	Officiating Deputy Conservator, 1st grade.	Deputy Conservator, 2nd grade.	1st October 1895.	Consequent on the return of Mr. Lemarchand from privilege leave.
H. Calthrop	Officiating Deputy Conservator, 2nd grade.	Officiating Deputy Conservator, 3rd grade.	Ditto.	
A. V. Monro	Officiating Deputy Conservator, 3rd grade.	Provisional Deputy Conservator, 4th grade.	Ditto.	
G. F. Taylor	Officiating Deputy Conservator, 2nd grade.	Deputy Conservator 3rd grade.	4th October 1895.	Consequent on the return of Mr. Gisborne Smith from privilege leave.
C. P. Fisher	Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade.	Ditto.	

21st October, 1895.—No. 599.—In *Punjab Government Gazette* No. 444 dated 22nd July, *for* the words "30th April" *substitute* "2nd April."

7.—Central Provinces Gazette.

5th October. 1895.—No. 3.—The following passed stipendiary students of the Imperial Forest School, Dehra Dun, having complied with the conditons laid down in Section 29 (1) of the Forest Department Code, 4th edition, are appointed as Forest Rangers, 5th grade, on a

salary of Rs. 60 each per mensem. The date from which the order for appointment is to take effect and the Forest Division to which they are posted are noted against their names :—

Mr. R. C. Pinder, from the 1st April 1895 —Hoshangabad.

Gouree Shanker, from the 26th April 1895— Nimar.

No. 4.—Dinker Vishnu Pranjpe, a passed private student of the Imperial Forest School, Dehra Dun, having complied with the conditions laid down in Section 29 (1) of the Forest Department Code, 4th edition, is appointed as Officiating Forest Ranger, 5th grade, on Rs. 60 per mensem, with effect from the forenoon of the 2nd July 1895, and is posted to the Nimar Forest Division.

This supersedes *Central Provinces Gazette* Notification No. 2, dated the 29th June 1895.

8th October, 1895.—No. 4323.—Mr. F. O. Lemarchand, Deputy Conservator of Forests, returned from the one month's privilege leave granted him by Order No. 3448, dated the 7th August 1895, and resumed charge of the Balaghat Forest Division from Mr. S. M Chitnavis, Deputy Commissioner, on the forenoon of the 1st October 1895.

15th October, 1895.—No. 4395.—On return from the special leave granted him by Order No. 1874, dated the 18th April 1895 Mr. A. F. Caccia, Assistant Conservator of Forests, is posted to the charge of the Mandla Forest Division.

No. 4396.—On being relieved by Mr. A. M. F. Caccia, Mr. R. C. Thompson, Extra-Assistant Conservator of Forests, is transferred to the charge of the Damoh Forest Division.

16th October, 1895.—No. 4405.—Mr. A. M. F. Caccia, Assistant Conservator of Forests, 1st grade, assumed charge of the Mandla Forest Division from Mr. R. C. Thompson, Extra-Assistant Conservator of Forests, on the afternoon of the 5th October 1895.

8.—Burma Gazette.

11th October, 1895.—No. 314.—Mr. C. H. Hobart-Hampden Deputy Conservator of Forests, on his return from furlough, is posted to the charge of the Lower Chindwin Forest division.

21st October, 1895.—No. 324.—The following transfers are ordered in the Forest Department :—

Mr. E. B. Powell, Extra Assistant Conservator of Forests, from Tigyaing to the charge of the Bhamo Revenue subdivision, Bhamo division, Shwegu.

Mr. W. A. Hearsey, Extra Assistant Conservator, from Shwegu to the charge of the Mogok subdivision, Ruby Mines division, Mogok.

Mr. C. W. B. Anderson, Extra Assistant Conservator, from Mogok to the charge of the Myadaung subdivision, Katha division, Tigyaing.

21st October, 1895.—No. 325.—With effect from the date on which he may be relieved of the charge of the Pegu Circle, Mr. F. W. Thellusson, Deputy Conservator of Forests, is posted to the charge of the Rangoon Forest division, *vice* Mr. H. Carter, transferred.

21st October, 1895.—No. 326.—On his relief by Mr. F. W. Thellusson, Mr. H. Carter, officiating Deputy Conservator of Forests, is transferred from Rangoon to the charge of the Thayetmyo Forest division *vice* Mr. Branthwaite, who will then hold charge of the Prome Forest division only.

9.—Assam Gazette.

28*th September*, 1895.—No. 5382G.—The following postings and transfers of officers in the Forest Department are ordered :—

Mr. H. G. Young, Deputy Conservator of Forests, on return from furlough, to the charge of the Kamrup Forest Division.

Mr. H. S. Ker-Edie, Deputy Conservator of Forests, on relief by Mr. H. G. Young, to the charge of the Darrang Forest Division.

Mr. D. P. Copeland, Deputy Conservator of Forests, on relief by Mr H. S. Ker-Edie, to remain in charge of the Lakhimpur Forest Division.

10.—Hyderabad Residency Gazette.

14*th October*, 1895.—No. 349.—The Resident is pleased to invest Mr. B. Bhukan, Extra Assistant Conservator of Forests in Berar, with all the powers described in section 36 (1) of the Berar Forest Act 1886, as amended by the Berar Forest Law Amendment Act, 1891.

11.—Mysore Gazette.

21*st October*, 1865.—No. 3841—Ft. 229. The privilege leave of absence for one month granted, under Article 188 of Forests, in Notification No. 1307—Ft. 68, dated 30th July 1895, is hereby extended by two months.

Mr. Monteiro, Extra Assistant Conservator of Forests, will continue to be in charge of the Shikarpur Sub-Division during Mr. Srinivasa Rao's absence on leave, or until further orders.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

31st October, 1895.—No. 1160—156-2-*F.*—Mr. A. St. V. Beechey, Assistant Conservator of Forests, 2nd grade, Coorg, is transferred, in the interests of the public service, to the Central Provinces.

1st November, 1895.—No. 1165—258-8-*F.*—Mr. J. Nisbet having resumed charged of the Pegu Forest Circle in the forenoon of the 26th October 1895, on return from the privilege leave granted him in the Notification of this Department, No. 903-F., dated the 30th August last, Mr. F. W. Thellusson, Officiating Conservator, reverted to his substantive appointment of Deputy Conservator, with effect from the same date.

1st November, 1895.—No. 1167—302-4-*F.*—Privilege leave for three months, under Articles 277 and 291 of the Civil Service Regulations, is granted to Mr. A. Smythies, Deputy Director of the Imperial Forest School, Dehra Dun, with effect from the 30th October 1895.

From the same date, the following temporary arrangements are made during Mr. Smythies's absence, or until further orders :—

(i) Mr. A. F. Gradon, Instructor at the Forest School, to officiate as Deputy Director.

(ii) Mr. B. B. Osmaston, Assistant Conservator, North-Western Provinces and Oudh, to officiate as Instructor at the Forest School.

14th November, 1895.—No. 836—Mr. W. F. Llopd, Deputy Conservator of Forests, Port Blair, is appointed to be an Assistant Superintendent in the settlement so long as he holds his present Office or until further orders.

12th November, 1895.—No. 1174-*F.*—311-3.—The following transfers are ordered in the interests of the public service :—

(i) Mr. A. V. Monro, Deputy Conservator, 4th grade (provisional), Punjab, to the Central Provinces.

(ii) Mr. P. H. Clutterbuck, Officiating Deputy Conservator, 4th grade, Central Provinces, to the North-Western Provinces and Oudh.

(iii) Mr. M. Hill, Officiating Deputy Conservator, 4th grade, North-Western Provinces and Oudh, to Burma.

2—Madras Gazette.

1st November, 1895.—No. 569.—M. R. Ry. V. Alwar Chetty Garu, B. A., Extra Assistant Conservator of Forests, Madras, is granted privilege leave for two months under article 291 of the Civil Service Regulations, 2nd edition.

4th November, 1895.—Mr. V. Alwar Chetti, B. A., Extra Assistant Conservator of Forests, to the Salem District.

6th November, 1895.—M. Balaji Singh, Forest Ranger, 5th Grade, Kistna, is transferred to Godavari, to join soon after relief,

6th November, 1895.—No. 603.—

No.	Name of officer.	District.	Nature of charge.	Remarks.
1	Mr. C. E. C. Fisher	Kistna ...	...	To do duty under the supervision of the District Forest Officer.
2	Mr. H. F. Arbuthnott	Coimbatore	...	To do duty under the supervision of the District Forest Officers of North and South Coimbatore.

21st November, 1825 —No. 612.—

No.	Name of officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy. &c.
1	Mr. J. L. MacCarthy O'Leary.	Assistant Conservator of Forests, 2nd Grade.	Assistant Conservator of Forests, 1st Grade.	Permanent.	
2	Mr. H A. Latham	Do.	Do.	Do.	
3	Mr. S. Cox	Do.	Do.	Do.	
4	Mr. H. F. A. Wood	Do.	Do.	Acting	*Vice* Mr. F. Foulkes acting in the 4th Grade of Deputy Conservators.
5	Mr. H. Tireman	Do.	Do.	Do.	*Vice* Mr. F. L. C. Cowley-Brown acting in the 4th Grade of Deputy Conservators.

NOTE.—All the above appointments will take effect from 15th July 1895, the date on which the officers completed the tests required for promotion to the 1st Grade.

3.—BOMBAY GAZETTE.

9th November, 1895.—No. 5178.—Messrs. A. D. Wilkins, Deputy Conservator of Forests, and L. S. Osmaston, Assistant Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, Poona, on the 7th instant, after office hours.

13th November, 1895.—No. 5284.—Messrs. L. S. Osmaston, Deputy Conservator of Forests, and R. S F. Fagan, Deputy Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, Poona, on the 8th November 1895, before office hours.

13th November, 1895.—No. 5306.—Messrs. R. S. F. Fagan, Deputy Conservator of Forests, and W. C. Shepherd, Assistant Collector, respectively delivered over and received charge of the Divisional Forest Office, Sátára, on the 7th of November 1895, in the afternoon.

14*th November*, 1895, No. 5314.—Messrs. D. A. Thomson, Assistant Conservator of Forests, and R. S. F. Fagan, Deputy Conservator of Forests, respectively delivered over and received charge of the Sub-Division Office, Sátára, on the 5th November 1895, in the afternoon.

14*th November*, 1895.—No 5243.—Messrs. E. G. Oliver and T. R. D. Bell, Deputy Conservators, respectively delivered over and received charge of the Divisional Forest Office, Working Plans Party No. I; S. C., on the forenoon of the 1st November 1895.

15*th November*, 1895.—No. 8986.—Mr. B. J. Haselden, Assistant Conservator of Forests, First Grade, and Divisional Forest Officer, C. D., Kánara, is allowed privilege leave of absence for two months and eighteen days.

No. 8987.—His Excellency the Governor in Council is pleased to appoint Mr. W. E. Copleston to act as Divisional Forest Officer of the Central Divisional of Kánara during the absence of Mr. B. J. Haselden or pending further orders.

19*th November*, 1895.—No. 5347.—Messrs.—W. G. Shepherd, I. C. S., Assistant Collector, and A. D. Wilkins, I. F. S., Deputy Conservator of Forests, respectively delivered over and received charge of the Sátára Forest Division on the 9th November 1895, in the afternoon.

21*st November*, 1895.—No. 5416.—Messrs R. S. F. Fagan, I. F. S., Deputy Conservator of Forests, and W. C. Shepherd, I. C. S., Assistant Collector, respectively delivered over and received charge of the Sub-Division Forest Office, Sátára, on the 7th of November 1895, in the afternoon.

21*st November*, 1895.—No. 5417.—Messrs. W. C. Shepherd, I. C. S., Assistant Collector, and A. D. Wilkins, I. F. S., Deputy Conservator of Forests, respectively delivered over and received charge of the Sub-Division Forests Office, Sátára, on the 9th November 1895, before noon.

22*nd November*, 1895.—No. 2036.—Mr. J. Dodgson, Assistant Conservator of Forests, Second Grade, appointed to the Northern Circle under Government Resolution No. 3152 of 21st October 1885, has been attached to the Working Plans Division, and reported himself for duty to the Divisional Forest Officer, Working Plans, Northern Circle, in the forenoon of the 19th instant.

5.—N.-W. P. and Oudh Gazette.

6*th November*, 1895.—No. 3698.—II. 835*C*.—Pandit Sadanand Gairola, Extra Assistant Conservator of Forests, in charge of the Saharunpur Division of the School Forest Circle, to be attached to the Jaunsar Division of the same Circle.

6*th November*, 1895.—No. 3699.—II. 835*C*.—Babu Karuna Nidhan Mukarji, Extra Assistant Conservator of Forests, attached to the Dehra Dun Division of the School Forest Circle, to the charge of the Saharunpur Division of the same Circle.

8*th November*, 1895.—No. 3730.—II. 31*C*.—Colonel J. E. Campbell. Officiating Conservator of Forests, Oudh Circle, on being relieved by Mr. S. Eardley-Wilmot, to revert to Deputy Conservator of Forests, in charge of the Garhwal Division of the Central Forest Circle.

13th November, 1895.—No. 3785.—II. 651*B*.—Lala Har Swarup Extra Assistant Conservator of Forests, on being relieved of the charge of the Ganges Division of the Central Forest Circle, to be attached to the Direction Division of the Oudh Forest Circle, as Working-Plans Officer.

14th November, 1895.—No. 3809.—II. 378*C*.—Mr. R. C. Milward, Assistant Conservator of Forests, 2nd grade, on return from leave, is attached to the Bahraich Division of the Oudh Forest Circle.

19th November, 1895.—The following temporary reversions among Forest Officers are notified for general information.

Entry No.	With effect from.	Consequent on.	Name.	From.	To
1	23rd October 1895.	Mr. A. G. Hobart-Hampden's return from privilege leave.	Mr. L. Mercer	Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade.
			Mr. F. A. Leete.	ditto. ditto. 4th grade.	Officiating Assistant Conservator, 1st grade.
2	24th October 1895.	Mr. S. Eardley-Wilmot's return from privilege leave.	Col. J. E. Campbell.	Officiating Conservator, 3rd grade.	Deputy Conservator, 1st grade.
			Mr. W. Shakespear on privilege leave.	Officiating Deputy Conservator, 1st grade.	Deputy Conservator, 2nd grade.
			Mr. N. Hearle.	Ditto.	Ditto.
			Mr. F. B. Bryant.	Officiating Deputy Conservator, 2nd grade.	Deputy Conservator, 3rd grade.
			Mr. B. A. Rebsch.	Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade.
			Mr. A. P. Grenfell.	Officiating Deputy Conservator, 4th grade.	Assistant Conservator, 1st grade.

25th November, 1895.—No. 3967.—II-651*B*.—Mr. P. H. Clutterbuck, Officiating Deputy Conservator of Forests, who has been transferred to these provinces, to the charge of the Gorakhpur Division of the Oudh Forest Circle.

25th November, 1895.—3949.—II.-116c.—Mr. W. Shakespear Deputy Conservator of Forests, on return from leave, to the Pilibhit, Division of the Oudh Forest Circle.

25th November, 1895.—No. 3968.—II.-651b.—Mr. J. C. Tulloch. Assistant Conservator, of Forests, in charge of the Gorakhpur Division of the Oudh Forest Circle on being relieved by Mr. C. P. H. Clutterbuck, to the charge of the Kheri Division of the same Circle.

6.—PUNJAB GAZETTE.

11th November, 1895.—No. 629 A. L. No. 33.—In Notification No.—323 A. L. No. 13, dated 14th May 1895, the entry regarding Mr. Coventry should be omitted, and in Notification No. 448 A. L. No. 21, dated 22nd July 1895, the first entry regarding Mr. Williamson, and the following should be substituted :—

NAME.	Present grade.	Grade to which promoted.	With effect from	REMARKS.
Mr. R. M. Williamson.	Provisional Assistant Conservator, 1st Grade.	Officiating Deputy Conservator, 4th Grade.	2nd May	Consequent on the departure of Mr. Morris on privilege leave.
Mr. E.M. Coventry	Assistant Conservator, 1st Grade.	Officiating Deputy Conservator, 4th Grade.	8th May	Consequent on the departure of Mr. Rind on one year's sick leave.

18th November, 1895.—No. 641.—A. L. No. 34.—Mr. E. Forrest, Deputy Conservator Forests, Rawalpindi, has obtained privilege leave of absence for 2½ months, under Article 291 of the Civil Service Regulations, with effect from the afternoon of the 1st November 1895.

Mr. B. O. Coventry, Assistant Conservator of Forests, is appointed to the charge of the Rawalpindi Forest Division *vice* Mr. Forrest, with effect from the above date.

19th November, 1995.—No. 649 A. L. No. 35.—Mr. L. Gisborne Smith, Deputy Conservator of Forests, on return from the privilege leave of absence granted him in Punjab Government Notification No. 458. A. L. No. 22.—dated 8th August 1895, is posted to the Chenab Division, of which he assumed charge on the 13th October, 1895.

23rd November, 1895. No. 663—A. L. No. 36.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the dates specified against each :—

NAME.	Present grade.	Grade to which promoted or reverted.	With effect from.	REMARKS.
Mr. E. Dobbs ...	Deputy Conservator, 2nd Grade.	Officiating Deputy Conservator, 1st Grade.	2nd Novr. 1895.	Consequent on the departure of Mr. Forrest on 2½ months' privilege leave.
Mr. G. F. Taylor	Deputy Conservator, 3rd Grade.	Officiating Deputy Conservator, 2nd Grade.	Ditto.	
Mr. C. P. Fisher	Deputy Conservator, 4th Grade.	Officiating Deputy Conservotor, 3rd Grade.	Ditto.	
Mr. H. A. Hoghton	Deputy Conservator, 4th Grade.	Officiating Deputy Conservator, 3rd Grade.	7th Novr. 1895.	Consequent on the return of Mr. Hoghton from furlough.
Mr. C. P. Fisher...	Officiating Deputy Conservator, 3rd Grade.	Deputy Conservator, 4th Grade.	Ditto.	

7.—CENTRAL PROVINCES GAZETTE.

7th November, 1895.—No. 4639.—With reference to Order No. 4396, dated the 15th October 1895, Messers. Mahomed Kadir Baksh and R. C. Thompson, Extra-Assistant Conservators of Forests, respectively made over and assumed charge of the Damoh Forest Divison on the forenoon of the 24th October, 1895.

28th November, 1895.—No. 5038.—Mr. A. St. V. Beechey, Assisant Conservator of Forests, 2nd grade, Coorg, transferred to these Provinces under Government of India Notification No. 1160-F 156-2, dated the 31st October 1895, is posted to the Balaghat Forest Divison as Working-Plans Assistant.

8.—BURMA GAZETTE.

25th October, 1895.—No. 11.—With reference to Revenue Department Notification No. 314 (Forests), dated the 11th October 1895, Mr. H. N Thompson, officiating Deputy Conservator of Forests, made over, and Mr. C H. Hobart-Hampden. Deputy Conservator of Forests, received charge of the Lower Chindwin division on the afternoon of the 22nd October 1895.

No. 12.—Mr. C. W. A. Bruce, officiating Deputy Conservator of Forests, reported his return from privilege leave granted him in Revenue Department Notification No. 170, dated the 20th May 1895, on the 11th

October 1895 and assumed charge of the Upper Chindwin division from Mr. A. M, Burn-Murdoch, officiating Deputy Conservator of Forests, on the afternoon of the 18th October 1895.

29th October 1895.—No. 15.—Mr. S. Carr, F. C. H., Assistant Conservator of Forests, reported his return from the three months and 15 days' privilege leave granted him in Revenue Department Notification No. 201 (Forests), dated the 20th June 1895, on the 26th instant, before noon, and resumed charge of the Yamethin subdivision from the same date.

5th November 1895.—No. 335.—On relief by Mr. W. T. T. McHarg, who returns from privilege leave, Mr. H. H. Forteath, officiating Deputy Conservator of Forests, is transferred from Minbu to Pakôkku to hold charge of the Yaw Forest division till the return from privilege leave of Mr. C. L. Toussaint, after which Mr. Forteath will revert to the charge of the Gangaw subdivision.

No. 336.—On relief by Mr. Forteath from the Yaw division, Mr. C. W. Allan, Extra Assistant Conservator of Forests, is posted to special duty at Pakôkku.

5th November 1895.—No. 18.—With reference to Revenue Department Notification No. 323, dated the 21st October 1895, Mr. H. Carter officiating Deputy Conservator of Forests, made over, and Mr. F. W. Thellusson, Deputy Conservator of Forests, assumed, charge of the Rangoon division on the afternoon of the 26th October 1895.

No. 19.—With reference to Revenue Department Notification No. 326, dated the 21st October 1895, Mr. F. J. Branthwaite, Deputy Conservator of Forests, made over, and Mr. H. Carter, officiating Deputy Conservator of Forests, assumed, charge of the Thayetmyo division on the afternoon of the 2nd November 1895.

12th November, 1895.—No. 347.—On relief by Mr. H. B. Ward, who returns from privilege leave, Mr. H. B. Anthony, Deputy Conservator of Forests, is transferred from Bassein to Moulmein for special duty in the Kado Forest division.

No. 348.—On his return from privilege leave, Mr. J. Messer, officiating Deputy Conservator of Forests, is posted to the charge of the Working Plans division, Toungoo.

No. 355.—Under the provisions of Article 340 (*b*) of the Civil Service Regulations furlough for one year is granted to Mr. C. E. Muriel, Deputy Conservator of Forests, with effect from the 1st January 1896, or the subsquent date on which he may avail himself of it.

21st November 1895.—No 363.—Mr. C. S. Rogers, Extra Assistant Conservator ef Ferests, is transferred from Pyinmana to the charge of the Möngmit subdivision of the Ruby Mines Forest Division.

No. 364.—Notification No. 324, dated the 21st October 1895, regarding certain transfers of Forest Officers, is hereby cancelled.

9.—Assam Gazette.

1st November, 1895.—No. 6152G.—Babu Jogesvar Sur, Extra Assistant Conservator of Forests, is transferred from the Lakhimpur Forest Division to the Darrang Forest Division.

8th November, 1895.—No. 6382G.—Consequent on the return from furlough of Mr. H. G. Young, Deputy Conservator of Forests,

the following promotions and reversion are made with effect from the 25th October 1895:

Mr H. G. Young, Deputy Conservator of Forests, Third Grade (provisional), to officiate as Deputy Conservator of Forests, Second Grade.

Mr. F. J. Campbell, Deputy Conservator of Forests, Fourth Grade (Officiating Second Grade), to officiate as Deputy Conservator of Forests, Third Grade.

Mr. J. E. Barrett, Deputy Conservator of Forests, Fourth Grade, (Officiating Third Grade), to revert to his substantive appointment.

10.—Hyderabad Residency Gazette.

21*st October* 1895.—No 357.—The Resident is pleased to declare that at the departmental examination held at Amraoti on the 9th and 10th of September 1895 under section 72 of the Forest Department Code, the undermentioned Forest Officers in the Hyderabad Assigned Districts passed in the subjects specified against their names:—

Mr. C. H. Haldane, Extra Assistant Conservator of Forests. } Marathi and Hindustani by the higher standard.

Mr. L. K. Martin, Extra Assistant Conservator of Forests. } Procedure and Accounts (with credit); Land Revenue.

25*th October* 1895.—No. 362.—Mr. W. G. J. Peake, Extra Assistant Conservator of Forests, on being relieved of the temporary charge of the Buldana Forest Division, is attached to the Basim Forest Division.

11.—Mysore Gazette.

27*th October*, 1895.—No. 4137—248*F*.—Under Article 188 of the Mysore Service Regulations, Mr. A. G. R Theobald, Sub-Assistant Conservator of Forests, Mysore District, was granted privilege leave of absence for two months and fourteen days from the 20th February to 3rd May 1895, inclusive.

27*th October*, 1895.—No. 4140—*F*. 245.—Mr. K. Shamaiengar, Sub-Assistant Conservator of Forests, Mysore District, was granted casual leave of absence for five days from the 3rd to 8th September, 1895. both days inclusive.

27*th October*, 1895.—No 4055—*F*. 241. Under Articles 188 of the Mysore Regulations, Mr. T. Abdul Karim, Deputy Conservator of Forests, Mysore District, is granted privilege leave of absence for one month and twenty days from the 15th October, 1895 or from such other date as he may avail himself of the same.

Mr. A. G. R. Theobald, Sub-Assistant Conservator of Forests in charge of the French Rocks Sub-Division, will be in charge of the current duties of the Office of Deputy Conservator of Forests, Mysore, during the absence of Mr. Abdul Karim on leave, or until further orders.

8*th November*, 1895—No. 4583—*F*. 288.—Mr. Y. Sitaramaiya, Assistant Conservator of Forests, Bangalore District, was granted casual leave of absence for three days, from the 20th to the 22nd October 1895, both days inclusive.

WIRE-ROPE SLIDE

IN

THE BRÜCKWALD

AT

INTERLAKEN, SWITZERLAND.

BY

A. M. REUTHER,

INDIAN FOREST SERVICE.

CALCUTTA:

OFFICE OF THE SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.

1894.

WIRE-ROPE SLIDE IN THE BRÜCKWALD AT INTERLAKEN, SWITZERLAND.

Situation. The Brückwald forest is situated on the south slope of the "Harder" range of hills, at Interlaken, on the right bank of the Aare stream. It is divided into two portions: the Upper Brückwald lies between 920 and 1,500 m. elevation above the sea, and the Lower descends from 920 m. to the bank of the Aare at an elevation of 566 m., the slope being steep throughout. The Upper Brückwald (60 hec.) is separated from the Lower (25 hec.) by a ledge of rock, called the Bleikischopf, which traverses the whole forest, dipping towards the west.

Elevation Division.

Area.

Growing stock. The growing stock in the Upper Brückwald consists of a mixed wood of Spruce, Silver fir, and Beech, with a large proportion of fine Larch; the Lower Brückwald is mostly young and middle-aged Beech forest.

Breakage of timber in working down over rock-ledge. Of the outturn of the Upper Brückwald about 40 per cent. to 60 per cent. is valuable timber, but by breakage in working it down over the rock-ledge this outturn in timber suffered reduction to about 8 per cent. to 10 per cent. of the total outturn. Even the firewood used to reach the foot of the ledge very much split and fractured, and smashed into irregular pieces. But the main evil involved in extraction of the timber and firewood from the Upper Brückwald consisted in the extensive injury done to the young Beech woods in the Lower forest, as the only remunerative means available for extraction of the material were earth-slides, from which the logs frequently escaped and made erratic passages for themselves through the undergrowth.

Damage to young woods in Lower forest.

In order to obviate these evils a wire-rope slide has been constructed, traversing the Lower Brückwald, from the top of the ledge of rock down to a main road running at a short distance above the bank of the Aare.

Data regarding wire-rope slide.

The horizontal distance covered by the wire-rope is .	500 metres.
„ vertical „ „ „ „ .	340 „
„ total length of the wire-rope is . . .	615 „
Mean inclination „ „	68 per cent.

Composition of main rope, and cost. The main wire-rope is of cast steel, 2 cm. in diameter, and weighs 1·6 kilos per metre. It is composed of 5 strands of cast steel, each 2·5 mm. in diameter, coiled around a central steel strand 2·6 mm. in thickness, and is guaranteed to withstand a strain of 13,000 kilos. It cost 1·04 francs per kilo, or 1·65 frs. per metre.

Composition of brake-rope and cost. The brake-rope is also of cast steel, 9 mm. in diameter, composed of 6 strands each of which consists of 6 wires 1 mm. thick.

Its weight is ·33 kilos per metre, and the cost 1·26 francs per kilo (or 38 cts. per metre).

Method of fastening the ropes.

The main rope is securely anchored at the upper station to tree-stumps and to independent attachments in the ground. At the lower

Straining gear.

station its extremity is coiled round a log of wood fitted with an iron axle of square section, the rounded ends of which rest in iron sockets let into heavy beams of wood securely fastened to the ground. The log around which the end of the wire-rope is coiled can be made to revolve

Second main rope.

by means of powerful wooden levers whereby the tension of the wire-rope can be increased to any desired degree. Parallel with this main rope, and at a distance of about 3 m. from it, is a second wire-rope similar to the one described, and fastened in the same manner, but of less diameter and less strength than the other. This diversity is due merely to the fact that the thinner rope happened to be in stock when the slide was constructed; but its use is attended with inconvenience,

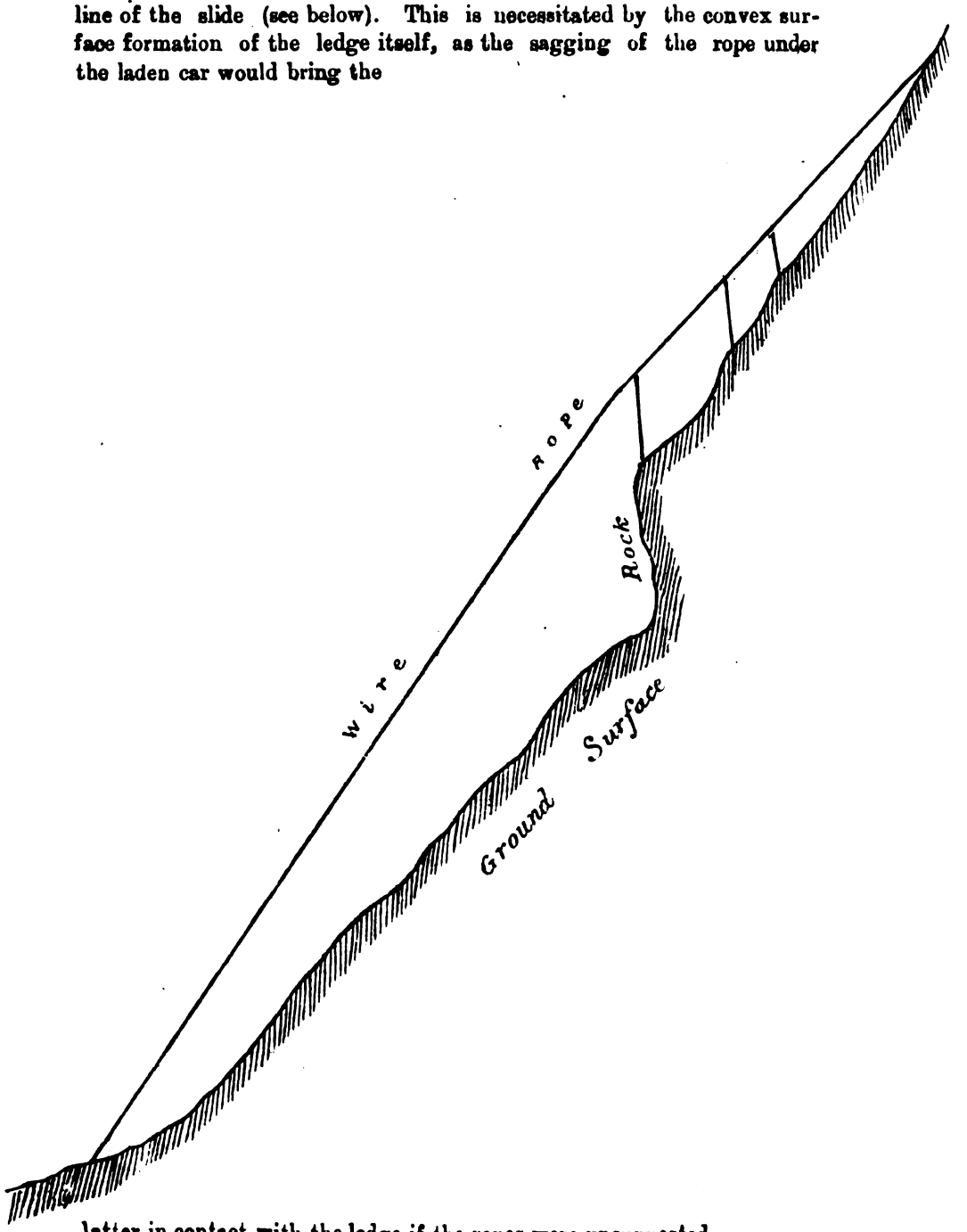
Shifting the cars.

as this rope is too weak to stand the tension necessary for carrying the loaded car, and can be used only for the empty car. This defect necessitates the shifting of the car from one rope to the other after each run.

Supports to ropes above ledge of rock.

The two ropes carrying the cars are not free for the whole distance between the upper and lower stations, but pass over wooden trestles at three different points between the rock-ledge and the upper station, as shown in the annexed sketch of a longitudinal section along the centre-

line of the slide (see below). This is necessitated by the convex surface formation of the ledge itself, as the sagging of the rope under the laden car would bring the



latter in contact with the ledge if the ropes were unsupported.

Brake apparatus.

The wire brake-rope, the ends of which are attached to the two cars, passes over two wooden drums at the upper level station. Each of the drums is provided with a wooden brake worked by a lever. While the cars are running the levers are held by one of the workmen who applies just sufficient pressure (as dictated by practical experience) to allow the laden car to descend smoothly and without undue speed.

Fixed Tramway.

At the upper station a fixed tramway of iron rails laid on wooden sleepers traverses the forest horizontally, and brings the timber and firewood from the Upper Brückwald to the head of the slide. Five or six men suffice to work the slide and to load and unload the slide-cars. The latter consist of a pair of grooved wheels connected with a cross-bar, from the middle of which the load of wood is suspended. The wheels run on the wire-rope in the usual manner, and are kept in position by the gravity of the freely-suspended load, aided by the flanges of the wheels. The cars can carry a load up to 1·4 cub. m. of wood.

Cars.

Maximum capacity of the slide.

Comparison of financial results with, and without the slide.

Even apart from the immunity from injury secured to the young Beech woods in the Lower Brückwald, the profitable results of employing this wire-rope slide are sufficiently illustrated by the following figures.

The total quantity of wood to be extracted from the Upper Brückwald was 12,000 cub. m. Without the aid of the wire-rope slide the results (as proved by previous experience) would have been as follows :—

Net results without slide.

10 per cent. timber = 1,200 cub. m., valuing 18 frs. per cub. m.	21,600 frs.
80 per cent. firewood = 9,600 cub. m., valuing 12 frs. per cub. m.	115,200 „
10 per cent. wastage = 1,200 cub. m.	
TOTAL . 12,000 cub. m., valuing	136,800 frs.
Cost of extracting 10,800 cub. m., at 6 frs. per cub. m.	64,000 „
Surplus, without use of wire-rope slide	72,000 frs.

Net results with the slide.

Actual results with use of wire-rope slide :—

48 per cent. timber = 5,760 cub. m., valuing 18 frs. per cub. m.		103,680 frs.
52 per cent. fire-wood = 6,240 cub. m., valuing 12 frs. per cub. m.		74,880 „
TOTAL . 12,000 cub. m., valuing		178,560 frs.
Cost of extracting, by the slide, 12,000 cub. m. at 5·1 frs. per cub. m.	61,200 frs.	64,560 „
Cost of erecting the slide, with old material formerly used elsewhere, and replacing defective parts—with cost of maintenance	3,360 „	
Surplus, with use of wire-rope slide		114,000 frs.

which is 42,000 frs. in excess of the net results of working without the slide.

Cost of new material for slide.

The main rope has already been in use 17 years, but shows no trace of wear; but the friction on the brake rope is beginning to tell, and the latter must soon be replaced. If entirely new material had been used for construction of the slide, the total cost would have been about 6,000 frs. instead of 3,360 frs., but the profit would still have amounted to 39,360 frs.

The slide is worked by contract, at the following rates :—

Contract rates for working slide.

Extraction of fire-wood, per cub. m. . . .	3·57 frs.
„ „ timber	3·75 „
„ „ faggots	7 „

Before erection of the wire-rope slide, faggot wood had no sale at all, as it could not be extracted at remunerative rates. Petty current repairs to the slide are carried out by the contractor at his own expense.

Estimate for a new wire-rope slide 800 m. long.

The following is a detailed estimate of the cost of a wire-rope slide of the Brückwald type, for a length of 800 m. :—

1,700 m. of main rope, at 2 frs. per m. . . .	3,400 frs.
900 m. brake-rope, at ½ „ „ . . .	450 „
Brake apparatus at upper station	1,000 „
Straining gear at lower station with self-constructed leverage	1,000 „
Two cars and belongings	500 „
Cost of erection (labour)	1,000 „
Contingencies	600 „
TOTAL .	8,000 „

Where a difference of 4 to 5 frs. exists between the price of fire-wood and of timber, a wire-rope slide would (in circumstances like those of the Brückwald) be remunerative for extraction of even 2,000 cub. m. of wood. In the case of the Brückwald, however, the gain is not merely a direct financial one, but lies mainly in the complete immunity from the injury which exploitation works in the upper forest formerly entailed on the young woods of the Lower Brückwald.

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REBOISEMENT

OF

LANDSLIP AND AVALANCHE AREAS

IN THE

INTERLAKEN FOREST CIRCLE, SWITZERLAND.

BY

A. M. REUTHER,

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1894.

REBOISEMENT OF LANDSLIP AND AVALANCHE AREAS IN THE INTERLAKEN FOREST CIRCLE, SWITZERLAND.

1.—General.

Control of forest protection in higher mountain regions.

Under the Swiss federal forest law enacted in March 1876, the supervision of forest protection in the higher mountain regions is vested in the Federal Government, which contributes 20 per cent. to 70 per cent. of the funds necessary for afforesting localities where protective belts of forest are of paramount importance in guarding against landslips, avalanches, etc. These contributions are often supplemented by the Cantons concerned—and the Canton Bern, for example, where reboisement works have of late years been energetically carried out, has hitherto defrayed 30 per cent., and the Federal Government 45 per cent., of the cost of such works in that Canton; the balance of the expenses, *viz.*, 25 per cent., being borne by the respective forest proprietors. Without such liberal grants by the Federal and Local Governments these difficult and unremunerative works could not be carried out at all, as the inhabitants of the higher mountain regions are usually poor, and very averse from the measures for forest protection and reboisement which generally necessitate restriction of goat and sheep pasture, and even of grass-cutting. The prejudices of the inhabitants are, however, disappearing; and encouraged by the Government grants, by the success which has attended the earlier operations, and by the remunerative employment afforded to the poor people by the reboisement operations, a number of Communes have during the last ten years undertaken important afforestation works within their own boundaries.

Funds for reboisement works.

Attitude of rural population towards measures for protection and reboisement.

Reboisement works begun by Communes.

Operations commenced in places where cultivated fields, dwellings, roads, etc., were most exposed to danger from landslips and avalanches, in consequence of denudation of extensive areas on the steep mountain slopes above them. The denudation of such areas occurred either through previous clear felling of the forest, or through storms, landslips, etc.; and through subsequent erosion of the exposed soil by the rain and melting snow, ravines were formed which gradually deepened and extended, and finally laid bare more or less broad strips straight down the hill sides to the valley below. The rock-masses and debris carried down by the torrents, formed in these ravines during heavy rain, devastate the fields below and endanger houses and communications.

Operations begun where most urgently required.

Results of forest denudation, and spread of erosion.

Where the evil has not extended very far and the soil is still fairly stable, natural or artificial regeneration often fails through the injury

Remedy where the evil is attacked sufficiently early.

sustained year after year by the young seedlings through pressure of the snow drifting down the slope, or of accumulations of earth and rock-débris. In such cases it is often sufficient to shelter each individual seedling by a wooden stake driven into the ground immediately above it, which protects it against snow drift and moving stones and earth; or low ridges made at intervals along the contour lines by collecting the loose surface stones often enable the seedlings to establish themselves thoroughly and restock the denuded area.

Measures adopted in more serious cases.

But in more serious cases, such as in landslip and avalanche areas, much more thorough measures are requisite. In such cases the instability of the soil may be quite superficial, or it may extend down to the substratum of solid rock. In the former case the instability has gene-

Slipping of the surface-soil.

rally arisen from gradual erosion of the denuded soil by rain, and the character of the area is that of a network of small runnels which merge into one another and gradually deepen and extend, rapidly eroding the banks and causing here and there small slips of the surface-soil. As the erosion extends, such slips grow more frequent and more extensive, until the whole surface-soil becomes insecure, and the occurrence of a formidbale landslip grows imminent.

Remedy where the movement of the soil is only superficial.

If the erosion has not progressed very far and the slipping of the soil is still quite superficial and limited to small plots here and there, wattled fencing is usually sufficient to bind the soil and to admit of its being successfully planted. Wooden stakes are driven into the ground, 60 to 80 centimetres apart, in rows along contour lines, and strongly wattled with branches close down to the ground-surface. Grass seed is sown, and alder and willow planted, in the spaces between the rows of fencing, and by these means the stability of the soil is soon restored.

Treatment of extensive landslips reaching far below the surface.

Where landslips are more extensive, and reach to a considerable depth below the original ground-surface, the source of the instability must first be ascertained and removed. It may be due to spring water, or accumulation of locally percolated rain water, forcing itself between impermeable strata and the overlying soil—or through undermining of steep slopes by torrential streams—or superficial erosion may spread so far that entire hill-sides grow unstable and threaten to slip in large masses. In such cases fascines and wattled fencing alone are insufficient, and must be supplemented by suitable drainage works and masonry retaining walls, before the unstable soil can be sufficiently fixed to admit of successful planting. As an example of such operations, the following description of the reboisement of the Spissbach landslip area (between Grütschalp and Mürren, above Interlaken) will serve for general illustration of such operations in the Interlaken Forest Circle.

2.—*The Spissbach Landslip.*

A portion of the spruce forest covering the steep slope on the left bank of the Lütschine stream, at an elevation of 1,250 to 1,500 metres above sea-level, was overthrown in 1883 by the "Föhn" (a local storm-wind which sometimes arises with remarkable suddenness on the "Jungfrau" mountain, and sweeps with great violence down the neighbouring gorges and narrow valleys). Several springs have their source within and above the area denuded by the storm, and the soil—a loose limestone shale—was always somewhat waterlogged, especially in spring after melting of the snows. Four years after the damage done by the storm, *viz.*, in 1887, a landslip occurred which extended over 40 hectares and carried away not only the denuded plot of ground but also a portion of the forest situated below it, and completely buried 10 buildings and some fields of the Lauterbrunnen village, and a portion of the road situated at foot of the slope in the Lütschine valley. For three years afterwards the surface of the landslip area remained so unstable that it was considered dangerous to begin work on it; but after repeated smaller slips had taken place and the solid substratum of rock had in many places been laid bare, it was possible to begin operations.

Denudation caused by "Föhn."

Soil waterlogged

Landslip of 1887.

Operations begun in 1891.

The first thing to be done was to regulate the surface and sub-soil drainage from the springs and the local rain water. For this purpose a number of small channels were dug in the grassy slope above the landslip area; the bed of each channel was lined with uncoursed rubble masonry, and covered in with slabs of stone inclined inwards so as to form an arch, over which loose stones were laid, the whole being covered with earth and turf, thus guarding against choking of the channels by falling rock-débris and earth. These small channels completely drain the grassy slope which had become insecure and threatened to slip, thereby jeopardising the electric railway line which crosses the slope at a short distance above the landslip area. These small channels all converge towards a central depression in the slope, and discharge themselves into a large open drain which leads straight down the hillside through the landslip area into the Lütschine stream. The landslip area itself consists of three main ravines, each of which has a separate system of small catchment drains at its upper end, which empty themselves into three main drains that carry all the spring and rain water into the stream below. The main drains are three feet deep, three feet wide at the top, and two and-a-half feet at the bottom; and both the beds and sides are lined with coursed rubble masonry 40 to 50 centimetres thick. As these main drains lead straight down the slope, they have a very steep fall; and to guard the stone-work of the beds from being torn up by the rush of water, stakes in close contact with each

Drainage works.

Minor catchment channels.

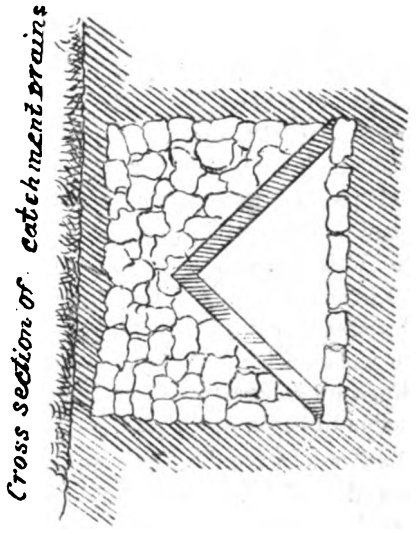
Danger to electric railway line.

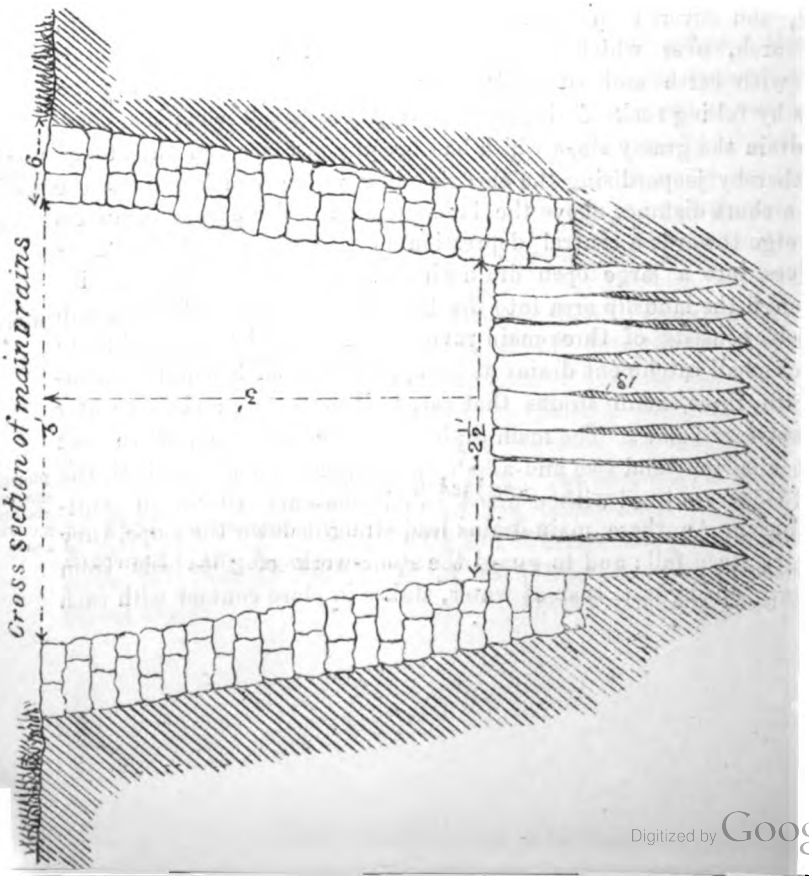
Main drains.

Dimensions and construction of the drains.

other have been driven into the bed to a depth of eighteen inches, in rows five to ten metres apart, their heads projecting slightly above the stone flooring. The cost of these drains was eight francs per cubic metre.

Cost of drains.





The next step was to solidify the unstable surface of the landslip area itself and to guard against further slipping. Wherever the slope has a gradient of 80 per cent. or more, retaining walls of coursed rubble masonry with foundations on the solid rock (in many places laid bare by the landslip) were constructed along contour lines at intervals of about 40 metres. The walls are 4 feet high and 3½ feet thick, costing 8 francs per cubic metre. In the spaces between these walls wattled fences were erected, also along the contour lines; the stakes are 1½ metres long, driven about 50 centimetres deep into the ground, about 60 centimetres apart, and interlaced with strong branches, forming a strong wattled fence, costing 30 cents. per running metre. These fences were made at distances varying with the degree of slope, as follows :—

Retaining walls and wattled fences.

Cost of walls and fences.

50	per	cent.	inclination	.	.	.	.	.	5	metres apart.
60	„		„	.	.	.	.	.	4	„ „
70	„		„	.	.	.	.	.	3	„ „
80	„		„	.	.	.	.	.	2	„ „

Distances between rows of fences.

The slopes were cut down to the natural angle of repose, and sown with grass seeds. Alder seedlings, 4 years old, were then planted out one metre apart, and where the soil was better and less unstable, some spruce and silver fir seedlings were planted out 2 metres apart. The alder grows rapidly and develops a strong root system, and has been found by experience to be the most useful species in reboising bare, stony slopes in this locality. The planting was begun only in 1891, but the plants look healthy and thriving, and judging by the results of similar operations in other parts of the Interlaken Forest Circle, the plantation of the Spissbach area may be expected to prove thoroughly successful. Some of the planting and fascine work yet remains to be done, but the operations are being energetically pushed on, and are expected to be completed during the current year (1893).

Planting of whole area.

Alder specially useful for reboising stony slopes.

The total cost, according to the sanctioned estimate, is expected to be as follows :—

Total cost.

Drainage channels	.	20,000 francs.
Stone barrages, fascines, and planting . . .	.	15,000 „
Total	.	35,000 „

or 875 francs per hectare.

3.—The Sausbach landslip.

Another landslip of about five hectares, which occurred in 1892 in the Steinschlagwald on a very steep slope overhanging the Sausbach stream, is being similarly treated.

Situation and area.

Soil.

The soil here is gravel and shale, and in some parts the surface of the slope is very rugged and scarped, and covered with large rock masses.

Masonry walls and wattled fences,

Masonry retaining walls, constructed of large blocks of limestone, have had to be largely employed here, and also wattled fencing, as in the case of the Spissbach area. The stakes are 3 to 5 metres apart, and project half a metre above the ground.

Alder planting.

Here also the principal species employed in the reboisement is alder, which has been planted out, at four years of age, at irregular intervals in the crevices between the rock-masses. Where the surface-soil has altogether disappeared, the planting holes have been filled with earth brought from elsewhere. The alder seedlings are thriving; only the strongest and best developed nursery plants have been used, many of which (now five years old) are one metre high.

Planting of Spruce, Austrian Pine and Larch.

In the more favourable spots Spruce, *Pinus austriaca*, and Larch have also been planted, and the whole area has been sown with grass seeds.

Cost.

The total cost of the reboisement works in this locality, which are still in progress, is estimated at 14,000 francs.

4.—The Kanalschluchtlawi avalanche area.

Situation.

On the same side of the Lütschine valley as the two afore-mentioned areas, above the villages of Zweilütschinnen and Lauterbrunnen, is a steep slope with east aspect, fairly well-wooded lower down, but more open towards the top.

Spot where avalanches began.

In a small, grassy glade, on a very steep slope high up the hill-side, at an elevation of about 1,600 metres above sea-level, avalanches used to be formed nearly every winter, which tore down the hill-side through the forest below, and blocked the railway line between Zweilütschinnen and Lauterbrunnen, and also obstructed the main road in the valley. Along the track of these avalanches reproduction of the forest was impossible, as the seedlings which appeared were swept away year by year by the falling masses of snow.

Terracing the slope.

A few years ago operations were commenced by terracing the upper portion of the slope, the terraces being made right across the track of the avalanches at intervals of about 5 metres.

Rows of stakes.

Along the outer edges of the terraces strong wooden poles were driven into the ground, ½ metre apart, and projecting 1½ metres above the surface of the terraces.

Stone walls.

In addition to the terraces and rows of stakes, a series of strong stone walls ¾ metre thick and 1 metre high at the upper side, were made along contour lines across the track of the avalanches, at distances varying with the gradients, the walls being nearer together the steeper the slope. This series of terraces, stakes, and stone walls begins at the very source of the avalanches, in the steep, grassy glade, and extends downwards for a distance of 600 metres along the track, which is narrow in its upper

course, but widens out considerably lower down. The total area thus treated is about six hectares. After completion of the terracing and walls, the whole area was planted up with 7,000 strong Spruce and 3,000 Larch plants, which are thriving satisfactorily. The cost of the walls was six francs, and of the rows of stakes 80 cents., per running metre, the total expenditure incurred being 5,000 francs, or 833 francs per hectare.

Area treated.

Planting.

Cost.

The terraces, rows of stakes, and walls support the masses of snow which on this steep slope would otherwise slip and form avalanches, and although during the last winter the snowfall was exceptionally heavy, no avalanches occurred, and the plants survived the winter without injury. The operations may be regarded as completely successful, and when the plants grow up and close overhead, no necessity will remain for renewal of the rows of stakes and walls.

Effect of terraces, stakes, and walls, in supporting the masses of snow.

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EXPERIMENTAL

REGENERATION FELLINGS

IN THE

BEECH FORESTS

OF

ALTENBUSECK AND GIESSEN.

BY

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INDIAN FOREST SERVICE.

CALCUTTA:

OFFICE OF THE SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.

1894.

EXPERIMENTAL REGENERATION FELLINGS IN THE BEECH FORESTS OF ALTENBUSECK AND GIESSEN:

In order to illustrate, by practical examples, the yield of the several stages of felling in the natural regeneration (under shelter-wood) of a completely stocked, mature beech forest, and also the increment in sectional area consequent upon the comparative isolation of the trees composing the shelter-wood, two experimental plots of one hectare each have been set apart in the Communal Forest of Altenbuseck and in the Town Forest of Giessen respectively. The growing stock before the preparatory felling and each of the subsequent fellings, the yield, the increment in sectional area, etc., have been carefully measured and recorded, and the results are shown in the following notes and statements :—

1.—*Experimental Plot in Altenbuseck Forest.*

Compartment Vorderster Seewald, 18.

Area of Plot—1 hectare.

Local Conditions.—Loam soil, consisting of decomposed basalt, deep and fresh, covered with thick layer of beech leaves. Moderate slope towards south-south-east. Quality II.

Growing Stock—Beech, 100 to 120 years old (with a few scattered oak and hornbeam), raised by natural regeneration ; growth excellent, stocking complete. Quality 9.

Number of stems (5th August 1876) . . .	466
Diameter from 14 to 61 centimetres.	
Aggregate sectional area	38·6204 sq. m.
Sectional area per stem	·079 "
Corresponding diameter	31·7 cub. m.

FELLING.		STEMS FELLED.					PERCENTAGES				YIELD IN CUBIC METRES.				
				SECTIONAL AREA.			OF THE ORIGINAL		OF THE EXISTING						
Kind.	Date.	Number.	Diameter centi-metres.	Total square metres.	Per stem square metres.	Corresponding diameter, centimetres.	No. of stems.	Total sectional area.	No. of stems.	Total sectional area.	Timber	Branches and roots.	Total.	Per tree.	Per square metre of sectional area.
Preparatory .	5th Aug. 1876	30	15 to 35	1·3962	·0465	24·3	6·4	3·8	6·4	3·8	6·72	9·22	15·94	·53	11·4
Seeding . .	14th July 1877	121	15 to 42	7·633	·0631	28·3	26	20·7	27 7	20·9	72·88	50 86	123·74	1·02	16·2
Final I . .	9th July 1879	75	18 to 48	5·5257	·0737	30·6	16·1	15	23·8	18 5	59·6	29·84	89·44	1·19	16·2
„ II . .	30th July 1881	40	18 to 46	3·7807	·0945	34 7	8·6	10·3	16·7	15	40·4	21·31	61·71	1·54	16·3
„ III . .	18th Nov. 1882	26	26 to 57	2·8823	·1108	37·2	5·6	7·8	13	13·2	28·9	14·88	43 78	1·68	15·2
Windfall . .	January 1884 .	2	30 to 33	·1562	·0781	31·5	·4	·4	1·1	·8	1·54	·6	2·14	107	13·7
Final IV .	19th July 1884	50	25 to 67	5·5645	·1113	37·6	10·7	15·2	29·1	28·5	57·26	29·36	86·62	1·73	15·5
„ V .	30th Oct. 1886	25	27 to 57	2·9249	·1170	38·6	5·4	7·9	20·5	19·3	23·4	13·56	36 96	1·48	12·6
„ VI .	27th July 1889	31	29 to 58	4·1705	·1345	41·4	6·6	11·3	32	31	45·88	23·52	69·4	2·24	16·6
		400		34·034									529·73		
„ VII .	15th Aug. 1891	30	30 to 65	4·2216	·1407	42·3	6·4	11·5	45·4	43·6	46·32	22·74	69·06	2·3	16·4
TOTAL .		430	15 to 67	38·2556	·089	33·6	92·2	103·9	...	...	382·9	215·89	598·79	1·39	18·6

After the 7th felling in the final stage (in August 1891) the number of trees still standing was 66, with an aggregate sectional area of 9·9016 sq. m. The volume of these 66 trees may be calculated—

(1) either by multiplying their sectional area by the height (26 m.), and the form figure (·57);

(2) or from the proportion of the total sectional area of the trees felled to the corresponding yield,

Thus, by the 1st method:

$$9{\cdot}9 \times 26 \times {\cdot}57 = 147 \text{ cub. m.}$$

by the 2nd method:

[number of trees felled = 466 — 66 = 400
their sectional area and volume = 34·034 sq. m. and 529·73 cub. m. respectively—*vide* statement on preceding page.]

Hence—34·03 : 9·9 = 529·73 : V

$$\therefore V = \frac{9{\cdot}9 \times 529{\cdot}73}{34{\cdot}03} = 154 \text{ cub. m.}$$

The mean of these two results is 150 cubic m.

Hence, the total yield up to August 1891 may be reckoned at 150 + 530 = 680 cubic m. (including branch and root-wood).

In 1876, before the preparatory felling, the volume of the growing-stock was—

$$36{\cdot}8204 \times 26 \times 57 = 546 \text{ cub. m.}$$

Hence, total increment during 15 years (1876 to 1891) 134 was cub. m.

or 9 cubic m. per annum, equivalent to 1·63 per cent. of the original volume.

The results of the several valuations of the growing-stock (which in each case took place *before* the corresponding felling) are shown in the annexed statement.

Valuation.		No. of existing stems before felling.	Diameter at breast, height, centimetres.	Total sectional area square metres.	Mean sectional area per stem, square metres.	Corresponding diameter, centimetres.	Mean area occupied by each tree		Mean distance from tree to tree		Increment in sectional area.				Remarks.
Number.	Date.						Before the felling, square metres.	After the felling, square metres.	*Before* the felling, metres.	*After* the felling, metres.	Period.	In square metres.	In percentages.	In percentage per annum.	
1	5th Aug. 1876	466	14 to 61	36·8204	·079	31·7	23·3	24·9	4·83	5	.....	...	...	...	
2	14th July 1877	436	15 to 63	36·5006	·0837	32·6	24·9	34·46	5	5·87	5-8-76 to 14-7-77	1·0765	3	3	
3	9th ,, 1879	315	18 to 64	29·8419	·0947	34.7	34·46	45·23	5·87	6·72	14-7-77 to 9-7-79	·9843	3·4	1·7	
4	30th ,, 1881	240	18 to 64	25·1479	·1048	36·5	45·23	54·28	6·72	7·36	9-7-79 to 30-7-81	·9317	3·4	1·7	
5	18th Nov. 1882	200	24 to 64	21·7592	·1088	37·2	54·28	*62·39	7·36	7·9	30-7-81 to 18-11-82	·3920	1·8	1·4	
6	19th July 1884	172	25 to 67	19·5545	·1137	38	*63 12	88·99	7·94	9·43	18-11-82 to 19-7-84	·8338	4·4	2·6	
7	30th Oct. 1886	122	27 to 61	15·1519	·1242	39·8	88·99	111·92	9·43	10·58	19-7-84 to 30-10-86	1·1618	8·3	3·7	
8	27th July 1889	97	29 to 65	13·4434	·1387	42	111·92	164·5	10·58	12·83	30-10-86 to 27-7-89	1·2264	10	3·6	
9	15th Aug. 1891	66	30 to 66	9·9016	·15	43·7	164·5	301·58	12·83	17·37	24-7-89 to 15-8-91	·6187	6·7	3·3	

* This difference is due to the windfall of two trees in January 1884, between 5th and 6th valuation.

Note.—In order to compare the increment as recorded above with that of the standing trees still forming the remnant of the shelter-wood, several cylinders of wood were removed from some of the latter (in May 1893) with 'Pressler's Zuwachs Bohrer,' which showed the diameter increment during the past five years to have been 3·8 cubic m. equivalent to an increment of 3·2 per cent. per annum of sectional area. This result is in remarkably close agreement with that shown in the foregoing table.

A number of the shelter-wood trees removed during the final fellings were carefully examined and measured, and the corresponding form figures deduced. The results are given in the following statement:—

Beech.

Year of felling.	Number of trees measured.	Mean height metre.	Form figure deduced	
			Stem.	Whole tree.
1879 . .	11	25·81	·46	·53
1881 .	7	26·7	·46	·57
1884 . .	8	25·4	·5	·59
1886 . .	6	25·6	·46	·58
1889 . .	6	25·9	·48	·57

2.—*Experimental Plot in Giessen Stadtwald.*

Compartment Hubertusbrunnen, 54.
Area of Plot—1 hectare.
Growing Stock.—Beech, with some oak and hornbeam, aged 118 years in 1886. Quality between II and III.

Details are shown in the following statements, in so far as the experiment has been carried out at the present.

Species.	GROWING STOCK IN 1886.		FIRST (PREPARATORY) FELLING IN WINTER, 1877-78.						
	Number of stems.	Sectional area in square metres.	Number of stems felled.	Sectional area in square metres.		Mean diameter. centimetres.	Yield in cubic meters.		
				Total.	Per stem.		Total.	Per square metre of sectional area.	Average per stem.
Beech	643	27·5	171	4·48	·0255	18	43·48	Including root wood 9·702	·25
Oak	63	4·19	2					Excluding do. 8·921	
Hornbeam	7	·47	3						
Total	713	32·16	174						

	BALANCE OF GROWING STOCK AFTER FIRST FELLING.			MEASUREMENT IN AUGUST 1889.				MEASUREMENT IN AUGUST 1891.				
	Number of stems.	Sectional area in square metres in 1886.		Sectional area in square metres.		Increment in sectional area, 1886 to 1889.		Sectional area in square metres.		Increment in sectional area, 1889 to 1891.		Mean diameter in centimetres.
		Total.	Per stem.	Total.	Per stem.	Total.	Percentage per annum.	Total	Per stem.	Total.	Percentage per annum.	
Beech	472	27·68	·0515	24·01	·0533	·948	1·1	25·302	·056	1·433	2·5	26·7
Oak	61			4·38				4·508				
Hornbeam	4			·24				·253				
Total	537	27·68	·0515	28·63	·0533	·948	1·1	30·063	·056	1·433	2·5	26·7

	SECOND (PREPARATORY) FELLING IN WINTER OF 1892.						BALANCE IN 1892 (AFTER 2ND FELLING).		
	Number of stems felled.	Sectional area in square metres.		Mean dimater centimetres.	Yield in cubic metres.		Number of stems.	Sectional area in sq. m.	
		Total.	Per stem.		Total.	Per square metre of sectional area. Per stem.		Total.	Per stem.
Beech	77	2·532	·034	20·8	31·49	Including rootwood 10·623 ·36	395	27·099	·06
Oak	6	·179				Excluding do. 9·695	55		
Hornbeam	4	·253					*Nil.*		
Total	27	2·964					450		

The figures in the foregoing statements of the experimental regeneration fellings, in the forests of Altenbuseck and Giessen, afford a good illustration of the course of regeneration fellings in a mature beech forest, and of the quantity of material which should be removed at each felling. They also serve to show that in consequence of the greatly stimulated diameter-growth of the stems of the shelter-wood when placed in comparative (and progressive) isolation by the regeneration fellings, no financial loss is incurred by deferring their ultimate removal, although the regeneration period may extend to 20* years. The loss in postponing the utilisation of the most promising of these trees is compensated by the increased production of valuable timber of exceptionally large size.

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* Up to 20 years in the case of beech; but frequently extending to far longer periods in the case of conifers (*e. g.*, in the Black Forest).

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THE TOWN FOREST

OF

FRANKFORT.

BY

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CALCUTTA:

OFFICE OF THE SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.

1894.

THE TOWN FOREST OF FRANKFORT.

A.—Description of Locality.

Area.—3,407 hectares (8,415 acres), forming a belt about 8 miles long by 3 miles broad; divided into two circles, Oberwald and Unterwald.

Situation.—Opposite town of Frankfort, south of the river Main.

Proprietorship.—The town of Frankfort.

Climate.—Mild; temperature ranging from 0·2° C. to 20° C. (32·4° to 68° F.), the mean being about 9·9° C. (49·8° F.); but frosts usually severe. Rainfall only 62 centimeters (24·2 inches), and prolonged droughts of frequent occurrence.

The elevation ranges from 100 m. in the Unterwald to 150 m. in the Oberwald.

Rock and soil.—In the Oberwald the soil consists of sandy loam overlying limestone; in the Unterwald gravel and clay are found at a depth of a few inches below the surface-soil of sand.

B.—Injurious rights, etc.

Till the close of the eighteen century the forest was extensively burdened with injurious gazing rights, which had the effect of greatly impoverishing the soil and impeding reproduction. "Pannage" was also very widely practised, and the buildings and sheds where the pigs were enclosed at night are still in existence. But these rights were almost wholly abolished by law in 1807, and are now practically extinct. Fallow deer commit a good deal of damage, particularly to the Weymouth Pine, and certain portions of the forest have been fenced for the purpose of protection of young plantations.

C.—Composition of the growing stock.

The growing stock was originally composed exclusively of deciduous trees, mainly oak and beech, but in consequence of unlimited pasture of horned cattle and extensive browsing by sheep and goats, the forest greatly deteriorated. So serious was the deterioration from this cause that reproduction grew scanty, the soil was more and more uncovered and impoverished, and its fertility was ultimately reduced to so low a pitch that oak and beech no longer found sufficient nourishment. This led to the introduction of conifers, principally Scotch Pine, early in the fifteen century, and the forest now presents a very varied appearance, but has for the most part the character of a mixed forest. In the Oberwald the beech still largely predominates on the limestone soil, and forms even pure forest of excellent growth. But oak has been

largely associated with it artificially wherever the soil is fresh, while ash, elm, alder, maple, etc., and conifers occur in moist localities and at lower levels. It is a principal feature in the sylvicultural treatment of this forest to extend the admixture of trees capable of yielding large timber; and wherever the soil is suitable for such trees the beech is maintained only for the purpose of improving the soil, but is not permitted to suppress the more valuable species.

In the Unterwald the sessile oak predominates, but beech is frequently associated with it, and onpoorer soils Scotch Pine, silver fir, and spruce have been largely introduced. The oak thrives excellently on soil of the better quality, especially where loamy; and though of somewhat slow growth, forms excellent timber. Where frost is absent the beech outgrows the oak, and must be kept back by topping off, lopping, etc.

The Scotch Pine, is, however, best suited to this locality, and produces fine tall stems if allowed to attain sufficient age. It is especially suited for underplanting with beech and silver fir, and this particular form of two-storeyed forest is largely represented in the Frankfurter Stadtwald. Silver fir has been largely planted of late years, as its long tap-root enables it to derive moisture from the subsoil and to resist the frequent droughts better than the shallow-rooted spruce. Especially as underwood to the oak standards, which shelter it against late frosts, it has been found very suitable in association with beech.

Excluding minor species, the present composition of the forest is about ¾ oak and beech, and about ¼ conifers (mainly Scotch Pine, but also spruce, silver fir, Weymouth Pine, etc.)

D.—Working-Plan.

Past treatment of the forest.

Prior to the year 1780 the forest was worked somewhat unmethodically on the selection system, in the course of which treatment the oak (which was mostly in demand) was much more heavily felled than the beech, and is now far less numerous than formerly. This ill-regulated method of treatment was subsequently replaced by cutting definite compartments successively, and at a later period the system of clear cutting and artificial regeneration by planting was adopted; but owing to excessive damage by frost in the absence of shelter, it was abandoned in favour of the present system of natural regeneration under shelterwood (high forest) by compartments, in accordance with a regular working-plan.

Division into Working-Circles, and present method of treatment.

This working-plan divides the forest into two circles, the Oberwald and Unterwald, comprising 1,792 and 1,615 hectares, respectively. It is based on area, and (as already noted) prescribes the method known as the system of felling by compartments with natural regeneration under

shelter-wood. The following details are taken from the working-plan of the Oberwald Circle.

The plan commences with a very short but sufficiently comprehensive description of the Forest Circle, in which the following points are briefly noted:

Situation, elevation, etc.

The Oberwald Circle consists of a forest belt 9 kilometers long and 4 kilometers broad, situated south of the river Main, ranging eastwards, with an elevation of about 150 meters above sea-level.

Climate.

The climate is described as mild, with an early spring season, but with occurrence of late frosts which require special precautions in the operations for regeneration (especially at lower levels) by maintaining the shelter-wood for a longer period and prolonging the period of regeneration, or by working portions of the forest by selection.

Rock-formation and soil.

The rock-formation and soil are stated to be limestone underlying a sandy loam, the surface-soil in the lower parts being gravelly.

Water-level.

The water-level is said to be 3 to 4 meters below the surface.

Rotation.

The rotation is fixed generally at 120 years; but it is expressly provided that healthy, promising trees may be reserved for a longer period in order to yield timber of exceptional size and value. It is divided into six working periods of 20 years each.

Working Periods.

Areas.

The area of the Oberwald Circle is given as follows:—

Productive area	1,724 hectares.
Unproductive (roads, sites of buildings, etc.) . .	68 „
Total area .	1,792 „

Aesthetic forest.

Out of this area the Town Council of Frankfort have decided to set apart a portion of forest to be treated with special regard to æsthetic purposes, and to be worked by selection. The portion reserved for this purpose is situated in the Kaisertanne block, and comprises 102 hectares fully stocked with a fine growth of beech, 109 years old, with handsome stems about 30 meters high. Deducting this area from the total productive area of the working-circle, the balance remaining for treatment as high forest to be naturally regenerated by compartments is 1,622 hectares.

Age classes.

The growing stock has been divided into six age classes, corresponding with the following areas:—

Age class.	Area.
Over 100 years	402·4 hectares.
81 to 100 „	346 „
61 „ 80 „	172·5 „
41 „ 60 „	387·7 „
21 „ 40 „	296·2 „
„ 20 „	119·5 „
Total 1,724·3 (productive area).	

Blocks, compartments, and map.

The forest area is divided into blocks distinguished by local names and numbers, and subdivided by numerous roads and rides into compartments and sub-compartments comprising 16 to 20 hec. each. The working-plan is accompanied by a map on the scale of $\frac{1}{20,000}$ (equivalent to 5 centimeters = 1 kilometer), on which the blocks, compartment roads, etc., are clearly shown, and the character of the growing stock predominating in each compartment is distinguished by different colours.

General provisions.

The working-plan leaves a wide discretion to the Controlling Forest Officer in the determination and application of the appropriate sylvicultural operations; but a few provisions of a general nature are prescribed: for instance, that the litter of leaves is not to be removed except from the roads; that attention be paid to the early removal of brushwood and of soft and inferior woods, etc.

Description of compartments.

After the general description of the forest follows a statement describing the several compartments, in tabular form; then a table specifying the compartments pertaining to the first half (10 years) of the first working period, with their areas, estimated yield, etc., and indicating in concise, general terms the nature of the operations to be carried out, and the yield anticipated.

Period to which the detailed prescriptions apply.

The detailed provisions of the working-plan apply only to the first 10 years of working, and affect only 234 hectares in the aggregate, leaving 1,388 hectares to be exploited and regenerated during the remaining five periods of the rotation—an average of 278 hectares for each of those five periods.

Area pertaining to first working period.

The fact that a smaller area has been allotted to the first period seems to indicate that the compartments to be worked in this period are of a quality better than the average; or else that an unusually large number of the existing stems are expected to prove suitable for reservation beyond the fixed rotation.

The annual yield of timber and fuel, in cubic meters, has been calculated to be as follows:—

Species.	Final Yield.	Intermediate Yield.	Total.
Oak . . .	1,007	466	1,473
Beech . . .	1,926	933	2,839
Other deciduous trees	25	32	57
Conifers . . .	762	612	1,374
Total .	3.720	2,043	5,743
Per hectare .	2·16	1·17	333

5,743 cubic meters timber

Add { Faggots . . . 2565 ,,
Stools and root wood . 525 ,,

. 8,833 cubic meters
or 5·12 cubic meters per hectare.

E.—Sylvicultural Methods of Treatment.

The foregoing details have been mentioned in order to describe briefly the general plan on which the Frankfurter Stadtwald is worked as a whole; but this forest is interesting and instructive rather in respect of the sylvicultural methods which there find practical application, than from any peculiarity of the working-plan. The chief features which deserve special mention are :— This forest interesting mainly in regard to its sylvicultural treatment.

(1) the combination of Agriculture with Sylviculture ;
(2) the two-storeyed forest,
(3) the regeneration by compartments under shelter-wood.

1.—Combination of Sylviculture with Agriculture.

The method of combining sylviculture with agriculture has been extensively practised in the past, and is still applied in some compartments of the forest. For instance, compartment Kaisertanne VI, 2 *a*, consisting of pure Scotch Pine about 145 years of age, was cut in strips between 1870 and 1885, a few of the finest and most promising trees (now about 114 feet high) being left as standards. Oak was then sown in lines 1½ meters apart, and potatoes, beans, etc., were raised for some four or five years between the lines. The oak resulting from the sowings of 1885 has now (May 1892) attained a height of about 2½ meters, and is well grown, and the stocking complete except in a few places where frost has caused small blanks, or thinned out the young trees. Windfalls among the Scotch Pine standards are rare, as the precaution was taken to leave the soil undisturbed for some six feet around each trunk; but the wisdom of reserving the standards in this locality seems doubtful, as they are already showing signs of deterioration. They have, however, doubtless been of some service in protecting the young oak growth against frost. Oak grown among field-crops, under standards of Scotch Pine.

In Grasränke (VIII, I), an old crop of oak and beech was cut in 1851, and beech planted in lines 2 meters apart (the distance between the plants being ½ meter) and field-crops were grown between the lines. The results are good: at an age of 34 years the number of Beech sown in alternate lines with field-crops.

Stems was . . .	1,408	
The volume . . .	232 cubic meters	per hectare.
The annual increment .	6·82 „ „	

The chief advantage expected from the system was the benefit to the tree-growth by the repeated working up of the soil at each season of sowing the field-crops, whereby the ground was kept free from weeds and grass, and the subsoil freely exposed to the action of the atmosphere. These advantages were, however, found to be merely temporary; for on cessation of the agriculture weeds and grasses again overspread the ground, radiation increased, and night frosts played more havoc Advantages and disadvantages of the system.

among the young trees. Thus the results of the system were found to be very variable and on the whole unsatisfactory. In many localities the damage done by night frosts was excessive, especially after removal of the field-crops, and differences in quality of the soil also caused inequality in the results. Thus, in compartment Buchscheerchen, 2, 3 and 6, Weymouth Pine was planted alternately with beech and oak, and field-crops raised between the lines. The Weymouth Pine are now 42 years old, but the oak aad beech have completely disappeared through frost and consequent suppression by the Weymouth Pine. Spruce was introduced to replace the oak and beech, but the soil being gravelly, central rot set in. The Weymouth Pine also have suffered injury from the "Chermes Strobii." The results now, at the age of 42 years, are as follows:

Weymouth Pine, beech, and oak, planted among field-crops, and effect of frosts.

Species.	Number of stems.	Height in meters.	Volume in cubic meters.
Weymouth Pine .	976	19·5	556
Oak and Beech .	*Nil*		
Spruce . . .	232	16·9	38
TOTAL	1,208		594

The mean annual increment per hectare is 14 cubic meters. Scotch Pine would be much better suited to this soil, and though under similar conditions it would probably yield not more than 9 cubic meters per hectare (as against 14 cubic meters produced by the Weymouth and Spruce) it is not improbable that the quality of the Scotch Pine timber would have been so much better and more valuable as to compensate fully for the deficiency in volume.

Combination of agriculture with sylviculture now abandoned.

The field-crops cannot be successfully grown without removing the stumps and roots of the previous stock of trees; but owing to the growing cost of this operation in consequence of increase in the rates of wages, and still more in view of the frequent failures of the young growth through damage by frost, the method of combining agriculture with sylviculture has been almost wholly abandoned in the Frankfurter Stadtwald.

2.—*Double-storeyed High Forest.*

One of the most striking features of the Frankfurter Stadtwald is the two-storeyed forest, composed in some compartments of Scotch Pine or of oak, in the upper storey, with an underwood of beech, or

of oak, or of both together; elsewhere occurs oak underplanted with Weymouth Pine or silver fir. There are also compartments containing mixture of oak and beech of equal, and sometimes various, ages; also mixtures of Weymouth Pine with spruce, and of Scotch Pine with Weymouth Pine. These manifold mixtures of different species, especially of deciduous trees with conifers, in double and single storeyed canopy, present a very varied forest-picture, and necessitate early and often repeated improvement cuttings by removing, or lopping, the less desirable species in favour of the more slow-growing but more valuable kinds. Thus oak is rapidly outgrown by beech in this forest, and must be duly protected by lopping, or topping off, or removal of dominating beech—and silver fir, while young, requires similar protection against the beech.

Great diversity in the forest-pictures presented by the Frankfurter Stadtwald.

Improvement cuttings to favour the more valuable species.

In Wartfeldheeg, compartment X, 3 Oberwald, is an example of two-storeyed forest, with oak in the upper and beech in the lower storey. The oak was sown broadcast in 1800, moderately thinned in 1847, and then underplanted with beech seedlings extracted from the surrounding forest. A further thinning of the oak was made in 1850, and more beech planted, and since then the thinnings have been repeated every 10 years. Within this area a plot of one hectare has been marked out, in which the thinnings are made every 5 years, and the yield carefully measured and noted, in order to determine the degree of density most favourable for such conditions. The measurements made in 1886 and 1892 show the following increments:—

Oak underplanted with beech.

Species.	Increment in Cubic Metres.	
	From 1886 to 1892.	Annual.
Oak	26·2	4·4
Beech	12·3	2·0
Total .	38·5	6·4

The local forest officers hold the opinion that a moderate density of the underwood results in a larger increment than a high degree of density; if this proves to be correct, the advantages of the two-storeyed forest have probably been hitherto somewhat over-rated.

In Hinkelsteinrauschen (VIII, *c*, 2) is another example of forest with oak, 200 years old, in the upper storey, and a lower storey of beech (partly sown and partly planted), 72 years old, interspersed with some Scotch Pine 50 years of age. The volume here is:—

Oak, with lower storey of beech and Scotch Pine (sown and planted).

Oak	250 cubic meters per hectare.
Beech	80 „ „ „
Scotch	20 „ „ „
Total .	350 „ „ „

The oak here contain only 1·6 cubic meters of *timber*, which is a very low quantity, but the soil is gravelly and only of the 4th quality, and the local officers propose to re-stock this compartment with Scotch Pine.

Scotch Pine, with lower storey of beech (sown).

In the two adjacent compartments II, 14*a* and VI, 3 of the Unterwald, a large area stocked with Scotch Pine was thinned in 1872, at which time the age was 56 years. Beech was then sown *in lines* in II, 14*a*, and in compartment VI, 3 *in patches* ½ meter square, and 1½ meter apart. Valuation surveys made in 1878 and 1883 showed the following results for the Scotch Pine, per hectare:—

Year.	Age.	Number of stems.	Volume in cubic meters.
1878 . .	62 years . .	1,414	386 7
1883 . .	67 „ . .	1,040	361

Difference.....374 stems, removed by a thinning between 1887 and 1883, yielding 97·7 cubic meters. The increment during the five years was therefore:—

361 + 97·7 — 386·7 = 72 cubic meters.

or 14·5 cubic meters per annum.

Since 1883 only dead trees have been removed; but now (May 1893) the number of Scotch Pines still standing is only 560, and their crowns are mostly poor and straggling. The cause lies in the sudden heavy thinning made in 1872, by which the trees were too suddenly brought into a condition of comparative isolation after having grown up in very close canopy for 56 years. The trees were very injuriously affected by this operation, which should have been performed gradually in a series of light thinnings at intervals of some years. The beech underwood, however, has grown up well, and the condition of the forest is now less that of a two-storeyed forest than of a high forest with advance growth, and in order that the beech may adequately develop, the upper storey must be made much thinner by the early removal of the Scotch Pine, the poor condition of which is in any case unfavourable to their preservation for any considerable time.

Natural two-storeyed forest of Scotch Pine with underwood of beech.

The Kaisertanne compartment VI, 5 (Oberwald) affords an example of an upper storey of Scotch Pine, 130 years old, with a fine underwood of beech, all of natural origin, the beech having sprung up from seed carried among the Scotch Pine by the wind and birds. The Scotch Pine are now 67 centimeters in diameter, with a mean height of 28 meters, the volume being about 4·84 cubic meters. Another good example of a natural underwood of beech, under an upper storey of Scotch Pine, occurs in the Unterwald, compartment VII, 8 and 4.

One of the chief advantages of the system of double-storeyed forest lies in the production of clean, tall, stems of valuable timber in the upper storey, the underwood having the effect of stimulating their height growth. Oak grown over an underwood of beech benefits in a most marked manner, and produces straight, lofty stems clear of branches. An underwood of beech has the further great advantage (quite apart from its direct influence on the development of the individual stems composing the upper storey) of improving the soil by the heavy litter of leaves which it sheds. The system is also of special value in places where (as in the Frankfurter Stadtwald) severe frosts prevail, as it enables beech, silver fir, and even oak, to be safely raised under the shelter afforded by the upper storey which protects them against frost.

General remarks on the system of two-storeyed forest.

3.—Regeneration by compartments under shelter-wood.

In the Oberwald (compartment II, 3 *a*, *b*, *c* and 4 *a*, *b*) interesting examples occur of natural regeneration of beech under shelter-wood, by compartments (high forest), with artificial introduction of other species. The beech grew up as a fully-stocked wood to an age of 138 years and the preparatory and regeneration fellings were carried out in the usual manner. The stumps of the felled beech were then stubbed out by the Frankfort gardeners, who were permitted to retain the rootwood in remuneration for levelling the soil after removal of the stumps and roots, and planting silver fir, Scotch Pine, etc. on the levelled spots. Oak also is introduced in groups wherever blanks have occurred through failure of the beech regeneration, frost, etc. It is necessary to plant the oak in groups, because they are in this locality readily out-grown by the beech.

Natural regeneration of beech, with artificial introduction of silver fir, Scotch Pine, oak, etc.

Another system also is adopted here for the purpose of introducing oak among the beech—namely, by clearing strips 15 meters broad and 30 meters apart. Acorns are then sown broadcast, or in lines, on the cleared strips, and the intermediate portions of uncleared beech forest are then regenerated in the usual way under shelter-wood. This method produces well-defined groups of oak, which are thus safe against suppression by the surrounding beech.

Introduction of oak by sowing strips cleared in beech forest.

F.—Plantation of Weymouth Pine.

Near the Forest House at the Untere Schweinstiege is an interesting plantation, about ½ hectare in area, of Weymouth Pine with a small admixture of Scotch Pine, both being now 95 years old. These Weymouth Pine are said to be the oldest in Germany; they are well grown, but not quite so high as the Scotch Pine. The development of this little plantation is best illustrated by the following statement, in which the

sectional areas, heights, volumes, etc., as recorded at various ages, are shown for both species side by side. Weymouth Pine is a good deal in favour in the Frankfurter Stadtwald, as it thrives well here, and enriches the soil by the thick layers of needles which it sheds. But its selling price is somewhat below that of the Scotch Pine.

Plantation of Weymouth Pine and Scotch Pine.

Year.	Age (in years.)	Number of Trees.			Sectional area (in square meters).			Mean Height (in meters).		Volume of standing crop (in cubic meters).			Thinnings (in cubic meters).
		W. P.	S. P.	Total.	W. P.	S. P.	Total.	W. P.	S. P.	W. P.	S. P.	Total.	
1845	47	..	...	...	...	...	109.9	...	...	...	...	...	...
1858	60	2,572	245	2,817	87·81	9·71	97·52	17 9	20·5	960	121	1,081	32·1
1870	72	1,964	181	2,145	85·52	9·93	92·45	19·9	20·8	955·8	132	1087·8	118
1880	82	1,629	157	1,786	75·67	10·25	85·92	20	22	923	137	10·60	189·9

Mean Annual Increment :

Up to age 60 years . . . . . 18·5 cubic meters.
From 60 to 72 „ . . . . . 17·1 „ „
„ 72 to 82 „ . . . . . 18·9 „ „

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TOUR IN FRANCE

FROM

10th to 29th July 1894.

The three weeks were devoted to a study of the beech forest of Lyons in Normandy, the oak and beech forests of Le Haut Perche, the resin factories, pine forests, and dunes south of Arcachon. I accompanied Mr. W. R. Fisher, Assistant Professor of Forestry, Cooper's Hill, and the junior forest students through the forests of Lyons and Le Haut Perche, whilst Messrs. Fisher, Young, and myself went together to the pine forests.

The students had to carry out with their own hands markings for seeding fellings, secondary fellings, and final fellings; they also marked trees to be thinned out in woods of different ages both at Lyons, where the forest is treated chiefly for beech, and at Le Haut Perche, where oak is regarded as the chief species. Thus, in studying these forests, I had the special advantage of observing Mr. Fisher's eminently common-sense plan of instructing his students in practical forestry. My studies were also greatly aided by a note on the forest of Lyons written by M. Le Père, Inspecteur des Forêts, and translated by Mr. Fisher, by M. Trégomain's treatise on Le Haut Perche, M. Grandeau's article on the dunes, Mr. Fisher's notes to the students, and by information kindly given by the various French forest officers we met on our tour. I have freely profited by all these sources of information in drawing up the present report. Details regarding trade, the markets for forest produce of all kinds, and the price of materials have been purposely omitted, except where such details might have some bearing on forest management in India.

I will first briefly describe the forests visited, and then try to show how their method of treatment can be applied with modifications to some of our Indian forests.

N. HEARLE.

Forest of Lyons (Normandy).

General description.

The forest covers 26,211 acres, more than half the area being situated on undulating ground at an altitude varying from 164 to 722 feet.

The climate is the mild and moist one of an area not far distant from the sea.

The soil is formed by the weathering of secondary and tertiary strata; the former is only exposed in the lower part of the valleys and consists of nearly horizontal beds of white chalk with numerous layers

of flints. The tertiary strata are much less regular and form the subsoil over the greater portion of the forest area; they contain flints, gravel, quartz, sand, sand-stone, etc. The depth of the soil varies from 8 inches to 13 feet, and is generally moist and permeable.

The forest is essentially a beech one, this species occupying more than two-thirds of the area and attaining very fine dimensions at a comparatively low age. The wood of castelier, 150 to 230 years old, contains over 14,000 cubic feet per acre, the trees having a mean height of 148 feet. The hornbeam and the oak are mixed unequally with the beech, the proportion of the oak being less than one-fifth of the stock. There are a few small woods of Scotch pine on soils at present too poor for broad leaved species.

From time immemorial, the forest has been treated according to the regular high forest system, and most of it is composed of woods with a proper gradation of ages up to 120 years, middle-aged trees on the whole predominating. Blanks are almost unknown, and plantations are only required to complete the natural regeneration at the extremely rare places where it is delayed beyond the usual time. These plantations are generally made to introduce oak into pure beech woods.

The forest staff consists of one Inspecteur, two gardes-generaux, and 30 forest guards, the beats of the latter averaging 900 acres.

The Working Plan.

The present working plan has been in force since 1856. It divides the forest into 15 working sections (*vide* sketch map) with a rotation of 150 years for each. This rotation is sub-divided into six periods of 25 years each for working sections 1 to 12 and 14, and into five periods of 30 years each for working sections 13 and 15.

As usual in France, at the corners of the compartments the

Working sections are indicated by		I, II, III,	etc.
Periodic blocks	„ „	1, 2, 3,	„
Compartments	„ „	A, B, C,	„

(Vide *sketch map of II working section.*)

These figures and letters are usually painted on trees at the corners of the compartments, *e. g.*, III F^5 would mean compartment F of the fifth periodic block, third working section. The system is the shelter wood compartment one. If the age-classes are regular, knowing the date of the working plan, we can at any time tell what operations are going on in the different periodic blocks. The working plan having begun in 1856 for 13 working sections, we are in the 13th year and for the two others in the ninth year of the second period. Thus, for all the former working sections, in block I there would be cleanings amongst young growth and early thinnings; block 2 would be under regeneration; in block 3 there would be thinnings in old woods aged from 115 to 140 years; in block 4 thinnings in woods from 90 to 115 years old; in block 5 thinnings in woods aged from 65 to 90 years; and in block 6 thinnings in young woods between 40 and 65 years old.

Principal fellings.—Three regeneration fellings (seeding, secondary, and final) are undertaken. At present, near the middle of the second period, seeding fellings are the most frequent. The principal fellings are regulated by volume (988,000 cubic feet per annum).

In a normal wood the trees reserved at a seeding felling—*vide* photograph of seeding felling—are in number about one-third of the standing crop, but in volume only one-half. The finest middle aged beech are selected as seed-bearers, but preference is always given to oak, and care is taken to concentrate the seed-bearers of this species as a protection against frost and drought. The fellings are made from East to West. To assist reproduction the forest plough, a sort of cultivator with three teeth, is used whenever necessary. It is so economical and successful that hoeing is only employed in places where the soil is too stony or too steep, and it may be used both before and after the fall of the mast. The plough costs £16.

The location of the secondary and final fellings depends on the condition of the young crop and the limit fixed for the annual yield. In every working section, therefore, fellings considered necessary on account of the state of the young growth are always made before commencing to regenerate a new area by a seeding felling—the seeding fellings may take five or six years to go through one compartment. The secondary fellings generally follow six to eight years later and are in their turn quickly succeeded by the final fellings, so that the regeneration is completed in 10 to 15 years at the outside. The course of natural regeneration being in itself irregular, the secondary and final fellings are frequently amalgamated. In the final fellings the branches are lopped off and the trees topped before felling to lessen the injury done to the young seedlings.

Improvement fellings.—These are regulated by area, 1,977 acres per annum, and yield almost as much as the principal fellings.

The thinnings are sold standing by *unit of produce* which method is profitable both financially and sylviculturally. The markings can by this means be increased or corrected at any time during the fellings, and the preservation of the oaks can be carefully guarded. These thinnings are generally limited to the removal of dying and suppressed trees, but, owing to the compact condition of the stock, the outturn is large, being from 700 to 1,000 cubic feet per acre thinned. The total annual yield for the forest is 71 cubic feet per acre, and this may be increased when a regular gradation of ages has been everywhere established for the actual mean volume of the mature standing crop now being regenerated, and of which the average age hardly exceeds 100 years is 5,716 cubic feet per acre. This is after a nearly equal volume has been furnished in the thinnings.

Cleanings.—These are made at the expense of the State. The object is not only to thin out overdense thickets of young wood, but chiefly to protect valuable species, especially oak.

Compartments visited.

The second working section was visited in detail, and it furnished a good example of what an ideal working section should be, being the most compact and the most regular of the 15 sections.

The position of the portions inspected is indicated in the accompanying sketch map.

A small portion of the sixth block in the second working section was so old that it had to be regenerated during the first period, otherwise the age classes are very regular. In a fifteen-year-old beech wood in the same section, we found some beech branched to the base. These come from advance growth in existence before the seed-felling was made, and were for a long time isolated. They will all have to be cut back at the next thinning.

II A[2]. The area where final fellings have already been made is completely stocked—*vide* photograph with well grown seedlings, except about 5 per cent. of the area for the most part blanks in low marshy localities. These places are to be planted up now, *i.e.*, two years after the final fellings, with tall, strong three-year-old plants, mostly oak with ash in the depressions.

In the other part of the compartment, where a seed-felling was made nine years ago, there is such a good crop of seedlings that a secondary felling can now be made.

II C[3]. Markings for a seed-felling have just been made, the trees to be reserved being marked at the base and those to be felled blazed breast high.

II E[3]. The students under Mr. Fisher's directions marked 34 acres for a seeding-felling. There were some old branched beech Tir et Aire reserves in this area, and as many of these as possible are to be cut out. They are past giving good seed, whilst their shade is too dense to admit of successful reproduction underneath them. The trees reserved were selected so that their branches touched when disturbed by the wind. Their numbers were—

	Modernes.	Baliveaux.	Total.
Oak	59	446	505
Beech	255	1,724	1,979
Hornbeam	*Nil*	40	40
TOTAL .	314	2,210	2,524

or 74 trees per acre.

The students then marked an area for a secondary felling, taking out all trees over well established young growth and opening out the canopy in parts where it was too close.

V A[2]. Final fellings were in progress. A fine stock of advance growth of beech was on the ground before the seeding felling was made, and this will remain to form the new forest.

V B[2]. Resembles a good Indian forest with trees of mixed ages and an almost complete advance growth underneath. There are many old trees, Tir et Aire reserves, mixed with younger beech and hornbeam of various ages.

XII E[2] is a very old beech wood, much over its proper age. The trees have large crowns, and many are now incapable of producing good fertile seed. The trees averaged 150 feet in height, one reaching 170 feet and measuring 11½ feet round.

I C[1]. A young wood, aged about 30 years, consisting almost wholly of beech, with very few hornbeam, and scarcely an oak. There was no direct cover on the ground, but dead leaves and a few small beech seedlings. The height of the poles varied from 30 to 40 feet, and their girth from three to four inches in diameter. Thinnings had been made for the second time.

I E[1]. Nearly 30 years old in which a thinning had just been made for the first time. In order to save and encourage the few oak found in this compartment, the thinning should have been made earlier, and more boldly, in the neighbourhood of the oaks.

VI A[1]. Formerly there were considerable gaps in this compartment. These have all been filled up by close planting beech and oak, only at a distance apart of 1¾ feet. The Forest Officer informed me that he varied the distance according to the size of the transplants, the smaller they are, the closer the planting, so that the distance varies from 1¾ to 5 feet. The swampy part was drained by leading drains from all directions to a natural depression, a deep pit into which all the water was led, natural fissures conducting it underground. Sycamore and ash were used in the damper parts.

III B[6]. The compartment contained trees from 70 to 80 years old, and the students marked for a third thinning.

Adjoining the high beech in the first working section is a private forest treated on the coppice-with-standards system. The difference between this and the Government Forest is very striking, and cannot be attributed to a difference of soil or climate, but solely to the method of treatment. In the private forest there are a few scattered standards of ash and oak with a coppice growth of aspen, birch, hazel, oak, etc., the soft woods forming a notable proportion of the stock, as they so frequently do in a forest carelessly managed and with a short rotation.

Le Haut Perche.

General description.

There are three separate masses of State Forest situated on high ground to the north, south, and west of Mortagne, the capital of Perche, and from 8 to 10 miles of the town. Their names and areas are as follows :—

	Acres.
Bellême	6,002
Reno-Valdien	3,926
Le Perche-la-Trappe	7,962
Total	17,890

The altitude varies from 550 to 1,000 feet. South-west winds are the most prevalent. The average rainfall is 34 inches, and in the forest

it is as high as 37 inches. The average temperature is 49° Fahrenheit, the maximum recorded being 98° Fahrenheit in 1871.

Throughout most of the forest we find tertiary strata known as "l'argile à silex" and belonging to the Eocene period. The soil thus consists of a bed of clay with large flints which occasionally form layers. On the high points this has been denuded, exposing the "Sables du Perche" belonging to the middle cretaceous period; here the soil is sandy, and in places a sandy loam.

Forest management was very rough until 1665 when all rights were fixed, *i.e.*, a forest settlement was made, and the Tir et Aire system was introduced.

The chief species occur in the following proportions:—

	Percentage of			
	Oak.	Beech.	Other broadleaves.	Pines.
Bellême . . .	0·54	0·30	0·05	0·11
Reno-Valdien . . .	0·50	0·34	0·05	0·11
Le Perche-la-Trappe .	0·40	0·26	0·15	0·19

The sessile is the chief oak, the pedunculate only occurring here and there. The oaks sometimes attain a height of 130 to 150 feet, with a bole of 80 to 100 feet and a girth of 6 ½ to 10 feet. Ash has been, and is being, introduced into the damper parts of the forests for the past 30 years, and succeeds admirably. There is scarcely any hornbeam. The soft woods, especially birch, were formerly very abundant, but a constant war has been waged against them, and they now form only 5 to 10 per cent. of the stock. The Scotch pine was introduced about 50 years ago, and is most useful for stocking the "Sables du Perche." The undergrowth consists of holly, heath, myrtle, buckthorn, and ferns.

The subordinate staff consists of—

Bellême . . .	3 forest guards.	1 cantonnier.
Reno-Valdien . .	2 „ „	1 „
Le Perche-la-Trappe .	4 „ „	2 „

The average beat of each guard is 2,000 acres. The cantonniers are used chiefly for the maintenance of the roads, of which there are under the forest administration—

Metalled roads	55½ miles.
Unmetalled „	74½ „

Execution of the Working Plans.

The success of the shelter-wood compartment system is well shown in the forests of Le Haut Perche. A succession of compartments, aged from 1 to 70 years, can be shown without a break, and this not only on good soil but on bad, whilst it has only been necessary to resort to artificial planting over less than five per cent. of the area.

Principal fellings.—Usually the three classical fellings are made, seeding, secondary, and final. It is very rare that two secondary fellings have to be made, but, on the other hand, sometimes the secondary felling can be dispensed with altogether, *e. g.*, after a prolific crop of acorns.

A good high forest completely stocked with mature oak and beech generally contains from 70 to 90 trees per acre, mostly seedling trees. In the seeding felling a little over one-third of this number is removed, their volume being equal to from 20 to 25 per cent. of the total volume of the crop. In woods aged about 120 years, and composed mainly of old coppice shoots, there are as many as 120 to 160 per acre and in the seeding felling up to 40 per cent. in number and 30 per cent. in volume have to be cut out. The seeding felling is not made too open, as the acorns are heavy and remain close to the parent trees, whilst a certain amount of cover is necessary to check the otherwise luxurious growth of grass and herbs.

In the secondary felling about half the trees containing about half the volume in timber of those remaining are cut out. This is generally undertaken two years after a good stock of natural seedlings has been obtained, whilst the final felling is made 3 or 4 years later. Owing to the irregular seeding of the oak, the interval between the seeding and final felling varies between 5 and 10 years. The beech seeds somewhat more frequently than the oak, and beech seedlings persist long under cover. When, therefore, a seeding felling is made, we usually find an extensive undergrowth of beech which must be all cut back to encourage oak reproduction, and with the same object the trees felled are mostly beech.

After the secondary felling the young beech may again have to be cut back, but only partially, in order to keep the oaks from being dominated. Again, after the final felling, the young beech have to be lopped or topped where they tend to injure the young oak. This must be continued for some years and cleanings of soft woods made.

Improvement fellings.—The young growth is maintained thick whilst young, but thinned out more and more until it reaches 90 to 100 years old, when the thinnings become bolder with a view to increase the girth of the trees, but it is necessary to maintain—

(1) all shrubs covering the soil, the holly in particular;
(2) the undergrowth of beech and hornbeam which comes up well under cover.

If no undergrowth exists, young beech is planted to keep the oaks in a healthy state. Thinnings are made every 12 or 15 years amongst the broad leaves, but amongst the pines every 5 or 7 years.

Re-stocking.—If a good seeding year immediately succeeds a seeding felling the soil having been disturbed by working, the forest is in a good condition for the reception of the seed, but if not much good seed falls for severals years, the soil becomes hard and gets covered in parts with herbs. In this case, after a good crop of acorns, the soil is disturbed by raking or by digging it up in plots, and in places where no seedlings have come up after a good seed year, acorns have to be sown.

To fill up blanks in the secondary and final fellings, it is necessary to plant out oak and ash from the nurseries, and beech from the forest where they are nearly always too numerous in places.

In the forests of Bellême and Reno-Valdien all the lands covered with "Sables du Perche" have been filled up with pine. In Le-Perche-la-Trappe the parts where the soil is clay mixed with flints forming almost beds at a slight depth, are unsuitable for broad leaves and will have to be planted up with pine. The two small valleys in the same forest which are damp and peaty will have to be similarly treated, as owing to the frost and fog the oak is always frost-bitten and the beech and hornbeam stunted even after drainage. Spruce was tried but failed, and it has now been proved by twenty years' experience that pines are more successful. The pine seed is grown in patches 1½ feet in diameter and 6 feet apart from centre to centre. In planting, two-year-olds are used and are planted out 3½ feet apart. In La Trappe there are now nearly 1,000 acres stocked with pine, the oldest trees not being more than 50 years of age. Thinnings are made once in seven or eight years.

The oldest pines in these forests not exceeding 50 years, the question of the most suitable rotation in their case is not a pressing one and need not be decided as yet.

A short description will now be given of the working-plans and compartments visited in each of the three forests.

I.—Bellême (6,002 acres).

Bellême from 1665 to 1782 was a crown forest treated under the Tir et Aire system. In that year a new plan was framed, the rotation was shortened from 150 to 99 years, and the forest divided into four working sections. In the first section the forest was to be worked as coppice with standards; the second section was first to undergo a rotation of coppice with standards and then converted into high forest; whilst the third and fourth sections were to be treated as high forest on the shortened rotation of 99 years. The working plan and all the papers concerning the forest were lost during the revolution, and it is not known what steps were taken to carry out the above scheme.

In 1822, the shelter-wood compartment system was introduced and has remained in force ever since. As this was, probably, the first introduction of this system into France, it was not quite a success at first, especially as regards the reproduction of oak. In the seeding fellings too many trees were left per acre 65 to 75, instead of from 50 to 60. In 1826-27, the results of the new system had been so good that its continuance was assured and the forest is now, as regards the size and age of the trees in its different compartments, probably the most regular in France.

The present working plan began in 1858. It was framed from detailed descriptions of compartments and a complete estimate of the exploitable material. The continuance of the shelter-wood compartment system was prescribed. A rotation of 200 years was adopted for the broad leaved species, as this was considered the age at which the oak attained its maximum mean annual increase and dimensions the most suitable for special purposes, realising high prices. As all the pines were young and fairly evenly scattered throughout the forest, there was no necessity to fix a separate rotation for them.

The rotation was divided into eight periods of 25 years each, the forest into four working sections, and each working section, into eight periodic blocks, *vide* photo of map. The working plans officer did not attempt to concentrate the periodic blocks, but this was effected in 1882 (*i. e.*, at the end of the first period, when, as usual, the plan came under revision) and the blocks were re-arranged so that each formed a compact area.

The fellings which were to take place in each working section yearly were—

1st.—A principal felling to be made in each block in succession, *i. e.*, the first periodic block to be regenerated in the first period, the second in the second period, and so on. The time between the seeding and final fellings were usually six to twelve years.

2nd.—During the first period, a thinning to be made throughout the seven periodic blocks not undergoing regeneration, the whole area being thinned over once in the period, a portion ($\frac{1}{25}$th) being done yearly.

3rd.—Cleanings to be made in the young woods for which the officer in charge would have to obtain special sanction as necessity arose.

The principal fellings were fixed by volume. The annual possibility was calculated by taking one-twenty-fifth of the volume estimated, adding to it the future estimated increase and then reducing this by one-tenth as a reserve. The volumes obtained were:—

		Cubic feet.
I.—Working Section	. . . . .	63,116
II.— Ditto	. . . . .	33,923
III.— Ditto	. . . . .	60,539
IV.— Ditto	. . . . .	43,807
	TOTAL .	201,485

When the plan was revised in 1882, it was found necessary to regularise the inequality in outturn which would otherwise result when passing from the second to the third period, the third periodic block containing much less material than the second. This was done by forming a reserve, as follows, of 700,000 cubic feet belonging to the second period, to be cut in the third.—

1st.—By neglecting to calculate in the possibility the increase in exploitable material during half the period, *viz.*, 300,000 cubic feet.

2nd.—By economising 400,000 in the total amount of the principal fellings.

The annual yield was thus fixed for—

		Cubic feet.
I.—Working Section	. . . . .	51,290
II.— Ditto	. . . . .	31,240
III.— Ditto	. . . . .	60,363
IV.— Ditto	. . . . .	17,438
	TOTAL .	160,331

or nearly 27 cubic feet per acre, a diminution of 20 per cent. on the first period.

The annual increment is 53 cubic feet per acre, and most of the balance is taken out in the Improvement Fellings. The best crop is 13,000 cubic feet per acre.

The improvement fellings were based on area and at first one-twenty-fifth of the area of each periodic block was thinned annually, or a total of 210 acres for the whole forest. In 1870, this was altered and 418 acres thinned yearly, so that the whole forest except the block under regeneration, would be thinned twice in a period.

At the revision in 1882 it was arranged, save in very exceptional cases, to carry out the thinnings by whole compartments. The advantages are that the coupes are better marked on the ground, that they abut on roads and a lot of unnecessary survey work is dispensed with.

When a wood is about 100 years old, after the oak have been well drawn up, a heavier thinning is made, to allow the crowns of the oak room to expand, and thus to favour increase in girth. It is then that the beech undergrowth springs up.

Cleanings are made frequently in the newly regenerated crops, all soft woods being pulled up and the beech cut down.

Gaps are planted up with oak after the final fellings, but, owing to the excellent natural reproduction, planting is only needed over two per cent. of the area.

The beech is everywhere kept subsidiary to the oak.

Compartments visited.

I E[1]. A seeding felling wasmade in 1890, and the area is already well stocked with seedlings, whilst almost everywhere a few young oak and beech are to be found.

I A[1]. A magnificent wood of oak and beech, the result of the old Tir et Aire system. The trees are very straight. They are on the average 130 feet high and 80 feet to the first branch. The estimated yield is over 13,000 cubic feet per acre. The seeding felling is to be made shortly when as many as possible of the old branched beech and old oaks past maturity will be removed.

I B[2]. A seeding felling was made 10 years ago and the resulting reproduction of oak and beech admits of a secondary felling which is now being made. The advanced growth of beech will have to be cut back.

I D[2]. Probably the first seeding felling in France, under the then new shelter-wood compartment system, was made here in 1832. The stock is, therefore, now between 60 and 70 years of age. The thinnings were not, to begin with, made boldly enough, the consequence being that the proportion of oak is feeble, and many of the oak that do exist are suffering from dominating beech.

The students marked a thinning in this area cutting out dominating beech over good oak, dominated beech where there were no oak, and bad oak everywhere.

II.—Reno-Valdien (3,926 acres).

Working Plan.

At one time Reno belonged to private owners and was much maltreated, whilst Valdien belonged to monks who only cut a few trees for their own use.

In 1782, an engineer drew up a working-plan for Reno, prescribing coppice with standards, but this had hardly time to be thoroughly carried out when the revolution occurred.

In 1826-27, owing to the great success of the shelter-wood compartment system in the forest of Bellême, it was definitely determined to introduce it into Reno-Valdien, and in 1850 two working sections were formed, one for Reno, the other for Valdien.

The present working-plan dating from 1875 continues this system. The rotation adopted was 180 years, divided into six periods of 30 years each. The forest, as before, was divided into two working sections, Reno and Valdien, and each working section into six periodic blocks.

The fellings prescribed were for each year—

(i) Principal fellings in the periodic block under regeneration, and for the first period abnormally in a compartment of the 4th periodic block, and in two compartments of the 6th periodic block.

(ii) Improvement fellings in each periodic block other than the one under regeneration.

(iii) Cleanings amongst young growth after the needful sanction has been obtained.

Principal fellings.—Their possibility was fixed at—

	Cubic feet.
I.—Working Section	56,339
II. Ditto	41,795
TOTAL	98,134

These figures were based on the actual volume of exploitable material, neglecting the annual increase intended to form a reserve. At the revision in the middle of the second period, the yearly increase being taken into account, the annual yield was fixed at—

	Cubic feet.
I.—Working Section	78,118
II. Ditto	58,139
TOTAL	136,257

or an increase of nearly 30 per cent.

The improvement fellings were based on area. These thinnings have to be made twice in a period, *i.e.*, one-fifteenth of the total area has to be thinned annually, but to avoid surveys they are always made by compartments.

Cleanings are begun from the earliest age and are very carefully made.

Compartments visited.

The compartments visited were mainly those under regeneration.

1B [1] was regenerated before the date of the present working plan (1875). Thinnings have already been made; all dominated beech near oaks have been kept to prevent the latter producing side branches and to cover the ground.

IH[1]. The final felling was made in 1872, and the new crop is progressing well.

1F[1]. A seeding felling was made in 1881, and a secondary felling over a portion of the area in 1887. There are seedlings of oak and larger ones of beech which were on the ground before the seeding felling was made. These latter will have, for the most part, to be cut back to encourage the oak. In another part of the compartment the final felling was being made. The tops and branches of the trees are first lopped off, then the oaks felled, whilst the beech are left standing until required for sabot making for which green wood is needed. They are, of course, all felled and worked out by the end of the purchaser's contract. There were 60 per cent. of beech before regeneration, which will be reduced to 40 per cent. to the advantage of the oak, to encourage which three cleanings have already been made.

IJ[1]. The portion not yet regenerated is a wood of beech and hornbeam with some large oak and a scattered undergrowth of beech, but no young oak. In the part where a seeding felling was made in 1890, about one-third of the material was removed, including a large number of beech and the bad oaks. All the beech advance growth was cut back with the result that young oaks have germinated almost everywhere.

In the second working section we first entered a part containing almost pure oak, mostly coppice shoots at least 70 years old. A seeding felling has been made and the subsequent reproduction of oak is excellent. Now is the time to make a secondary felling, and we were informed that this will be done next year.

We then passed through an area where a seeding felling had not as yet been made. The crop consisted of old coppice oaks and other oaks, with a fair proportion of old branched beeches and others of younger age down to small saplings. Finally we passed through a part where a secondary felling had been made and where a final felling was about to be marked. Considered it of greater urgency and importance to make the secondary felling in the first portion entered where a seeding felling had been made, in order to give the young oaks more light, than either the seeding or final felling in the other parts.

We also inspected the lower end of 11D[5] which is stocked with Scotch pine, aged about 40 years, with an undergrowth of a few young oaks and beech. The oaks are suffering from the cover of the pines and will soon be cut out. Thinnings in the pines are made four times in a period or about once in seven years.

Le-Perche, La-Trappe (7,962 acres)

Working Plan.

The area comprises the two forests of Le-Perche and La-Trappe separated from each other only by a public road.

(1) Le-Perche (4,942 acres).

Le-Perche is an old State Forest with a soil resembling that of Bellême but poorer.

Formerly there were two coppice sections and one high forest

section of about 1,500 acres. The latter had been managed successfully under the shelter-wood compartment system since 1848.

By the 1870 working-plan it was determined to convert the whole area into high forest. The rotation was fixed at 150 years, as the oak failed to reach its most useful dimensions sooner, and after that age its mean annual increment diminished. The rotation was divided into five periods of 30 years each, the forest into two working sections, and each section into five periodic blocks.

Owing to the extreme irregularity of the forest, some difficult combinations had to be made for the first period.

In I. Working Section.

1st—A principal felling by volume in the periodic block whose term it is to be regenerated with a similar felling in an abnormal compartment in periodic block No. 5.

2nd.—Improvement fellings in the periodic blocks other than the one under regeneration, but none during the first period in block 5.

3rd.—For the first period only, coppice with standards in block 5.

In II.—Working Section.

1st.—Principal fellings by volume in the periodic block under regeneration, with this reservation, that during the first period this felling will only apply to one compartment, whilst two compartments of block 5 will be regenerated abnormally.

2nd.—For the first period only, a final felling by area applicable only to three compartments of block 1.

3rd.—Improvement fellings in the periodic blocks other than those under regeneration, with some exceptions during the first period.

4th.—For the first period only a felling of coppice with standards in the 4th periodic block, and also in those compartments of the 5th periodic block which are not to be regenerated by volume.

5th.—Cleanings in young woods to be made after obtaining special sanction.

The principal fellings have been estimated from the actual volume of exploitable material, without including the future annual increase which is to constitute a reserve during the first period. The annual yield was fixed at—

	Cubic feet.
I.—Working section	105,900
II.— Ditto	60,928

There were also principal fellings to be made by area over 17 acres yearly during the first decennial of the first period. The revision made at the end of the first half of the first period increased the possibility by volume of the first working section by 50 per cent., due to the annual increment amounting to as much as 2·6 per cent. yearly having been disregarded in the original plan.

The improvement fellings are to pass twice over each compartment during the period, and will thus comprise about one-fifteenth of

the total area each year, *i. e.*, about 127 acres for the first working section and 89 acres for the second working section.

Fellings of coppice with standards.—The annual fellings are for—

I. Working section 27 acres in block 5.
II. „ 42 „ „

The coppice rotation has been raised from 15 to 30 years.

(2.) La-Trapp, (2,701 acres).

This forest formerly belonged to the Trappist monastery, and since 1665 the monks kept 420 acres under high forest, the remainder under coppice with standards with a fifteen years' rotation. It was seized by the French nation during the Revolution.

In 1846, the forest was falling into a very bad state, but, in spite of this, it continued to be treated as a coppice with standards on the short rotation of fifteen years. The only improvements attempted were cleanings of the soft woods and planting pines in the large blanks.

The present working plan dates from 1873. One working section was formed and the high forest system adopted. Owing to former bad treatment, and to the introduction of pines, the rotation was fixed at 120 years, with four periods of 30 years each, and four periodic blocks were formed. The plan prescribed no principal fellings, but provided for thinnings in blocks 1 and 2 over 91 acres yearly, and cutting back in blocks 3 and 4 over 88 acres yearly. Blanks were to be planted up, all stunted broad leaves cut back, and all good young oak carefully preserved. The prescriptions were vague and unsatisfactory, and the working plans officer failed to explain the difference between thinning and cutting back, so that, in reality, similar operations have been carried out in all four blocks.

A new working plan has, therefore, just been drawn up by M. Tregomain. He divides the forest into two working sections:—

I.—Four hundred and twenty acres on good soil, well-stocked, and comprising the old reserve.

II.—The remainder of the forest consisting of a poor coppice on bad soil on slopes facing south and west.

Section I will be treated as high forest, and improvement fellings made during the first period. M. Tregomain says that section II can neither form a broad-leaved high forest, nor a good coppice with standards, for most of the middle-sized trees die at the top or become like apple trees with a bole of 20 to 30 feet only. The only remedy is to convert it into a pine forest mixed with some broad-leaves. This can be done in from 15 to 20 years, during which the whole working section could be gone over by making fellings over equal areas. The broad-leaves would be coppiced, reserving only the most vigorous stems, as well as good clumps of oak and beech, but the others would all be boldly cut back. After the fellings, pine would be put down everywhere, except where the groups of well-to-do beech are found. Thus there would eventually be a pine forest mixed with a few broad-leaves scattered or in small groups.

In the coppice with standards under conversion, all good seedlings of hard woods more than 6 feet high are reserved.

Compartments visited.

I J^{5}. A coppice with standard felling is now being made. As this compartment will have to remain for 126 years before conversion, all the old reserves will be felled now in the coppicing operations.

I F^{5}. The last coppice felling before conversion has just been made. The oak standards are about 20 per acre, and all good young seedlings of oak, beech, etc., have been left uncoppiced. The young beech found here and there were sown before the area was last coppiced.

I E^{5}. A coppice felling was made two years ago. In frosty places it is customary to wait for a few years after coppicing before planting ash and beech, in order to get some shelter. Planting is generally done three years after coppicing, and a cleaning made three years after planting.

II J^{5}. This compartment was sown up artificially with oak and beech, and it is treated as high forest. It is very densely stocked, but the oaks are very few, thinnings not having been made with sufficient frequency in the past.

Forest of La Teste (6,047 acres).

General description.

The forest of La Teste is a long and narrow area stretching along the Gulf of Arcachon and the Bay of Biscay and bordered on the east by extensive private forests. It is situated in the region of the Landes, a region comprising over three-fourths of the department of the Landes and half that of Gironde. This region is in reality an old bed of the ocean, and was formerly full of marshes and lagoons and very unhealthy. Its sterility was, in a great measure, due to impermeable beds of alios formed of sand cemented together by deposits of iron. Since the law of 1857 providing for the drainage of the Landes and the planting of maritime pines, the climate has much improved, and the greater part of the area is now one immense pine forest.

The latitude is 45°, and, owing to the proximity of the sea, the climate is an equable one. The rainfall is 32 inches and the mean temperature 56° F. During winter the mean temperature is 50° inside and 46° outside the forest. The prevailing winds blow from the west and north-west.

The forest of La Teste is almost pure maritime pine (Pinus Pinaster) and a rare oak or two here and there, Querens pedunculata, Ilex and the Tauzin. The undergrowth is *nil* or consists of some broom, gorse, arborescent heath, and rarely some scattered arbutus. The pines grow on the fine yellow sand of the dunes, beneath which one or more beds of 'alios' occur at variable distances from the surface. The littoral dune forming the western border of the forest is from 100 to 200 feet high, and by its means, and a protective belt of 1,582 acres, the workable portion of La Teste is effectively protected from invasion by the sand.

The protective staff consists of one brigadier, three forest guards, and two cantonniers, the latter having the special care of the littoral dune.

Fire protection.—There are fire-lines 33 feet broad running from east to west parallel to each other, and about half a mile apart. Half of them form compartment lines, and the remainder are intermediate lines dividing each compartment into two portions. There is also a large central fire-line 50 feet broad running longitudinally through the forest and cutting all the other lines at right angles. The fire-lines are cleared of needles, grass, etc., once in three years.

Last year, in July, 1,200 acres were burnt, all the trees large and small being killed. This fire crossed several fire-lines and was eventually stopped by counter-firing. The fire originated in a private forest, and a law compelling private owners and railways to make suitable fire-lines and take suitable protective measures against fire similar to those in force in "Les Maures et L'Estorelle" is now under consideration. M. Grandjean, Inspecteur des Forêts, wishes to make the fire-lines three times their present breadth, and judging from Indian experience he is right. It would probably be best to suppress all the intermediate traces and broaden those which form the compartment boundaries, making them 120 to 150 feet broad and planting along their borders belts of evergreen trees and shrubs, such, for example, as the Ilex and cork oaks or even Quercus Robur or pedunculata, arbutus which is indigenous and Euonymus sp., which grows well at Arcachon. Along portions of the railway lines, regular fire-belts of broad-leaved trees, chiefly oaks, were noticed, but in most places these belts had not been properly maintained.

The Working Plan of the total area only 4,465 acres are worked under a regular plan, the remainder (1,582 acres) forms a protective zone paralled to the sea and checks the encroachment of the dunes. The pines in this protective belt are dwarfed and contorted; they are neither worked for resin nor timber, but preserved solely for protective purposes.

The rotation for the 4,465 acres is 60 years, and the area is divided into twelve compartments averaging 370 acres each, *vide* photo of map, one of which is regenerated at a time. The regeneration takes five years, and the compartment to be regenerated when 55 years of age is sold by auction. The purchaser is allowed to tap all the pines to death in the manner he chooses, but all the trees must be felled and cleared out of the compartment by the end of five years. For regeneration it is only necessary, as a rule, to leave the compartment which has been clean felled alone, and it soon fills up with seedlings self-sown from the neighbouring compartments. If any blanks do remain, they can be sown up, but this course has very rarely to be resorted to. The seedlings which may have sprung up under the old trees before these are felled are useless and have all to be cut back, strong saplings being produced only from seedlings which have sprung up in the open.

Thinnings begin when the stock is five years old, if the saplings are crowded, as this pine requires more light than almost any other species. These first thinnings are unprofitable, for the produce is unsaleable and has to be left on the ground. They are repeated every five years, and in a compartment 20 years old the trees are left about 10 feet apart, whilst the final felling leaves from 80 to 100 trees per acre. In private forests the thinnings are repeated every four years.

The rotation is considered too short to admit of the trees attaining their most profitable dimensions, and it will probably be increased to 75 years with a division of the forest into fifteen compartments.

Tapping for resin.—This is permitted between the 1st of March and the 15th of October, but the workmen are allowed, as a preparatory measure, to smooth the bark of the trees to be tapped from the 10th February. The best way is to remove the red bark down to a thin (reddish) skin for a breadth of four inches and a height of two feet or a little wider than the chip is to be and as high as it is to be worked in the season, thus keeping the pots clean. The right to tap is sold for five years. In the compartment under regeneration, the purchaser can tap all the trees to death; in the compartments which are being thinned he can tap to death all the trees marked for removal, and he can also tap alive (gemmer á vie) all the reserved trees which measure $3\frac{1}{2}$ feet in girth and over. The following restrictions are imposed in the case of pines to be tapped alive. There must be only one cut or groove which must begin just above the base of the tree, the collecting pot resting on the ground. Its width must not exceed $3\frac{1}{2}$ inches below and $3\frac{1}{10}$ inches above, and the cut can be refreshed once a week, but its maximum depth must not exceed $\frac{2}{5}$ inch. The length of the cut must not exceed—

	Feet.	Inches.
1st year	1	9
2nd „	2	6
3rd „	2	6
4th „	2	6
5th „	3	3
TOTAL	12	6

These trees can be lopped up to a height of 15 feet.

The baked clay pot used for receiving the resin resembles a flower pot and is about four inches in diameter and four inches deep. It is moved up yearly and fixed at the base of the new cut resting between a single strong nail at its base and a curved piece of zinc about $1\frac{1}{4}$ inches broad driven into the tree above and slightly projecting over the top of the pot. They generally take from two to four weeks to fill. The crude resin being heavier than water, after wet weather the rain water remains on the top and can be poured off. The resin is emptied out of the pots and carried to reservoirs in the forest. These reservoirs are made of half-casks placed in the ground and roofed over with a movable wooden cover. Thence the resin is taken in casks to the factory by cart. The carts have specially broad wheels adapted for travelling over sand.

Yield.—One groove yields on the average two and a half quarts of resin per annum, and one workman can attend to 5,000 grooves, so that he collects in a year about 60 casks of crude resin each containing 50 gallons of which he receives a proportion for payment according to the market value, generally one-half the outturn.

All the small trees are converted into mine props chiefly for export to England.

The estimated cutturn per acre of the fellings last sold was—

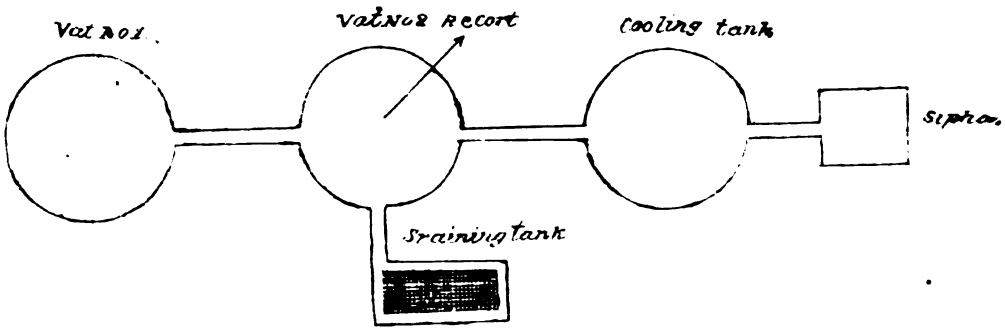
	Age.	Trees tapped		Timber.	Fuel.	Resin.
	Years.	Alive.	To death.	Cubic feet.	Cubic feet.	Gallons.
Final felling . . .	56—60	...	94	1,925	1,090	490
Final thinning . .	51—55	63	11	148	172	210

Export will be much facilitated by an electric tramway which a company intend constructing from Arcachon to the dunes for visitors, and which can be utilised for forest purposes.

Resin Factory at La Teste.

The owner, M. Leeca, very kindly showed us all over his factory, and explained in detail the method of extracting turpentine and colophany.

The crude resin is received from the adjoining forests in casks containing 52 gallons each (*vide* description of tapping in the account of the forest of La Teste). These casks are worth about 30 francs each. The crude resin is more liquid, of a lighter color, and of a greater value in the spring, than later on in the season. It gradually deteriorates until October, when work in the forest ceases. The resin is emptied out of the barrels into a large vat where it is heated, and passes into a second vat through a grating, which stops all impurities, bark, chips, etc. From vat No. 2 the turpentine is distilled through a retort at a temperature slightly over 185° F. Steam is passed through the retort to assist the distillation, and by its use fully 30 per cent. more turpentine is obtained. It passes into a cooling apparatus, a tank full of cold water, where it condenses; hence mixed with water it is drawn off into a smaller tank. The turpentine floats on the top of the water and is removed by an overflow pipe, the water being taken away from underneath by a siphon.



The turpentine is then stored in large metal tanks, from which it is drawn off as required into old Spanish wine casks.

The liquid colophany is removed from vat No. 2 after the distillation of the turpentine by the withdrawal from the base of the vat of a wooden plug stamped with clay. It is run into a straining tank, passing, whilst still liquid, over an extremely fine copper-wire sieve. A sample of the pure colophany is then taken by pouring a small quantity into a tin mould, and the rest is ladled out into buckets and carried to an open courtyard where it is poured into open shallow metal pans about two inches deep and of slightly smaller diameter than the casks in which the colophany is eventually packed. The cakes are exposed to the sun until sufficiently bleached, and they are then packed into casks one above the other uniting into a single mass.

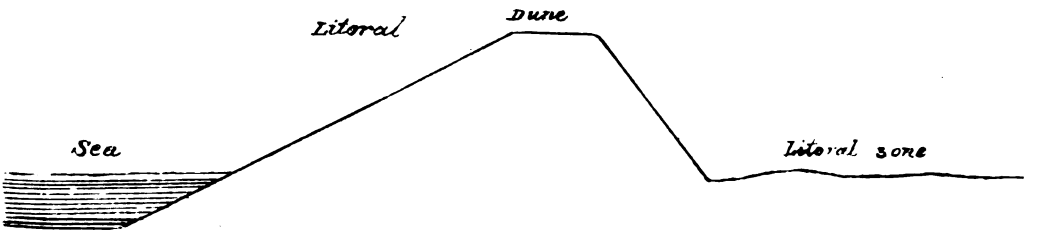
The greatest possible attention is paid to uniformity of color in each cask, the sample shown to the purchaser being the worst color in the cask. The tints vary from very pale yellow to dark amber, according to the season of the year during which the resin has been collected, and to the mode of preparation. The lightest in color are the most valuable, the dark amber being worth only one-third of the palest variety. Besides lightness of color, great stress is laid on purity as shown by the transparency of the samples.

The quantity of water at La Teste being limited, in order to supply the factory, the water after use passes through a series of shallow open tanks in the courtyard. By this means it is cooled and then passes into a well from which it is pumped up by a small steam engine to an elevated reservoir, and can thus be used over and over again. The engine also supplies steam to the retort.

The Littoral Dune.

The littoral dune we visited lay immediately south of Arcachon and protects the forest of La Teste; such dunes border the French coast for 140 miles in the departments of Gironde and the Landes.

The littoral dune consists of an artificially-formed high ridge of sand parallel to the sea. When properly formed and fixed, it resembles an immense railway embankment, flat at the top with a gentle slope towards the sea and a steeper one on the land side. It is high enough to check sand being blown over it from the sea.



Palisade.—The littoral dune has been formed artificially by planting a wooden palisade parallel to the sea-shore and at 300 to 650 feet from high-water mark.

The planks used were of pine 5 feet 3 inches long, 1 inch thick, and from 6 to 8 inches broad. About five were placed per yard with a space between each of $\frac{1}{5}$ths to one inch, in order to allow the sand to pass between. In planting them, a trench 1 foot 4 inches deep was dug and the planks were driven in 8 inches deeper, being for this purpose bevelled at their lower ends. After filling up the ditch, the planks remained 3 feet 3 inches above the level of the ground. The sand stopped by the palisade gradually rises, forming a gentle slope towards the sea, whilst that which filters through the planks form the steeper slope on the land side.

When the palisade is topped by the sand, the sand about the planks is excavated for 8 inches to 10 inches, and they are then raised. To raise them the simplest plan is to surround each plank with a chain through which a strong pole is passed which two men raise with their shoulders; or a lever is used, the lever being a pole, one end of which rests on the next plank and then one man suffices. The planks are raised 3½ feet, allowed to be again covered with sand, and then again raised time after time until the required height for the dune has been attained.

Often behind the palisade a line of stakes 8 feet high is planted in the sand to a depth of 1 foot 8 inches and 1 foot 8 inches apart. Flexible branches are twisted in and out forming a wattle fence 3½ feet high, which is raised from time to time as the sand deepens. When the sand is entirely covered a fresh row is put down.

Height of the littoral dune.—The height is not absolutely uniform. At certain places it reaches 65 feet, but from experience M. Grandjeau considers that it should not exceed 32 feet. The higher the dune, the larger must be its base in order to maintain the same gentle slope, and the greater will be its cost. The action of the wind on its summit will also be much more violent. The only advantage in increasing the height would be the greater protection afforded to the littoral zone, the width protected against the wind being about twenty times the height of the dune. However, all things considered, 32 feet has been found the most suitable.

Slope of the littoral dune.—The minimum slope is about 12°, but a slope of between 26° and 27° is what should be usually aimed at. The dune of Lijons has, on the average, a height of 50 feet, with a base of 200 feet or a slope of 25°, but in some places this is much less. The top has a width of 11½ feet.

A simple line of stakes is often used at the foot of the dune on its sea-side to enlarge its base, and it is likewise used to repair breaches made by the sea, but in this instance there is usually a double or trible row of stakes. It is also employed to fill in hollows when the stakes are placed according to the shape of the hollow.

Marrum Grass.—This is known to botanists as *Arundo arenaria; Calamagrostis, Psammh* and *Ammophila arenaria* being synonyms.

Its stems increase in height as the sand rises, and numerous roots are given out at its joints. This grass is indispensable in fixing the dunes. M. Grandjeau, Inspecteur des Forêts, Bordeaux, has successfully introduced the plan of using it from the very beginning of work on a dune, thus effecting a great economy. He plants up the sand in lines, planting thickly in depressions, thinly on ridges, and in this way obtain-

ing an even slope and a flat top. The chief danger, whilst the littoral dune is being raised, is the formation of ridges and hollows. Their formation is only prevented by constant attention on the part of the cantonnier in charge, who thins out the grass on ridges and fills up depressions with it or plants it at suitable seasons where it is required. Cuttings are preferred to seed. The marrum only flourishes near the sea where it receives constantly fresh supplies of sand Autumn is the most favourable time for planting, and sowings succeed best between 1st October and 15th December.

A portion of the forest bordering on the Gulf of Arcachon was sold by Napoleon III when he needed money for the Mexican War. The littoral dune has since been neglected by the private owners; the sands have begun again to advance and are now doing so at the rate of 15 feet per annum. We saw many pines buried in the sand almost up to the tops of their crowns. Government will probably have to interfere eventually.

The Littoral Zone.—The real forest does not begin immediately at the base of the littoral dune. Here we find a belt from 600 to 2,000 feet broad, known as the littoral zone, in which either the pine does not grow at all or is so stunted as to be useless for any but protective purposes. Under cover of the littoral dune, pine sowings are made in the littoral zone from east to west gradually approaching the dune. These sowings are covered with pine branches, etc., to protect the seedlings. Sowings of marrum are also made.

Suggestions as to the application of the operations studied to India.

I.—The Shelter-Wood compartment system.

This is the system under which the magnificent beech forest of Lyons in Normandy and the fine beech and oak forests of Le Haut Perche just described are managed.

Previous to taking furlough, I held charge of the Dehra Dun Division, North-Western Provinces. A large part of the division is covered with Sâl forest. The forest has been constantly burnt and maltreated in the past, so that the majority of the old trees are unsound and are incapable of improvement; in places there is capital, healthy advance growth of Sâl.

For over 70,000 acres of the Sâl area, or nearly three times the area of the Lyons Forest, there is a working-plan for a period of 15 years from 1887 to 1902. Seven working sections were formed and in each improvement fellings were to take place, all decaying, misshapen trees being removed where this would not reduce the cover too greatly, and would not expose the advance growth too much to frost, which is a great danger along the low-lying belt of land at the foot of the Siwaliks. These improvement fellings were to run through the whole of the working section once in the 15 years, and each section was divided into 15 compartments, one of which was to be worked yearly, climbers being cut previous to timber-felling. After export had been

finished in a compartment, all the broken-down or badly-grown Sâl poles were to be coppiced back. Since the successful establishment of fire-protection, an enormous number of Sâl seedlings have sprung up, and already over large areas, where the forest is sufficiently open, and where frost is not too severe, there is a splendid advance growth of Sâl. In fact, Sâl seeds frequently and profusely and the seeds germinate and maintain themselves well, so that wherever fires are kept out and frost is not too severe the reproduction of this species is far easier than either that of oak or beech. The Dehra Dun plan is essentially of a preliminary nature and is, in reality, nothing more than a plan of operations spread over 15 years, its main object being to get rid of the bad crop of Sâl trees now encumbering the ground. When, therefore, a new plan comes to be framed, some more permanent prescriptions will be needed, a rotation will have to be fixed, and the system under which the forest is to be treated will have to be decided upon.

The Dun forests supply the adjacent portions of the Gangetic plain with timber, Dehra and Rurki with firewood, and also the small requirements in timber and fuel of the villages in the Dun itself. Large quantities of firewood can be supplied from the forests other than sâl, and from private forests which can also yield a great number of Sâl poles. Thus, by far and away, the most important demand the Government Sâl forest has to meet is that for timber and timber of large dimensions. It must, therefore, be treated as high forest. The great extent of the forest, the doubtful success of planting Sâl, the scarcity of labour, and the great cost which would have to be incurred renders the artificial regeneration of the forest, as a whole, out of the question. Natural reproduction must, therefore, be chiefly relied on, and on this we can depend with the greatest confidence when we notice the great facility this species has of reproducing itself when protected from fire, frost, and excessive grazing. We have now to choose from the three systems given by Dr. Schlich in his Manual of Forestry—

(1) Regeneration under a shelter-wood by compartments.
(2) „ „ „ groups.
(3) „ „ „ single trees.

The first system is the one we have seen carried out in practice in the French Forests just described. The second is a modification of the first, and is a great improvement on it where regeneration is slow, difficult, or patchy. Its main point of difference from the first is that it takes advantage of all promising advance growth existing on the ground at the time regeneration is needed, and does away with the necessity of always making anticipatory seeding fellings, *i.e.*, fellings made with the object of encouraging germination, perhaps even before a good seed year. This is of special importance in India, where a heavy thinning of the forest would at once lead to a rank growth of high grass and other weeds impeding reproduction and increasing the danger from fire. In any system to be adopted in India, it is, therefore, of the utmost importance, *ceteris paribus*, to maintain as complete a canopy as possible of the old trees until the advance growth can take its place.

The plan adopted in Lyons-la-Forêt, Le Haut Perche, and indeed generally throughout France, of calculating the annual yield of the

principal produce from regeneration fellings by volume is defective. It obliges us to fell a certain volume yearly irrespective of the actual condition of the crop. It is also difficult in practise, the estimation of the volume being a long and tedious process and after all only very approximate. This would be still more difficult in the case of such irregular forests as our Indian ones, where the age of the trees, the proportionate number of the different species, and the other factors of calculation are so variable. The best course, therefore, in India, would be not to rigorously fix the annual yield of the principal fellings, but to secure an area check sufficiently elastic not to interfere with any regeneration fellings necessitated by the condition of the crop, whilst at the same time being ample to prevent the annual yield being exceeded for any length of time. The improvement fellings could be fixed by area as usual.

The third system is the one known in India as the "selection system" and it is that under which the Dun Forests are at present being treated by the so-called improvement fellings. Its great disadvantage is that regeneration is going on all over the forest here and there in patches at the same time, the forest always remaining irregular and the young seedlings having to come up and make their way under unfavourable surroundings. This is specially the case with young Sâl which is light-demanding regeneration, being in progress more or less everywhere, protection from grazing is more difficult, as are the cultural operations necessary in the advance growth. Neither are the forests of the Dun comprised in the seven working sections forests of protection, the rugged areas above the Hatiwala line having been excluded. Thus, the only advantage claimed for the system is its simplicity and its being, for that reason, the only system of high forest that the Indian Forest Department with its present staff is capable of carrying out. I for one fail to undertand how it is so much simpler than the compartment system, which decidedly renders the control of grazing and supervision generally so much easier. Nevertheless, granting that it were so, surely in the Dun with its comparatively small ranges (averaging 45,000 acres) and small beats (averaging 5,000 acres) and with the Forest School always at hand both to help and to criticise, we should be able to adopt the more improved system. If we cannot do so in the Dun now, when will it be possible generally in India, and of what use becomes much of the training imparted both at Cooper's Hill and at Debra itself?

For the Dun Sâl forests at present being worked under improvement fellings, I would, therefore, when a new plan comes to be prepared, adopt a system of regeneration under a shelter-wood, combining as many as possible of the advantages, both of the shelter-wood group and shelter-wood compartment systems.

Of the working sections in the Dun that of Thano is the smallest, and it is in a satisfactory state, except that much of the young growth demands more light. I would strongly advise its conversion into a regular forest being undertaken at once, both for its own improvement from a sylvicultural point of view and also to furnish useful data for the general plan when this has to be prepared in 1902. By this means the working plans officer will be able to determine more easily the

length of the regeneration periods and the general details of the working of the proposed system, and thus apply it with confidence to the other working sections.

A short outline will now be given of the plan it is proposed to adopt for the conversion of the Thano working section into a regular forest, premising that not having by me either descriptions of the forest or statistics of any kind and writing entirely from memory, my proposals and figures rest, subject to considerable amendments, when the locality is properly examined.

With a portion of the Malkot forest about 4,000 acres of Sál forest could probably be included in the Thano working section. Improvement fellings under the present plan have already been made over about one-half the area. This half is, for a great part, stocked with splendid advance growth resembling in fact, in parts a forest treated on the group system, in parts a forest on the shelter-wood compartment system where seeding fellings or secondary fellings have been made, or again a forest worked under the selection system. I would adopt, for conversion only, a rotation of 80 years, and presume an eventual division of the forest into four periodic blocks of 1,000 acres each, *vide* map. This is on the assumption, which the measurements in sample plots now being made may modify, that the proper rotation is 120 years. Owing, however, to the unsoundness of the present stock, it is important to get rid of this as quickly as possible, and as all healthy young trees capable of living for 80 years, will be left in the regeneration fellings, at the end of 80 years the stock in the first periodic block will consist of trees aged from 70 to 120 years, and should be ready for regeneration again when the longer rotation of 120 years could be introduced.

The block for immediate conversion should be selected from the area over which improvement fellings have been already made, and should comprise as large an acreage as possible of complete advance growth and poles capable of doing well throughout a whole rotation. The block need not necessarily be a compact one, although it would be preferable, but may consist of two or more separate portions. In this way the loss of material in conversion might be lessened and the greatest possible advantage taken of the existing young crop. This block (No. I) will have to be completely regenerated in 20 years. In the conversion all promising advance growth, all poles, as well as very promising young trees fit to last until the end of the rotation, will be reserved and form part of the new crop. It will be advisable to fix a maximum girth above which all trees will be felled and below which all trees of a promising future will be reserved. The block will doubtless comprise five of the compartments (200 acres each) formed under the present working-plan, and should be divided into fifteen sub-compartments, each compartment having three sub-compartments *a*, *b*, and *c* of about 65 acres each, *vide* map. Regeneration fellings will be made in these successively one sub-compartment a year, the first area selected being that which is the best stocked with advance growth and poles. In places where the young growth is sufficiently advanced to be out of danger from frost, a final felling will be made, all trees above a certain girth, and all misshapen, unsound trees of any size being cut out; in

other places where the young growth is not so advanced, but still in need of more light, a secondary felling will be made, or again it may be necessary in a few instances to make a seeding felling where the old trees are so numerous as to interfere with successful reproduction. In the latter case besides thinning the older trees, all low shrubs would be cut out and low branches lopped. Remembering the present condition of the crop, it is anticipated that final fellings will be the rule, and seeding fellings the exception.

The condition of those portions of sub-compartments in which secondary and seeding fellings have been made will be carefully watched, and final or secondary fellings prescribed in the annual plan of operations as soon as they are needed.

All seeding fellings should be completed within the first half of the period. Supposing, therefore, that sub-compartments b^3, c^3, a^4, c^5, and b^6 are the last to be taken in hand, anticipatory seeding fellings should be made in them during the last five years of the first decennary.

The state of the block at the end of fifteen years will probably, somewhat resemble that shown by the accompanying plan, where it is supposed that final fellings still remain to be made over the following seeding and secondary fellings—

Sub-compartment.	Seeding fellings.	Secondary fellings.
	Acres.	Acres.
c^1	...	22
c^2	...	20
a^3	...	26
b^3	29	12
c^3	24	25
a^4	20	22
b^4	20	20
a^5	12	30
c^4	...	21
	105	198
TOTAL	303	

Thus final fellings will be required over 303 acres and secondary fellings may be needed over 105 acres. These fellings can be divided amongst the five remaining years of the period by the annual plans of operations. If the total acreage of forest under seeding and secondary fellings is likely to be much less than 300 acres, the final fellings of the last five sub-compartments can be spread over ten instead of five years, so as to equalise the annual yield.

In the other periodic blocks, improvement fellings will be continued up to the year 1902, as prescribed in the existing working plan. After 1902, the nature of the fellings will be provided for in the new plan, which will then have to be prepared for the whole of the Dun Forests. Improvement fellings will doubtless be continued at longer or shorter intervals than at present, until the 20 years allowed for the regeneration of the first periodic block has expired.

It will thus be seen that the regeneration fellings recommended will,

in no way, interfere with the provisions of the present plan, but be simply supplementary to them. After revision by a careful study of the forest, I should be glad to see these recommendations carried out as speedily as possible for the sake of the forest, the future working-plans officer and the Dehra Forest School.

II.—The Management of Pine Forests.

The only forests in the North-Western Provinces that resemble the maritime pine (Pinus pinaster) forests of the Landes are the Himalayan ones of Chir pine (Pinus longifolia). I have had considerable experience of the latter, having framed a working plan for those in the Jaunsar Division. It is understood that large and valuable forests of this species in the adjoining native state of Tiri-Garhwal have been or are about to be leased by the British Government. If ordered to do so, I would gladly undertake the preparation of a working plan for them.

A portion of the Jaunsar Forests are now being tapped for resin according to the French system, and as the market for turpentine and colophany gets opened up, the tapping can doubtless be extended to the Tiri-Garhwal forests as well.

The Chir pine is light-demanding, but not so greatly so as the maritime pine. The demand from the Jaunsar and Tiri-Garhwal Forests is mainly for sawn timber, whereas in the Landes one of the main products is that of mine props for England. In the Chir forests, therefore, we must grow large trees and fix on a long rotation probably of 100 to 120 years. Perhaps we cannot do better than follow the lines indicated in the working plan for the Jaunsar Chir forests, dividing the forest into compartments and working one per annum cutting out in one felling all the marketable trees in one operation, leaving the unsaleable badly-grown trees as seed-bearers to be eventually felled when the area is well-stocked with young pine. Thinnings would begin where the young stocked is crowded at the age of ten years, and they would be repeated every tenth year. Tapping for resin would be carried out as far as practicable on the French system.

In the extraction of turpentine and colophany from the crude resin, more attention might be paid in India to the season when the resin is collected, that of different seasons being kept separate, and bleaching should be more thoroughly done, greater care being taken to have each lot of uniform color.

As regards fire-protection, there would seem to be nothing to learn from the Landes, the subject being apparently better understood in India than in Europe.

III.—Planting.

In the notes on compartment VI A^1 of the Lyons forest it was mentioned that the plants used to fill up the large blanks were put out at distances varying from $1\frac{3}{4}$ to 5 feet according to their size. This is much closer than we have been accustomed to plant in the North-Western Provinces where the distance has been usually 6 feet or more. The results of close planting in VI A^1 and indeed generally in France, have been most successful, and in future planting operations we must un-

doubtedly plant closer than hitherto, if we wish to establish overhead cover in a few years, an essential point in successful planting.

It is useful to note that in Le Haut Perche for nursery manure a preparation is made, consisting of $\frac{9}{10}$ths grass, herbs, dead leaves, etc., and $\frac{1}{10}$th lime placed in alternate layers and allowed to thoroughly decompose.

In introducing pine at LePerche-la-Trapp-e, pine seed is sown in patches 1½ feet in diameter and six feet apart from centre to centre. In planting two-year-olds are used and are planted out 3½ feet apart.

I think the forest plough mentioned in the description of the Lyons forest might be successfully utilised in India for plantation purposes, and it should effect a considerable economy in the cost of hoeing. It would be quite worthwhile to purchase one in France and try it in India.

PLYMOUTH; *22nd September 1894.*

N. HEARLE, *Deputy Conservator of Forests.*

MAPS AND PHOTOGRAPHS ATTACHED TO REPORT.

1. Sketch map of Lyons-la-Forêt, showing working sections.
2. Sketch map of working section No. II. Lyons-la-Forêt showing blocks and compartments.
3. Photograph showing stock of young beech after final fellings.
4. Photograph of seeding felling, Lyons-la-forêt.
5. Photograph of map of Bellême Forest.
6. Photograph of map of La Teste.
7. * Map of Thano working section showing blocks.
8. * Map of Thano working section showing compartments, Block I.
9. * Map of Block I, Thano, showing state at end of the fifteenth year of conversion.

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* These maps do not represent the boundaries of any forest actually existing, but are only for the purpose of explaining the suggestions made.

G. I. C. P. O.—1275 R. & A.—10-5-95.—500—J. S.

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FRUIT CULTURE IN THE NORTH-WEST HIMALAYA.

[*DICTIONARY OF ECONOMIC PRODUCTS, Vol. III., F. 706.*]

Compiled from various sources by MR. A. SMYTHIES, B.A., *Officiating Conservator of Forests, Assam.*

Other DICTIONARY articles that may be consulted:

Nuts, *Vol. V., Part II,* N. 178.

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The objects of THE AGRICULTURAL LEDGER are:—

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(3) To admit of the circulation, in convenient form, of information on any subject connected with agriculture or economic products to officials or other persons interested therein;

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E. C. BUCK,

Secretary to the Government of India.

(Special Forest Series, No. 1.)

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INTRODUCTION.

Object of fruit culture.

This pamphlet has been compiled from notes and information derived from various sources and supplied chiefly by Sir Edward Buck and the Inspector-General of Forests. In it an attempt has been made to gather together such information as was available concerning the present condition of fruit culture in the Himalayas of the Punjab and the North-Western Provinces, and to ascertain whether such culture can be extended, and if so, with what object and by what means. It may be stated at the outset that the principal object in view is not so much to produce high class European dessert fruit for the few who can afford to pay for it, as to extend the cultivation of such fruit as can bear exportation to the large hill stations and to the plains below, and thus to increase the production of an important article of food supply; and although several kinds of fruit are mentioned and their cultivation briefly described in the following pages, it will probably be found that the two most important fruits for our purpose are the apple and the Spanish chestnut.

Principal localities.

The principal localities in the North-West Himalaya in which fruit has been grown successfully, and in which persistent efforts have for several years past been made to introduce good kinds, suited to the climate and the soil, and to spread their cultivation, are as follows:—

I.—KUMAON.
II.—BRITISH GARHWAL.
III.—MUSSOORIE AND DEHRA DUN.
IV.—JAUNSAR.
V.—THE SIMLA DISTRICT INCLUDING KOTGARH.
VI.—BASHAHR AND KUNAWAR.
VII.—KULU.

We now proceed to consider the fruit culture in each of these districts in the order given, and although the information is by no means complete, we trust that, such as it is, it will be found useful and may serve to draw attention to the great variety of good fruit that has been successfully produced in these portions of India.

FRUIT. | Fruit Culture in the

KUMAON.

I.—KUMAON.

Chaubattia nursery.

The question of introducing fruit culture into Kumaon attracted the attention of Government as long ago as 1869-70, when an orchard and nursery were established at Chaubattia, near Ranikhet, and placed under the control of the Forest Department, the original idea having been to keep up the supply of trees and of fuel for the Cantonments. In 1870, the Lieutenant-Governor recorded his opinion "on the desirability of forming plantations and orchards in Ranikhet and the vicinity . . . . and generally promoting arboriculture in the adjoining hills," and after some correspondence on the matter, the services of the late Mr. Craw were engaged, and under his experienced and practical guidance, Chaubattia became one of the first fruit gardens in India.

It was soon discovered that English fruit trees succeeded well, and eventually it was laid down that—

"the chief object in view in the up-keep of this garden was the free distribution of the finer varieties of such fruit trees as would thrive in the climate and soil of the outer ranges of the Himalayas; to show practically the best methods of culture for the various species; and to prove what could be done in the outturn of excellent fruit under proper treatment."

Distribution of plants.

With this object in view, by the end of 1873-74, the following fruit trees had been distributed gratuitously :—

Apples of various kinds	254
Apricots	108
Cherries	113
Pears	269
Plums	57
TOTAL	801

Since that date the progress of the gardens and the number of trees distributed have been recorded in successive annual reports of the Forest Department, until at the end of 1890-91, the number of fruit trees sent out from Chaubattia had amounted to nearly 120,000, while forest trees, comprising walnut, pine, horsechestnut, deodar, Australian gums, ash, cypress, willow, etc., had been given away to the number of 250,000. The fruit trees comprised apples, apricots, pears, peaches, nectarines, plums, cherry, gooseberry, quince, Spanish chestnut, and miscellaneous.

Establishment of orchards.

During this period of twenty years fruit gardens have been established at other places in Kumaon besides Chaubattia, mainly through the instrumentality of Sir H. Ramsay, Commissioner of Kumaon, and Sir E. Buck, when Director of the Agricultural Department, North-Western Provinces. Nurseries were founded at Motesar between Almora and Naini Tal, and in the report of the Agricultural Department for 1877-78, Sir E. Buck wrote that proposals were made to Government to establish orchards, and land was selected for that purpose, and the suitability of Kumaon, owing to its climate and natural conditions, to yield certain products which could not be produced elsewhere, was mentioned.

The reasons which had led to the falling off in the cultivation of tea were discussed, and the possibility of growing tobacco and other products was considered. Sir E. Buck further said :—

Kumaon orchards.

"The most promising product is fruit. Large quantities of fruit, chiefly apples and dried stone-fruits, are brought annually from Kabul to India, and there seems no reason why Kumaon should not supersede that country as the orchard for the plains. The experiments which have been made by the Commissioner of Kumaon (Sir H. Ramsay) and at the Government nurseries founded by Sir William Muir at Rani-

khet, as well as by one or two of the planters, prove that apples and apricots can be raised with the very greatest success in the Himalayas. Large quantities of young trees have already been distributed by the nurseries, but private enterprise is deterred from making any rapid steps by the length of the period which intervenes between the outlay of capital in the plantation of orchards and the returns realised from them. The consequence is that apples are still selling for 6*d.* a piece in Naini Tal, although the far lower price offered in native bazars in the plains for inferior Kabul fruit is sufficient to guarantee substantial profits. These are the reasons which have induced the Commissioner of Kumaon and myself to give an impetus to fruit-growing, by the establishment of large orchards, which may, if found desirable, after the lapse of some years be eventually placed in private hands. The object in view in this case is not merely to bring money to Kumaon, but also to add to the food supply of the population of the plains, who depend almost entirely on vegetable productions for sustenance. Chestnuts (which provide the greater portion of food in the Pyrenees) are also not unlikely to succeed in the Himalayas; although experimental cultivation has not been so successful as in the case of apple and some of the stone-fruits. But as chestnuts possess extreme importance in their adaptability for exportation, every possible measure will be taken to increase their cultivation on the chance of their proving a success."

KUMAON.

Spanish Chestnuts.

Again in 1880, Sir E. Buck wrote as follows in his report on the Department of Agriculture and Commerce for that year:—

"The object of Kumaon orchards, in providing a fruit supply for export to the plains, as well as in affording a means of distributing fruit trees in larger numbers than the existing forest nursery at Ranikhet can supply them to the population of the hills, was explained in last year's report.

The orchards are to be restricted to fruits which are capable of export to the plains, mainly apples and chestnuts. At the commencement of the present year a supply of apple seed was obtained from England and 15,000 to 20,000 seedlings successfully reared. Arrangements were conducted under the personal orders of the Commissioner of Kumaon, who has had the boundary of the land determined, a portion of the forest cleared, necessary buildings erected, and a passable road constructed to the site of the orchard. Five hundred grafted apple trees have been put aside at Ranikhet for plantation and from them the seedlings now in the ground will be eventually grafted. It having been satisfactorily ascertained that chestnuts of good kinds cannot be so successfully raised from seeds as from grafted trees, arrangements have been made to import in Government troopships a certain quantity of chestnut grafts from the Mediterranean and from Cyprus, and meanwhile a large number of seedlings have (not without some difficulty) been raised, which in due time will be grafted from the imported trees.

Apples t 20,000 plants.

I must repeat here what I stated in my last year's report, that the reason why a movement on the part of Government in the direction of orchard planting is desirable, is that private enterprise is deterred from making any rapid steps towards the extension of fruit production by the length of the period which intervenes between the outlay of capital on the plantation of orchards and the realisation of returns from the sale of fruit. For a similar reason it is impossible for Government to obtain any practical results from the present undertaking for some few years to come, and my report must in the meantime be confined to the barren record of the number of trees sown, planted out, or grafted during each successive year."

By 1881, after several failures in importing chestnut seeds from Europe, 1,000 young chestnuts had been established with a great number of other fruit trees, and in the following year, after about 1,300 trees had been distributed to neighbouring villagers the stock in the garden consisted of—

Stock in 1882.

Apple grafts	5,620
Grafted pears	266
Chestnut trees	434
Apple seedlings	10,000 of which more than half were ready for grafting the next spring.

FRUIT. | **Fruit Culture in the**

KUMAON.

It is unnecessary to enter into further details of what was done each year, and it will suffice to note here that in 1886 the gardens were distributing over 5,000 trees a year, and that the distribution has been continued on a similar scale ever since. Thus it would appear that those two gardens, Chaubattia and Motesar, have been distributing fruit trees of which by far the larger proportion remained in Kumaon at the rate of 11,000 a year for several years past.

As to the result among the villagers of Kumaon, opinions are fairly unanimous that the extension of fruit culture is not commensurate with the efforts of Government to disseminate trees.

Result of plant distribution.

Mr. Eardley-Wilmot writes as follows:—

"It would doubtless be too much to affirm that the generosity of Government in the supply of the best kinds of fruit trees has not had any effect in the North-West Himalaya, but it is probably certain that it has not done so much good as was anticipated and desired. The reason of this no doubt is the apathy of the natives of the country; their inherent and almost invincible dislike to any institution unknown to their progenitors; the initial expenditure necessary in the creation of an orchard, the constant care required in attending to it, and the delay of some years which must occur before the original outlay can be recouped. The result of this combination of objections is that only a very few natives of the poorer classes have undertaken the culture of fruit trees, and that only on such a limited scale as not to affect the export of fruit from these hills; but, on the other hand, the planting of fruit trees has been much extended both by Europeans and by native gentlemen who would not be affected by the considerations noted above. We may thus come to the conclusion that the efforts of Government to introduce a new and profitable industry have not been quite successful as regards the classes it was primarily intended to benefit; but that great success has attended the efforts to disseminate throughout the North-West Himalaya large stocks of the best fruit trees; and that, should he desire it, the most lethargic of the hill peasantry is now in a position to stock his orchard at a merely nominal expense with young fruit trees of various species and of the best quality, which would evidently have been utterly impossible save for the foresight and energy of a generous administration."

The late Mr. D'Arcy wrote:—

"The number of trees distributed, I should tell you, is no measure whatever of the success of the Chaubattia gardens. A certain number of the fruit trees (most of the 'forest' trees were used departmentally, I believe, and could just as well have been grown in the ordinary forest nurseries), were distributed to distant places, Burma, etc., and have no doubt been useful; but the object sought in keeping up the gardens, has been the encouragement of fruit growing by the Kumaon villagers, and most of the trees distributed were given to these villagers free with this object. This has, I am told, been an entire failure. They took the trees but never tended them and though a few may survive, anything of the nature of village orchards or village fruit culture is not to be seen. Such fruit as is grown in Kumaon is cultivated by European planters."

And Mr. F. W. Seers of Ramgarh says:—

"A number of the better class of zamindars have also gone in for 500 to 1,000 fruit trees of sorts, but mostly apple trees. The successful cultivation of European fruits among the natives of Kumaon is, however, very imperfectly understood; apparently no means have been taken to educate the native cultivators into the proper methods of culture."

Fruit suitable.

We now come to the consideration of the kind of fruit that is most worthy of cultivation in Kumaon, and a general account of the localities where they thrive best, and to make this clear it will be necessary to quote various writers on the subject at some length.

Mr. Eardley-Wilmot writes as follows:—

"The principal varieties of fruit which will repay culture in the North-West Himalaya are the apple, the pear, the peach, the apricot, the plum, the sweet chestnut, and to a lesser extent cherries, raspberries, and nuts of kinds. Of these it appears to be the general opinion that the apple must take the precedence not only on account of its adaptability to the climate, but also on account of its faculty of

bearing transportation and keeping better than any other fruit. These qualities are, of course, of vital importance when it is remembered that the consumption of fruit in the immediate neighbourhood is and must always be extremely limited. The apple seems to thrive in the Kumaon hills as well as it does in England. It grows well at any altitude between 3,000 and 8,000 feet, but is at its best between 5,000 and 7,000 feet; at altitudes below 5,000 feet good keeping apples cannot be reared and above 7,000 feet the danger from hail and frost inordinately increases, but between these elevations the most delicate of dessert fruits can be produced. The great danger to apple cultivation, and indeed to all fruit cultivation in these hills, is doubtless one over which the cultivator has no control. He may lose the whole of his crop from hail; or if not totally destroyed, the fruit may lose much of its market value by the damage done to its appearance and keeping qualities. Hence the necessity, not always recognized in the past, of locating the orchards in such places as are not particularly exposed to storms and selecting spots which although they may possess other disadvantages are at least as far as possible protected from climatic influences.

KUMAON.

Apples.

The age of bearing with the apple as with other fruit trees, varies enormously and is practically different for each variety. It may here be stated once for all that all fruit trees can be thrown into early bearing by judicious root pruning. Speaking very generally all kinds of fruit with good cultivation do well from 5 years of age, although some varieties of apple, as the Kerry pippin, will fruit at 2 years old, and others, such as the Blenhiem orange not till 8 to 10 years of age. The profuse fruiting of immature trees is detrimental to the quality of the fruit and to the progress of the tree.

Age of bearing.

The yield of the apple is so much dependent on soil, cultivation and variety that it is almost impossible to give a correct idea of the quantity of outturn. In favourable circumstances a tree 15 to 20 years old may, and often does, yield 10 maunds of fruit, but such results cannot often be expected. From 1½ to 3 maunds of fruit from trees averaging 16 years of age may be reckoned as a fair crop; and a fair price including coolie carriage for 20—25 miles would be R10 per maund, if the whole crop of the orchard were purchased. For picked varieties a much higher price would be obtained, the retail selling price at the same distance for selected fruit would be about R30 per maund.

The cultivation of the pear is somewhat more difficult than that of the apple; the altitude suitable for its growth is similar; but the more delicate varieties require sheltered positions. The tree is a shy but fairly regular bearer. The age of bearing is later than that of the apple, the tree as a rule does not come into bearing before it is 10 years old, often later, and though the yield may in exceptional cases rise to 8 or 10 maunds per tree, it rarely exceeds from 2 to 2½ maunds. The fruit sells readily at even higher rates than the apple, but does not bear transportation so well, and must be gathered before it is ripe.

Pears

The English varieties of the peach thrive well in Kumaon and the tree comes into bearing early under similar conditions as those noted for the apple. Trees of two or three years old are often seen full of fruit and are unfortunately often left unrelieved of an excess crop, so that small inferior fruit is obtained instead of large well-flavoured specimens.

Peaches.

The peach comes to the greatest perfection when ripened before the rains set in, fruit ripened after the rains have commenced is watery and of a poor flavour. With good cultivation and at a suitable elevation peaches equal in every way to the Californian peach can be grown in Kumaon; to obtain the best results, therefore, the question of altitude and its effects in various localities must be carefully considered.

The cultivation of the peach merits further extension; the retail price at about 30 miles from the gardens reaches as much as R1 per seer and there is no doubt that if this fruit could be transported in good condition to the large stations all over India, fancy prices could be obtained which would prove most remunerative to the cultivator."

(The peach, however, according to the experience of others will not bear carriage to any distance, even when carefully packed.)

"The apricot thrives well and bears abundantly between the altitudes first mentioned, but is at its best between 4,000 and 5,500 feet, because, as noted for the peach, it then ripens its fruit before the wet season has influenced its flavour. The tree grows rapidly and bears profusely. With good cultivation it will come into bearing at 4 to 5 years of age, and at 10 to 15 years old the average crop will be about 4 to 5 maunds of fruit per tree. If the object of the cultivator be Jam-making, the culture of the apricot will repay him more than any other kind

Apricots.

FRUIT.	Fruit Culture in the

KUMAON.

of fruit. The Jam sells rapidly at about 8 annas per lb, whilst good dessert fruit retailed after 30 miles of coolie carriage will fetch about 12 annas per seer.

Plums.

The plum is, so far as can be ascertained, the most unsatisfactory of all fruit trees in Kumaon. In the first place, this species only bears in alternate years, and, moreover, it is a slow grower and a shy bearer. It is thought the rainfall in the outer ranges of the Himalaya influences the tree injuriously, and though excellent fruit is sometimes obtainable, until better results are forthcoming extensive planting of this tree is not recommended.

Chestnut.

The sweet chestnut was first introduced into the Chaubattia gardens by Mr. W. Craw and with such satisfactory results that the extension of the cultivation of this tree in the hills was officially recommended to Government by the writer of these notes. The trees in the Chaubattia garden are both seedlings and worked trees, *i.e.*, choice imported varieties budded on to local seedlings. They are now from 8 to 10 years old, are in fair bearing, and likely to prove a profitable introduction to the hills. The sweet chestnut requires a good soil and needs little attention, though it is probable that a good application of manure when bearing a heavy crop would much improve the yield. No quotations can be made as to the outturn and the commercial value of the nut at present.

Other fruits.

The cultivation of cherries, raspberries, and other similar fruits to be commercially successful must depend chiefly on the local demand, as these fruits do not bear transportation. At present this demand is not extensive enough to justify any extensive planting, and although the fruit might be preserved and would probably fetch fair prices not much has yet been attempted in this way. Nuts of all kinds flourish fairly well in the Kumaon hills; filberts require a cold damp soil to arrive at perfection, but little has been done to extend this cultivation and filberts are not locally in the market, although the imported nut commands high prices.

The result of observations tends to prove that with some outlay of capital and with good scientific cultivation fruit culture in the North-West Himalaya may readily be made a commercial success; and that without this good fruit cannot be produced and the undertaking must be a financial failure."

Mr. F. W. Seers of Ramgarh mentions Ramgarh, Julna, Binsar, and Hawalbagh as the principal fruit gardens and says:—

Apple.

"I have no hesitation in placing the apple far ahead of any other fruit, at any rate for sale and commercial purposes. By far the best and most select collection of apples in Kumaon are those of Binsar belonging to Sir H. Ramsay. It is well known Sir Henry has spent nearly half a century in forming his collection, systematically weeding out all unsuitable kinds. It is a matter for extreme regret that more attention was not paid to varieties in the first place when Government originally started the Kumaon orchard idea; in every garden I am acquainted with, the lamentable fact is strikingly obvious that half the trees are composed of unsuitable varieties, by which I mean varieties that are known to split in the rains and others, although very fine, are much too soft for the severe climatic conditions of India especially as regards despatch to the plains. The one indispensable thing for successful and profitable culture of apples in Kumaon is a select, well-graded list of good, sound, solid, fruiting varieties. There are some very noticeable traits about apples in this part compared with Europe; that superb apple the Ribston pippin is rapidly becoming extinct in England, mainly through the disease known commonly as Canker, and yet here in Kumaon the trees as a whole are wonderfully healthy and flourishing and give splendid and most highly coloured fruits. Apples in general are more highly coloured than in England, and remarkably fine specimens are easily obtainable from a good garden. Apples in Kumaon are subject to very little disease. The greatest evil is perhaps the lichen that grows on the bark; this, however, is easily destroyed with kerosine oil. Pears are generally grown in Kumaon, but from a commercial point of view they are not of much value, being notoriously bad travellers and liable to instant rotting when quite ripe. The larger main cropping varieties are very much affected by continuous rain; not less than twenty-five maunds split in two and rotted here this season after five days' continuous rain. Although a delicious fruit, I am disposed to place the pear rather low down as a useful fruit.

Apricots.

APRICOTS.—This is undoubtedly the most prolific and widely spread fruit in Kumaon. It bears marvellous crops which can be seen almost everywhere and apparently never suffers from disease. All the known varieties and some fine seedlings are in this garden and many other places, and it seems to be equally at home from 1,000 up to 8,000 feet.

KUMAON.

PEACHES and NECTARINES are also common; there is an indigenous or wild variety evidently of Cashmere origin very common in all parts of Kumaon bearing moderate-sized insipid fruit which is passable when cooked. Many of the European varieties are practically useless owing to fruiting in the monsoons. The most valuable varieties are those that fruit in May and June. When well cultivated the peach in Kumaon gives extremely well-coloured large and delicious fruits and has the merit of standing any amount of heat and comparative cold. **Peaches.**

CHERRIES.—These are very limited in Kumaon, but do remarkably well and fetch good prices. The largest and finest trees are in this garden: so far as I know, this fruit is not cultivated by zemindars. **Cherries.**

PLUMS.—The English varieties are extremely little known or cultivated, but there are four varieties of the Cashmere plums which are plentiful. They are, however, very acid even when quite ripe and somewhat astringent too. The English plums do very well and it is remarkable that such an excellent fruit is not generally known and more extensively cultivated. Quinces do marvellously well in Kumaon and produce wonderfully fine specimens of fruit, fairly common but not plentiful. The demand for this fruit is of a very limited character. It is more useful perhaps as a stock for grafting pears on to. **Plums.**

WALNUTS are very common all over Kumaon, and in great variety; many being so extremely hard as to be useless for table use. The sweet chestnut does very well at the higher elevations and independently of its excellent fruit is a handsome tree for avenues, etc. **Walnuts.**

LEMONS and ORANGES are also common beyond Almora, notably so in the Gungooly District. Many of the lemons produced in this neighbourhood are simply monstrous, and the oranges are deliciously sweet and good, unlike the Florida orange. The hill variety does not seem to develop acidity at all. Another characteristic is that it parts very readily from the rind and the quarters almost fall to pieces. The soil has undoubtedly something to do with the great success of the orange and lemon in the district noted above. **Lemons.**

APPLES are grown at varying elevations from 4,000 to 8,000 feet. The fruits of the highest elevations are in every way far superior to that at the lowest. The danger and damage to fruit at 8,000 feet from hail and wind is unfortunately very great and frequently the entire crop is destroyed by a bad hailstorm in May."

The following notes by various tea planters in Kumaon will also be read with interest. Mr. W. H. Jones of Bhim Tal Estate says:—

"Generally speaking nearly all European fruits thrive here. Those I know to have failed are gooseberries, currants, and pippins; the reason for this is the altitude.

Apples, quinces, apricots, plums, peaches, figs, and oranges all do well here at 4,560 feet. From experience I have learnt that all soils and situations will not do for fruit, whereas within the same altitude similar soils can be found in different aspects and situations where fruits will succeed in one and not in another. Apples, for instance, will not do where moisture is drained away during the spring.

A few years ago Government was so liberal with grafts from their nurseries that villagers could obtain whatever they asked for, but very few villagers can boast of fruit from their own apple trees. The fault was want of judgment in planting. A northerly aspect is almost a necessity at anything below 6,000 feet elevation; where suitable soil has been selected, irrigation is not necessary after grafts have once established themselves in the soil. **North aspect.**

Peaches here are always afflicted with the blight called 'coiled leaves' though it is never seen in wild peaches. All fruit trees in the hills are crowded with lichen in some places more than others; where excessive, it affects the growth of the trees. To my thinking this is attributable to the contiguity of the forest which has lichens on the smallest bushes. **Blight.**

Remedies can of course be applied, but I mention this for more learned heads to find a cause—whether European fruits can be said to have a congenial climate in the Himalayas. A pest that destroys the apple crop some seasons is the small greenish beetle. I have known it to account for 75 per cent. of the crop in 1889; but I have not observed it since. **Pest.**

Hail does great destruction to the Kumaon fruit crop, in some situations more than others. Certain ranges attract thunderclouds and I have known them to take one course invariably, so in selecting the site for an orchard this should be one of the chief considerations. Though Kumaon cannot be said to possess a fair proportion of orchards in comparison to its extent, fruit has now become very cheap owing to want of facilities for reaching the markets, due to the high Railway **Hail.**

FRUIT.	Fruit Culture in the

KUMAON.

charges, the crop cannot be said to be a profitable one in a good season, even without having recourse to preserving and drying; and as yet this industry has not been developed—whether the culture of fruit is lucrative enough to induce a larger extension sufficient to enable a paying industry to be ever established in the Hills remains to be seen."

Mr. N. E. Troup of the Kowsanie Tea Company at Almora writes :—

"I believe both the Forest nursery at Chaubattia whilst under the late Mr. Craw's management, and the Government nursery at Motesar during the late Mr. Mc-Master's superintendence of it, distributed a good number of grafted fruit trees (apples and pears of kinds principally, and apricots and cherry), but I should think these were mostly taken by the European residents in the stations and district and but a small proportion comparatively by the natives, though I believe in and about the vicinity of Almora some few of the better-to-do native residents have planted out considerable sized orchards, and others a few trees each, but in the villages in the district of my knowledge *very little* has been done in this line, the only noticeable exceptions known to me being Ajeem Chinaman in Bararao and Badri (or Sham Lal) Sah (I am not sure of the name) at Bageswar, but so far as my observations have gone, few or none of the natives, or for the matter of that Europeans too, have done much more than plant the trees out, being ignorant of the proper treatment of them afterwards.

Dangers to Fruit crops.

Some *very good* fruit is procurable in Kumaon, *but* I fear it can never be worked *commercially*, the crop being such a perishable one and liable to be injuriously affected by so many causes, frost, drought, too much rain, hail, etc., etc., and available markets for it being so far off. Apples are *the only* fruit that may be said to be capable of bearing transport, *when very carefully* packed, and even then a large percentage of them go bad—if sent any distance, and now that, I believe, New Zealand has taken to sending apples to India in ice, fruit will be a bigger drug than ever. The depredations of birds, animals, and insects too are very considerable. Wood peckers, jays, crows, bears, jackals, and worst of all hornets."

Mr. J. G. Bellairs of the Borenag Tea Company remarks that the natives on his side do not attempt fruit growing of any sort.

Mr. P. C. Gibson of the Kuttyoor Estate is of opinion that—

"As far as a commercial enterprise goes, fruit culture in this valley (Kuttyoor) will never pay, owing to the distance from any central market the difficulties of transit and scarcity of labor at the time it chiefly ripens (July and August). Apples are the only fruit which it is possible to land in *fair* condition at the nearest railway station, and they even do not turn out satisfactory as a rule."

Pests.

Mr. J. A. S. Richards of the Lohba Estate, Ranikhet, remarks on the difficulty experienced in protecting the ripe fruit from the depredations of birds and various other animals, and thinks that the zemindars have no spare ground on which to grow fruit, and that even if they had orchards, the fruit would all be plundered by the villagers while it was still unripe.

II.—BRITISH GARHWAL.

The following is the substance of a note kindly communicated by Mr. W. R. Partridge, Deputy Commissioner, Pauri :—

Fruit growing in this district is nowhere practised as an industry or means of livelihood. Hundreds of villages possess fruit trees, but the fruit is consumed locally and not sold. The commonest fruit tree seen, is the small hill peach, and there cannot be far short of 30,000 such trees scattered about in villages at altitudes varying from 3,000—6,000 feet. The next most common fruit tree is probably the small hill apricot, and then comes the walnut.

Peach and Apricot.

Apple and Pear.

The number of apple trees and pear trees is not large. A fair number have been distributed from the Government nurseries during the last 10 or 12 years, but they have not been properly looked after and the greater number have died. Occasionally, however, young trees are met with growing well. No special method of cultivation is followed; the young

GARHWAL.

tree is planted in a corner or on the edge of a field near the village and there it is left to take its chance. It receives no pruning or irrigation.

Prospects of fruit culture.

The great difficulty in the way of growing fruit in this district to a profit is the expense of carriage. In the case of perishable fruit it could not be landed in Ranikhet or Naini Tal, or placed on the railway in good condition. And there is no local sale.

Transport.

In the case of fruit like apples and pears which will bear transport better than peaches and apricots, the expense of carriage would reduce the profits of the grower to a very small figure. For instance, from Pauri to Naini Tal is ten marches. One maund of fruit would cost ₹7 or 8 for carriage alone, and it is estimated that not more than ₹12 or ₹14 would be given by a Naini Tal shopkeeper for a maund of apples or pears landed in good condition.

Thus, as long as Naini Tal is considered as the market for fruit from Garhwal, there would not appear to be much scope for a large extension of fruit growing in this district, but it is possible that with improved communication with the railway at Najibabad, apples and pears could be landed in Bareilly and other places at a fair profit. There is also the cantonment of Lansdowne which would probably absorb a portion of the yield.

Oranges.

With regard to oranges, Mr. Patridge notes that particularly good ones are grown in several villages, and are exported as far as Dehra and Mussoorie, where they are known as Srinagar oranges, though they are not produced in Srinagar itself. In the Government nursery at Pauri there are 20 to 25 different kinds of oranges and lemons, obtained from various horticultural gardens in the plains, and if they succeed young plants will be distributed to villages where the climate is similar to that of Pauri. There is apparently room for extended orange culture in Garhwal, as the fruit is certainly excellent.

III.—MUSSOORIE AND DEHRA DUN.

Packing.

Very little fruit is produced in Mussoorie for sale, and apples are imported from Kumaon chiefly from Rustomji's garden at Binsar, about 25 maunds being sold by Messrs. Fitch & Co. (who have kindly supplied a few notes on the subject) during the season. Each apple is separately packed in paper and in moss, and about 15 per cent. arrive in a damaged condition. They are sold at ₹1 per seer.

Profits of apple-culture.

Excellent apples are, however, grown in Mussoorie by Messrs. Mackinnon & Co., near the old Brewery, and though many of the trees have not yet come into full bearing, there can be no question of the profitable nature of the undertaking. The produce of one tree was sold some time ago for ₹100, and ₹700 has been offered for the entire crop.

The old Botanical gardens were at the proper altitude for fruit with a north-westerly aspect, and there is room for extension of fruit cultivation in this locality. The new Botanical gardens are quite unsuited to fruit growing as the altitude is too low, the aspect too sunny and the ground too stony. There are probably several other sites beyond Mussoorie suitable for fruit growing, but we soon get into native territory and the scope for profitable extension in this direction is somewhat limited.

Unsuitability of Dehra-Dun.

Dehra Dun is not, strictly speaking, within the Himalayas and as the altitude above the sea is only 2,300 feet, it cannot be expected that the kind of fruit we are here considering can be grown in that valley with any profit.

Chestnut.

Chestnuts, however, do well and there are numerous trees at Kowlaghur and Chandbagh, which were introduced by Dr. Jameson many years ago. Regarding the Spanish chestnut at Dehra Dun, the following

MUSSOORIE.

Chestnut.

information has been kindly supplied by Mr. Leslie Rogers, Superintendent of the Raja of Nahan's Kowlaghur and Awnfield Tea Estates:—

SOWING SEED.—The seeds must be sown fresh immediately after they are gathered about the beginning of October. I find they grow better in shallow, well drained boxes than when put out in open beds. These boxes or beds must be covered with wire netting or if that is not handy a thin layer of straw will do fairly well. This is to prevent the seed being dug up by squirrels, rats, porcupines, etc. They will germinate in the spring and be six to nine inches high at the beginning of the rains.

PLANTING OUT.—They may be planted out at the beginning of the rains on well drained soil. They cannot stand being waterlogged in any way. In fact it is better to heap up a little earth round their roots at first. Some manure may be put in with them but is not necessary. Little or no pruning is wanted. All weeds must be removed from around them and an occasional watering should be given in the hot weather months. For the first two or three years they must be protected from frost like young mangoe trees, during the winter months.

Frost.

YIELD.—The young trees begin to yield in the fourth or fifth year and go on steadily increasing till they are 25 or 30 years old. After that the quantity remains stationary or perhaps even declines. But the older the tree the larger and better the nuts. The average yield of a 15-year old tree is about 30 or 40 seers per annum. The yield is annual and the nuts begin to ripen about the end of August and are all over by the end of September. In this country the nuts only keep fresh for 8 or 10 days; after that they become mildewed and soft and are unfit to eat. While the fruit is on the tree it must be constantly protected from parrots and squirrels. I don't think anything else touches it.

Pests.

SELLING PRICE.—From 6 annas to 10 annas per seer. Sold principally to Europeans in Dehra Dun and Mussoorie. The average native does not appreciate the chestnut, and I don't think it would ever be an article of food supply to the people of the country. I have planted out about 200 trees which ought to be a profitable speculation when the Railway comes through the Dun.

Not a favourite.

IV.—JAUNSAR-BAWAR.

Jaunsar-Bawar is a pergunnah of the Dehra Dun District; it is situated between the Tons river on the west and the Jumna on the east, and extends from Kalsi at the foot of the hills for some 50 or 60 miles in a northerly direction. Chakrata is the only station in Jaunsar, and it is connected with the railway at Saharanpur about 77 miles away by an excellent cartroad. Mussoorie is distant some 35 miles.

The following note by Mr. E. MoA. Moir, Deputy Conservator of Forests, Jaunsar Division, shows what has been done at Chakrata and Deoban in the way of fruit culture:—

Fruit-culture in Chakrata and Deoban.

APPROXIMATE DATE OF INTRODUCTION AND KINDS PLANTED.—"Throughout the Jaunsar Pergunnah apricots, walnuts and peaches seem to have been cultivated from time immemorial.

Apricot. Apple. Pears.

As regards the introduction of apples, pears, plums, quinces, etc., they were first planted at Chakrata when the Cantonment was started in 1869-70, before which none of those species apparently existed in Jaunsar.

A few pomegranates of inferior quality are to be found near villages which were probably introduced many years ago.

The Forest Garden at Chakrata was commenced in 1880, and the first fruit trees, obtained from the old Mussoorie Botanical gardens, were laid down in that year; and

JAUNSAR.

up to the present fruit trees have been obtained and planted and also a number of young trees distributed as follows :—

Distribution of

One hundred and seventy grafted Spanish chestnuts were obtained in April 1880 from Saharanpur of which 50 were distributed to inhabitants of Chakrata and the rest (or at least all that remained alive which appears to have been only 10) were planted at the Forest Garden. Of those 8 are alive and are now doing well. All those planted in Cantonments died.

Peach. Apricot. Apple. Pear. Plum. Nectarine. Cherry.

In 1882—85, 374 peach, apricot, apple, pear, plum, nectarine and cherry were obtained from Mussoorie and Ranikhet and planted at the Forest Garden. The principal kinds planted were as follows :—

Peaches	. . .	American and Cabul.
Apricots	. . .	Cashmere, Brussels, Frogmore, etc.
Apples	. . .	King's Pippin, Ribston, Cashmere, etc.
Pears	. . .	Flemish beauty, Jargonelle, etc.
Plum	. . .	Orleans, Magnum Bonum, etc.
Nectarine	. . .	Claremount, Murray, etc.
Cherry	. . .	Florence, Honey heart, etc.

In 1888, 250 trees of various kinds were again obtained from Ranikhet and planted out, and most of them have succeeded well.

Besides the above, a considerable number of apples, pears, apricots, plums, etc., have been obtained from time to time between 1870 and 1880 from Saharunpur and Ranikhet by the residents of Chakrata and planted out in various compounds. Most of these now bear a fair quantity of fruit, but none appear to be of very good quality. This is mainly due to want of care in the matter of manuring, pruning, etc.

In 1881-82, Mr. Hearle obtained 50 apples, pears, plums and cherries from Ranikhet and planted them at Deotnat Forest Garden, below Deoban, situated at an altitude of 8,000 feet.

These trees have succeeded very well and in 1892 produced a fine crop of fruit which was of superior quality to that produced at the Forest Garden, Chakrata. This is probably due to more suitable altitude and also to better soil.

Altitude, soil, etc.

ALTITUDE, SOIL AND ASPECT.—The altitude of the Forest Garden at Chakrata is about 6,000 feet and this is considered a better elevation for peaches and cherries than Chakrata which is on an average 7,000 feet.

Pears do not seem to do well either at the Forest Garden or at Chakrata, as the altitudes are probably too low and the fruit is attacked by wasps, hornets, etc., before it gets ripe. Pears appear to do better at the higher altitude of Deothat.

The apples in the Forest Garden at Chakrata ripen apparently too quickly and are rather woolly, but this may be due to the species cultivated, and possibly to the soil and altitude.

Walnut.

As regards walnuts they are found throughout the district at elevations varying from 3,000 to 7,500 feet, the best (such as those of Bangar, Konain, and Kastur) being grown at 6,500 feet.

Cherries do very well at the Deothat Garden below Deoban, the variety cultivated being White Hearts.

Regarding soil, the best soils are of course most suitable for fruit trees. That of the Forest Garden, which consists of hard red clay is evidently bad, and if the trees had not been liberally manured annually they would probably have all died out ere this or at least borne little or no fruit.

As regards the soil most suitable for walnuts the best trees are found in well manured fields near villages.

Apples and pears do best on a northerly or north-easterly aspect, whereas for peaches a southern aspect appears to be most suitable as the fruit ripens before the rains set in, a most important fact.

Manner of cultivation.

MANNER OF CULTIVATION.—The trees should be planted in good pits not less than 3′ × 3′ × 3′ and filled with manure, pounded charcoal, etc., and in fact the more care taken in the preparation of the pits, the greater will be the chances of success. All tough grass, etc., should be removed from round about the trees, the circle being enlarged in proportion as the tree attains larger dimensions.

As the small roots probably go much deeper into the soil in this country than they do in orchards at home, no harm seems to be done by light digging round about the roots, and in fact if the trees were not periodically hoed they would soon cease to produce fruit.

The digging should be done during November and December, and a fork is of course preferable to a hoe for this work.

FRUIT.	Fruit Culture in the

CHAKRATA.

Pruning and irrigation.

PRUNING AND IRRIGATION. THINNING OUT OF FRUITS.—The pruning of all fruit trees should be done during November or December, otherwise the trees run to wood and produce little fruit. Malis are very careless in this operation and unless looked after, they either overprune or leave too much of the new wood.

If possible, irrigation should be arranged for during the hot weather especially when the fruit is ripening and there are no showers. At the Forest Garden, Chakrata, there is not sufficient water for irrigation.* Great success may be obtained in the matter of securing a good crop when the fruit is ripening by the plan of irrigating occasionally with liquid manure which can be prepared for the purpose. Another most important matter to attend to is the thinning out of the fruit early in the season. This ensures a reasonable crop of large fruit instead of a large quantity of inferior quality, half of which falls off from weakness of the tree. This operation the Malis particularly object to carry out, and unless one attends to it personally it is not likely to be done satisfactorily.

Manuring.

MANURING.—The proper manuring of fruit trees is one of the most important points to be attended to and this should be done in November or December. The quantity of manure depends on the size of the tree, but the more manure applied the better will be the result.

The manure may be either dug into the soil all round the trees or a shallow trench 6 inches deep may be dug situated about three feet from the tree and the manure filled in and then covered over with earth. Decomposed manure is apparently better than fresh manure for use in this country.

More well decomposed manure may be applied with advantage when the fruit is ripening.

Result.

MEASURE OF SUCCESS. DISPOSAL OF FRUIT.—The result of fruit cultivation at the Forest Garden and elsewhere at Chakrata may be considered fairly successful, but doubtless better results might have been obtained had the matter received more careful attention. One great drawback is the impossibility of obtaining fairly intelligent and careful malis (gardeners) at reasonable rates of pay. Men have been tried from Agra, Ranikhet and elsewhere, at the Forest Garden, but as they do not like the climate, and the pay, ₹12 to 15, is probably too low, none of these men have remained beyond a few months.

On the whole, however, the fruit trees planted at Chakrata Forest Garden have done well. About 300 fruit trees have been distributed from the Garden and 1,000 more seedlings have been now raised for distribution from seed obtained from Edinburgh. A number of these will be grafted.

Owing to the incapacity of the malis, not much has been done at the Forest Garden in the way of grafting up to the present, but about 50 apples, pears and quinces have been successfully grafted during the last few years.

Most of the fruit grown at the Forest Garden meets with a ready sale to the soldiers and residents of Chakrata, and much larger quantities of good fruit could easily be disposed of if available. There is, however, a marked objection to the payment of even reasonable prices for good fruit, and people seem to think that good English fruit can be produced and ought to be sold at about one-fourth of what it would cost in England, whereas the price charged is only about one-half at present.

Fruit-culture in villages.

RESULTS OF DISTRIBUTION TO VILLAGERS.—From time to time a limited number of fruit trees have been distributed gratis to the headmen of Khats, but it is not till this year (1892) that they have shown any particular interest in the propagation of fruit trees.

This season about 100 apples and pears have been applied for and distributed to those who are likely to take care of the trees and treat them properly.

Now that the villagers see the advantage of growing fruit it is expected that in future there will be a considerable demand.

Hail.

CAUSES OF INJURY TO TREES, ETC.—The injury done by hail is sometimes very serious and the whole crop may be spoiled by heavy hailstorms, either during March and April when the fruit is forming, but especially later on when the fruit is larger and more subject to be knocked off. An attempt was made to cover up the trees with screens made of bamboo, but this was found to prevent some of the fruits from ripening rapidly before the rains set in, and the plan was abandoned on account of expense, etc. As hailstorms which actually do damage, only occur apparently once in 3 or 4 years, it has been decided to let the fruit take its chance.

* This could be easily remedied by a better system of pipes.—*A. S.*

North-West Himalaya. (*A. Smythies.*) | **FRUIT.**

CHAKRATA.

No damage is done by snow at Chakrata, and in fact the more snow that falls the better appears to be the crop. The trees being bare of leaves at that season and pruned, the branches are not liable to be broken. At the higher elevation of Deothat, however, an exceptionally heavy fall of snow such as occurred in 1893 does a good deal of damage. **Snow.**

Insects cause much damage, especially wasps, hornets and beetles. The first two are especially fond of pears at the Forest Garden, and even though the plan of covering them up with double gauze bags has been tried they invariably make holes and destroy the fruit before it gets ripe. This happens principally during July. **Insects.**

Apples are not liable to attack so much as pears and peaches.

At Deothat where the pears ripen much later (August) they are not apparently liable to attack.

Certain species of fungi are observed to attack peaches and nectarines at the Forest Garden, but no very serious damage has been done. **Fungi.**

Wind does a good deal of harm in exposed places by knocking off the fruit, but the damage is much less than is done under this head in England. **Wind.**

In out-of-the-way places, such as Deothat, bears and monkeys do much harm. **Bears & monkeys.**

MARKET FOR FRUITS.—All apples, peaches, apricots, etc., grown in Jaunsar are consumed locally and there is no export trade at present. Walnuts are, however, taken by the villagers as far as Saharanpur and Dehra Dun for sale. **Market.**

The prices obtained for the Forest Garden fruit at Chakrata are as follows :— **Prices.**

	R	*a.*	*p.*	
Peaches, cherries, nectarines				
Apples and Orleans plums	0	8	0	per seer.
Pears, half ripe	0	6	0	„
Apricots and mulberries	0	4	0	„
Alu Bokharas	0	2	0	„
Quinces	0	1	0	„

Inferior and damaged fruit is sold at half price or for what it will fetch.

PRESENT STATE OF CULTIVATION BY VILLAGERS.—Beyond a certain amount of interest shown in the cultivation of walnuts and apricots very little care has been shown by the villagers of Jaunsar in the cultivation of fruit trees, but it is hoped that they are now awakening to the importance of this matter.

About 1,000 trees will be ready for distribution from the Forest Garden next year, and more seed will be obtained if these are disposed of.

SEASON OF FRUIT RIPENING AT CHAKRATA.—The following is the order in which fruit ripens at the Forest Garden at Chakrata :— **Season.**

Cherries and mulberries . . .	Latter half of May.
Peaches and apricots . . .	Whole of June.
Nectarines	15th June to 15th July.
Apples	Whole of July.
Pears	August, but never get a chance of ripening properly.
Quinces	August."

There is plenty of scope here for the extension of fruit cultivation, Mr. Moir allows that much larger quantities of good fruit could easily be disposed of in Chakrata itself. Moreover, it would pay to send fruit that can bear carriage to Mussoorie and to the railway. **Suitability or soil and climate.**

Throughout Jaunsar there are numerous localities where the aspect, soil and situation are admirably adapted to fruit culture. Here as elsewhere it is for Government to show the way by creating orchards, and proving to the native zemindar the profitable nature of the undertaking.

At Deothat, near Deoban, excellent apples, pears and cherries may be grown; the soil is rich, and the aspect and elevation all that can be desired. At Kathiyan, some 26 miles beyond Chakrata, there are most favourable slopes for fruit growing, with good soil and water handy. **Freight.** The cost of carriage from this place to Chakrata would not be more than one rupee a maund, and on to Mussoorie would be another two rupees, leaving a very ample margin for profit, when the retail price at Mussoorie

SIMLA.

is R40 per maund. To Saharanpur the carriage would be considerably less.

In all these localities special, but perfectly feasible, precautions would have to be taken against bears, monkeys, flying squirrels and other animals. If a stone wall of solid masonry with a spiked iron railing let in at the top proved ineffective, night watchers employed during the season and armed with guns, and an apparatus of empty kerosine tins pulled by strings would keep off animals. There is no difficulty here which could not be overcome with perseverance, but in order to show the native zemindar what to do, and how to do it, it is absolutely essential that Government should take the initiative and start, carry on, and make a success of the first orchard. A mere distribution of fruit-tree grafts is well nigh useless.

V.—THE SIMLA DISTRICT.

It is natural that the question of fruit culture should have attracted much attention in and around Simla, owing to the excellent market and the facility of rapid communication with the plains. At Kotgarh the better kinds of apple and pear were planted 30 years ago by Messrs. Berkley, and not long ago they were sold in Simla at four annas an apple and eight annas a pear, and the produce of a single apple tree realized in the Simla market as much as R500. Prices have gone down since then.

Fruit-culture in Kotgarh.

The Reverend H. F. Bentel writes as follows regarding recent planting in and near Kotgarh :—

"For the last two years I have planted out about 600 young fruit trees of various kinds and variety, apples (some 20 sorts), pears (about 20 kinds), apricots, peaches, plums, cherries, figs, vines, Maltese orange, Spanish chestnut, mangoes, etc., distributed in three places of different elevation, Thandhár, 7,000 feet high, Kotgarh, 6,500 feet, Chuhán, on the bank of the river (Sutlej), 3,000 feet (all in round numbers). I shall plant a few hundred more in each place, and then see how they will grow. More than half of these planted, are grafted trees, from Ranikhet, Saharanpur, Kulu (Mr. Carleton's estate), and a number of my own grafts. The whole area, put together, may be about three acres. As yet most of the trees look healthy and grow well, others (particularly some of the apple trees from Ranikhet and Saharanpur) have a sickly appearance, the leaves being covered with a white substance like mildew, which, I believe, is American blight. If so, the apple trees seem to be doomed unless some remedy can be found to save them. Besides there are other enemies, earthworms, grubs, beetles, etc., which attack either the roots, stem or leaves and will even destroy a tree if not well looked after. Of Spanish chestnut I have planted out about 20 trees only, some of which look healthy and grow well, others appear to have little life in them. Perhaps the altitude of Kotgarh does not suit them well; I shall therefore also try with them in the Sutlej valley at Chuhán. In the latter place I also tried with mango trees (Bombay and other good kinds from Saharanpur), but this turned out a complete failure; more than 20 trees that I had ordered, died, some already on the way and the rest after planting, a loss of about R30 in value. The only way to grow mango trees on the bank of the river seems to be by planting out stores of good kinds, the young plants will then get accustomed to the temperature. There are now growing at Chuhán several young trees which were raised in this manner.

As the greater portion of the soil is very clayey it requires a spacious and deep hole (not less than 3 to 4' in diameter) to be dug, and filled with suitable earth mixed with old manure, for each tree when planted out. This, as well as the price and freight of the trees from a distance together with the watering and tending them, makes the whole procedure somewhat expensive. The last spring with its lasting drought for over three months, was very unfavourable to the young fruit trees. In spite of all the watering a good many died. Since the rains have set in—the rainfall is here about the same as in Simla—everything of herb, shrub and tree that was not already dead has revived. Thus most of the young trees look now healthy and grow well. The propagation of fruit trees has been tried in different ways, by seeds, suckers, layers, cuttings, etc. There are now also some small nurseries here with different kinds of seedlings, suckers and grafted trees.

SIMLA.

My object in planting fruit trees as well as in making improvements in agriculture, arboriculture, etc., whenever I found an opportunity always has been, and still is, a twofold one, (1) to make these oldest and most substantial of all trades a source of income to the mission, and the latter, as far as possible, self-supporting, as I have done with Chusán, the Christian settlement in the Punjab, and (2) to show the natives in practice, not only how to improve their fields, and thus to get a better produce and income, but also how to utilize any waste spot near their houses and elsewhere, to remove filth and dung heaps and making their dwelling places healthy and decent looking by planting some good kinds of fruit, and other trees for their use as well as for sale, and thus to improve their often miserable condition.

I have already distributed a good many trees (seedlings, suckers and grafted) and also American peach stones of Mr. Carleton's, etc., but unless a hillman can see first a good income and little painstaking he will not take to fruit-culture. He will of course accept a tree and also plant it in a slovenly manner, if it does not cost him anything, but afterward leave it to itself and do nothing for it any more. No wonder that of 100 trees thus distributed to, and planted by, them, perhaps 5 or even 10 may grow merely by chance, all the rest are thrown away. Therefore, unless a hillman has some real interest in learning how to plant and tend a tree, etc., it would be a waste to give him any except of inferior kinds.

The most promising way to improve horticulture as well as arboriculture and agriculture, and to produce a taste for these natural sciences among the zemindars and others, is to teach them first of all in practice to the boys in school, and also to those zemindars who have a desire to learn. The produce of the soil in most cases could be three, five, or even ten times as much as it is at present, if properly worked, and so likewise fruit-culture could be made a good source of income. But then the Pahari as well as the Desi wants to see immediate results. This is another reason that he does not take to fruit-culture."

General results among villagers.

In Kumaon it was found that a substantial class of native agriculturists, corresponding to the yeomen farmers of England, were ready and anxious to avail themselves of the opportunity afforded by the Government nurseries to found orchards and, although there were numerous failures and many of the trees distributed from the nurseries died from neglect, there are now a large number of native fruit growers, some of whom export to Calcutta.

In the Simla Hill States such is not the case. There is no class of agriculturists between the untutored vassal of the hill chief, and the chief himself. The lower class are too ignorant and the higher too proud to take readily to innovations. A further measure than merely growing grafts in a nursery seemed to be required here. So Sir Edward Buck, who in 1881 had been transferred to the Imperial Government as Secretary, Revenue and Agriculture Department, took the matter in hand, and, with the co-operation of the Punjab Government and the Simla Municipality, established nurseries at the water-works and at Mahasu. The services of an English gardener, Mr. Parsons, were engaged, and young fruit trees obtained from Kumaon and England.

Sir Edward Buck's scheme.

In 1892 a scheme was framed by Sir E. Buck in co-operation with the Municipality and the Punjab authorities for the instruction of the hill chiefs or any of their subjects who may wish to grow fruit trees or establish orchards. This scheme, which was the outcome of a conference assembled at Simla, consisted in the appointment of a well-educated native official, with sufficient energy and influence to persuade the hill chiefs and their zemindars to attempt fruit culture on scientific lines, and the position and duties of this instructor were set forth in the following suggestions of the conference:—

Inspector of Hill Orchards.

"He should be generally under the administrative control of the Director of Land Records and Agriculture, but will be subject to the executive control of the Deputy Commissioner in whose district he is working. The Director should have the power to depute him to any district where his services can be utilized. We suggest that he might be designated 'Inspector of Hill Orchards.'

SIMLA. Arrangements for distribution of plants.

The Inspector will in all probability be at first more or less ignorant of the science and practice of fruit-culture, but his previous education will, it is anticipated, enable him to acquire this knowledge easily and speedily. To learn his work he should be stationed at the Mahasu orchards or at Annandale, and Mr. Parsons should be directed to give and arrange for the instruction needed, both scientific and practical.

There is another very important duty which we think might be entrusted to the Inspector. As the Punjab Government is aware, R1,500 a year is now given as a subsidy to the Municipality, on condition that a certain number of grafts are supplied annually, on requisition, for distribution to native chiefs and zemindars. This condition has hitherto been imperfectly fulfilled, partly, we believe, because the Annandale gardener has been very much impeded by the duties which devolve on him daily at Simla, where he has hitherto had no clerical assistance from visiting the water-works orchards as often as is necessary. But another and important reason why the distribution of grafts has been ineffective is the want of link between the nursery where the grafts are reared and outlying orchards. The European gardener [Mr. Parsons] has no idea who is likely to come forward to demand grafts, and the natives who would be willing, if pressed, to indent on the nursery for a supply, have little or no idea of how to set about the matter, even indeed if they are aware of the nursery's existence. The Annandale gardener cannot travel and cannot therefore establish relations between the people of the States and his own establishments.

We think, therefore, that it would be most desirable that the graft nurseries should be placed under responsible charge of the Inspector. A proposal has been already made by Mr. Parsons in his report on the Mahasu orchards [see page xxviii, Appendices to Municipal Report for 1891-92]. The nurseries should be transferred to a separate plot of land instead of, as now, being mixed up into the orchards proper. Such a transfer would facilitate the arrangement which we suggest. The Annandale gardener should be responsible for giving full and continuous instructions to the Inspector and the mális under him; and in order that his duty should be properly fulfilled should, unless this has already been done, be provided with a clerk from the R1,500 grant. The pay of the mális and coolies necessary to maintain the nursery should be paid from the same grant, as indeed they are now, and the Annandale gardener should be responsible for auditing their accounts, otherwise the provincial nursery and establishments should be under the executive control of the Inspector (subject to the Deputy Commissioner) and under the administrative control of the Agricultural Department.

The Government of India are prepared to provide a subsidy sufficient to cover the pay and allowances of an Inspector for a period of two years, from 1st October 1892, subject to a maximum annual expenditure of R3,000, *i.e.*, R1,500 in the current year, R1,000 in 1893-94, and R1,500 in 1894-95, on the general condition that the project is supported by an equivalent provincial grant.

If this offer of the Government of India is accepted, and the conference trust that it will be, it is hoped that the Punjab Government will be willing to undertake the cost of the following objects:—

(1) A small house of two rooms at Mahasu for the residence of the Inspector. This ought not to cost very much, *viz.*, from R1,000 to R1,500.

(2) The cost of training a number of mális at the Mahasu orchards with a view to their future employment in the service of the native chiefs and landowners and districts. It will be necessary to give these men an allowance. Native chiefs should be encouraged to send their own men.

(3) The establishment of branch nurseries in British territory and in the Hill States.

(4) The establishment of Spanish chestnut plantations in several localities. The Imperial Government has spent considerable sums during the past 15 years in introducing this valuable tree, and after many experiments it is now ascertained to some extent at what elevation the trees will fruit successfully. As the fruiting is not interfered with by drought, it forms a valuable food supply, and it is most essential that a strong lead should be given to its rapid and extensive distribution throughout these hills, and wherever it will grow."

Chestnuts.

Sir E. C. Buck has at the same time been continuously trying experiments at various elevations with different kinds of fruit trees. He has taken special interest in chestnuts as a fruit likely to prove a valuable substitute for grain in years of drought, and at an elevation of about

SIMLA.

2,500 feet to 3,000 feet near Simla has, with the assistance of Mr. Gosd, Secretary to the Municipality, succeeded in producing fruit which is quite equal to the best Spanish chestnuts.

Sir Edward Buck's experiments.

Another fruit or, to speak more correctly perhaps, a vegetable used as fruit, which Sir E. Buck has successfully introduced, is rhubarb. This is a Himalayan product, since various species grow wild at elevations of 10,000 to 12,000 feet. But it is found that on the north side of the hills, the English varieties can be grown with success at a much lower elevation, say, from 7,500 to 8,500 feet. The agriculturists in the vicinity of Simla are now beginning to grow this useful plant, and a neighbour of Sir E. Buck, a native cultivator, recently obtained the first prize for rhubarb at the Simla Horticultural show.

Rhubarb.

Grapes.

Sir E. Buck has also succeeded in producing very good grapes grown in the open at an elevation of 5,300 feet close to Simla.

Pamphlet on peach cultivation.

As a further means of extending the knowledge of fruit growing among the native zemindars, a small pamphlet on the advantages of peach culture was prepared by the Revd. M. M. Carleton, with directions for planting the seed and rearing the tree by Mr. Parsons, and it was printed and distributed among the inhabitants of the Simla district and other hill tracts. The following extract from that pamphlet may be found useful :—

"DIRECTIONS FOR SOWING PEACH STONES AND REARING PEACH TREES.

Peach.

The following directions for planting peach stones in the Punjab hills, and for the care of the peach trees, have been kindly prepared by Mr. Parsons, Superintendent of the Annandale gardens :—

1. A plot of ground should be selected near the dwelling in which to sow the seeds when received.

Such soil as wheat or Indian corn grow in will do very well, but it should be dug deeply, about 3 feet, most of the stones removed and the remaining soil mixed with some manure about one year old.

A plot 12 feet long by 6 feet wide will be sufficient to sow about 100 peach stones.

2. Soil consisting entirely of clay (*chickna mati*) should be avoided, and the plot should be in such a situation that water will drain away from it readily.

3. The stone should be sown as soon as received, and it is a good plan to sow them in straight lines.

The lines should be one foot apart, and the stones placed 6 inches apart in each line, and buried about 4 inches below the surface of the ground.

4. After the seed is sown the plot should be watered regularly during dry weather, about once in two days, so that the ground may be kept moderately moist.

5. The seed will usually take one year before it begins to grow, while some may not grow for 18 months after being sown.

The first winter after the plants have appeared they should be carefully dug up and planted, where they are to remain always.

7. The trees should be planted about 15 feet apart, the ground all round them being kept free of weeds, the soil loosened occasionally, and a fence put round them to prevent goats and other animals from eating them.

8. The best places for peach trees are those which face either east, south, or west.

9. The ground in which the young tree is to be planted should be prepared much in the same way as for sowing the seed. Pits should be made from 5 to 6 feet wide, and all the soil thrown out to a depth of 3 feet.

This soil should then be mixed with some old manure and all returned to the hole or pit, pressed down by treading on it and the young tree planted on the top.

10. The roots should be well spread out in every direction, and covered with fine soil and pressed firmly on the roots.

11. During December or January when the young tree is without leaves the top should be cut off to cause it to spread and the young shoots made every year should have their points cut off every winter, until the tree is fully grown."

FRUIT. | Fruit Culture in the

SIMLA. Result of peach cultivation.

As to the result of sowing peach stones, the Revd. M. M. Carleton writes as follows:—

"Nine years ago we received from Philadelphia some peach stones taken from a variety of very choice peaches. We planted them at Ani (in Kulu, altitude about 3,800 feet), and they nearly all germinated. With one exception, they were all transplanted to a rocky and rather poor soil; the exception was left where it had germinated in a rich soil, and this tree is now double the size of the others, though it has never received any cultivation.

The trees planted in a poor soil have been mulched and highly cultivated, but they still remain somewhat stunted. They all bear the finest fruit, some of the peaches measuring more than ten inches in circumference. They began to bear fruit when four years old."

Transport.

The orchards in the neighbourhood of New York, which yield hundreds of thousands of baskets of peaches, have to a very large extent been grown from seed, so it is evident that this method is to be highly recommended, and deserves more attention than it has hitherto received. It may be noted here that if, for the purposes of transport, peaches are gathered before they are perfectly ripe their flavour can be improved by exposure to sunlight for 24 hours, as soon as they arrive at their destination.

The following note by Mr. Ribbentrop, Inspector-General of Forests, shows what has been effected up to date in and around Simla in the way of fruit-culture, and should be read in continuation of the foregoing pages:—

"Sir Edward Buck took up the work of the Revenue and Agriculture Department in 1882. When he arrived he found that Simla was supplied with fruit from Naini Tal. He recommended that fruit-culture be established in Simla, as had been done by him in Kumaon. This led to Mr. Parsons' appointment.

Facility of extendiug fruit-culture was given by the acquisition of the catchment area. The Government of India provided a subsidy for initial outlay, and the local Government subscribed towards the expenses on the condition of grafted trees being supplied to the chiefs and land holders in the Hill States. The Municipality also contributed. A portion of Mr. Parsons' pay was debited to flower-culture, a part to fruit-culture.

The operations began in the winter of 1883. It took two or three years to get the nurseries started, and the distribution of grafts began on a small scale in the winter of 1887. The outturn of fruit has been gradually developing ever since, and is now greater than it has been hitherto.

The position at the beginning of this year is indicated by Mr. Parsons' Annual Report, a copy of which accompanies, and which shows the number of grafted trees distributed free up to date, and the number of those sold.

About 5,000 growing fruit-bearing trees have been established in permanent orchard. The stock of grafted young trees for future distribution is 5,000, and of wild stock 45,000.

A native apprentice is under instruction for the purpose of making tours through the States, to encourage chiefs and landholders to establish orchards.

The classes of fruit trees in the orchards are given in Mr. Parsons' Report.

The expenditure up to date has been ₹49,000, and the receipts ₹30,000; but the former includes ₹19,000 on account of the European Superintendent's pay, and the latter ₹15,000 the amount of contribution from the Local Government for grafted trees distributed free of charge. Deducting these amounts, the net cost has been—expenditure ₹32,000, receipts ₹16,000, leaving a capital outlay of ₹17,000, which is represented by the said orchards containing 5,000 bearing trees and young stock as above explained.

Thus far efforts made by Government and the Municipality. The only private orchard in existence, where operations were taken up by Sir Edward Buck, was a garden established by General Dickens on Summer Hill. At present perhaps a dozen* private orchards, of more or less importance, have been established, containing from 2 to 3,000 trees.

* The main fruit growers are:—
Colonel Mackenzie, Mr. Ker, Mr. Bliss, Sir E. C. Buck, Mrs. Corstorphan, Mr. Bsan, Mr. Clarke, Mr. Goad, Mr. Pitcher, Colonel Marshall, Mr. DeMonte, Mr. Rutledge, and Mr. Chisholm.

SIMLA. Value of Spanish Chestnut.

Sir Edward Buck at the same time that he promoted Government fruit nurseries for the distribution of trees throughout the Himalayas, established, privately, experimental fruit gardens at different elevations, in order to ascertain the capacities of mountain slopes, unsuited to ordinary cultivation, for the growth of fruit trees. He has succeeded in showing that on high elevations, otherwise unculturable, land can be utilised profitably for apple and pear trees, and that on elevations of about 5,200 feet Spanish chestnuts can be successfully grown. He strongly advocates the general extension of Spanish chestnuts at these lower elevations, in view of the fact that they produce the best crops in years of light rain when cereals are apt to fail, and thus provide a valuable food-supply when the ordinary food crops are deficient. The chestnuts which have been shown for the last two or three years at the Simla Horticultural shows have been equal in size and flavour to the best Spanish chestnuts. Apple trees grown on stony hillsides, absolutely unfit for any kind of crops, have produced fruit which is equal to any that has been grown in India.

Sir Edward has grafted wild pear trees, of which there are hundreds in every village in the Himalayan States, with wood from English trees, and these are now covered with fruit. These facts indicate that Sir Edward Buck's prophecy can, if vigorous action be taken, be fulfilled, *viz.*, that the North-Western Himalayas can be made the orchard of India. It is certainly a fact, of which perhaps few people are aware, that no European fruit, except chestnuts, can be named, of which a wild variety cannot be found in the hills and forests between Simla and the snows. Such being the case, there can be no reason why every European fruit cannot, in an improved form, be successfully cultivated.

Operations in the Mahasu orchard.

The following account of the Mahasu orchards has been furnished by Mr. Parsons, the Superintendent :—

"These are situated on the Mahasu range, distributed in various plots from 8 to 10 miles from Simla.

The aspect varies from about south-east to north-west, and the elevation from about 7,000 to 7,800 feet.

The soil is of almost every description found on the hills, and varies from poor gravelly material to stiff clay.

The situation is generally dry, anything in the nature of irrigation is impossible, and manure has not been used.

Apple trees are thriving best in a somewhat clayey loam, but are also doing well in lighter soil, which is also best for stone fruits and pears.

The elevation is suited better for apples and pears than the other varieties, but in favourable seasons apricots and peaches do well.

Plums, figs, and quinces are unimportant, and commercially of little value.

The situation is somewhat too high for Spanish chestnuts.

Raspberries, gooseberries and currants, filbert and crab have also been tried, but are not worth growing for profit.

Vines are grown for distribution, but the Simla climate is not suited for the production of grapes out-doors above 4,000 feet.

Walnuts are being tried from introductions from Kashmir and France.

Japan plums have also been introduced, and some of the varieties are likely to prove better than anything of the kind imported into Simla before.

Cherries, the English and French varieties, produce rather poor crops, and are more trouble to protect than most other fruit.

The morello and a variety resembling it, but somewhat smaller, which has probably been introduced from Kashmir, produce larger and more regular crops.

The cost of maintaining the permanent orchards and the propagation of young stock for distribution and sale has not hitherto been kept separate, but this will be effected in the course of the next year or so.

The arrangements for propagating young trees are these :—

For the Apple.—Apple seed is imported from Europe to raise stocks for grafting on.

For the Pear.—Pear seed is imported from Europe and wild pear (Pyrus Pashia) seed collected locally; stock raised from cuttings of the common hill pear and the quince are also used for the same purpose.

For Peaches.—Peach, plum and almonds seeds are sown.

For Apricots.—Apricot and plum stones are sown.

For Plums.—Plum stones are sown.

For Cherries.—Suckers are generally used which come up from other trees.

FRUIT. | Fruit Culture in the

SIMLA. Mahasu orchard.

When more than one kind of tree is used for grafting the same variety of fruit, experience so far is in favour of the following being the better varieties :—

FOR THE PEAR.—The quince and the large common hill pear. The wild pear is of very and slow growth, and the English stock has not been sufficiently tried.

FOR THE PEACH.—The almond and plum are better than the peach itself.

FOR THE APRICOT.—Both the plum and its own stock seem equally good.

Of diseases and other matters affecting the health of the trees, the following are the principal :—

Pests.

The Goat Moth is very destructive, chiefly affecting the largest apple trees, which in course of time it frequently kills. The moth deposits its eggs on the bark of the tree and the caterpillar gradually works its way into the wood of the stem, branches, or roots, where it takes from 2 to 3 years to mature; frequently the damage is difficult to detect until the tree is ruined. When the hole made in the tree can be discovered the grub may sometimes be killed by thrusting a wire into it, and completely stopping the holes with a mixture of clay ; soot and kerosine oil is also frequently effectual. The apple tree is also frequently infested with "American Blight," which has been introduced into India by trees having been sent from Europe with the insects on them ; it is now found in nearly every orchard of any extent. It attacks both old and young trees, but the older trees do not suffer so much as the younger ones. Applications of methylated spirits of wine, diluted kerosine oil, soot, sulphur, and similar remedies are effectual in keeping it in check.

The stem of the peach tree when grafted or budded on the peach stock is frequently blistered by the sun when the branches do not shade the stem ; the growth of the tree is checked and it ultimately becomes worthless.

In some seasons the leaves of the peach are what, for the want of a better name, may be called blistered ; the growth of the midrib seems arrested, the leaf curls up more or less, and the growth of the young shoot is also arrested either completely or for a time.

The disease seems more attributable to climatic causes than to any other, and protection from the cold in early spring would probably prevent the damage taking place.

Bears and monkeys do a little damage but can be checked, while hail storms are more serious, causing cracks and spots on the fruit and reducing its value."

The following Annual Report on the Mahasu orchards for 1893-94 is also by Mr. Parsons :—

"The income during the past year was nearly ₹600 less than in 1892-93, due partly to somewhat lower prices, and partly to the cold wet summer of 1893.

There was an abundant crop of apricots, but owing to the want of heat they were nearly all unsaleable. The peach crop was somewhat less, and also affected by the wet weather.

The apple crop was also less than the year previous ; certain trees which were covered with snow for a long time in the winter of 1892-93 having yielded very poor crops, but these have now recovered and promise to give an average crop this season.

The sale of produce realized as follows :—

FRUIT.

	R	a.	p.
Apples	1,122	4	3
Apricots	42	7	0
Peaches	383	11	0
Pears	75	2	0
Other fruit	8	10	0
	1,632	2	3

MISCELLANEOUS PRODUCE.

Fruit trees	507	2	0
Lucerne	96	8	8
Sundry produce	50	13	9
Government Grant	1,500	0	0
GRAND TOTAL	3,786	10	8

SIMLA. Mahasu orchard.

In addition to the above, R143-4 was realized on account of fruit trees and credited to the Director of Land Records and Agriculture, Punjab.

The expenditure for the year was:—

	R	a.	p.
Share of Superintendent's pay	1,800	0	0
,, Clerks	240	0	0
Mális' and coolies' pay	1,699	7	2
	3,739	7	2
Ordinary Contingencies	408	4	0
Total ordinary Expenditure	4,147	11	2
Capital Charges.			
Balance on account of building fruit-house	1,625	6	6
Total	5,773	1	8

The establishment charges are higher than they perhaps should be on account of the proportion of the Superintendent's and clerks' pay being more than can be fairly debited to the orchards.

The new catchment area and station tree-planting accounts might bear a portion of these charges to equalize the incidence of expenditure on the various Departments I have to superintend.

The total expenditure from the commencement is:—

	R	a.	p.
Expenditure to 31st March 1893	43,299	9	2
,, during 1893-94	5,773	1	8
Total to 31st March 1894	49,072	10	10

and the income

Total to 31st March 1894	26,493	10	4
Receipts, 1893-94	3,786	10	8
Total Receipts	30,280	5	0

which makes the cost to the Municipality to 31st March 1894, R18,792-5-10.

Two thousand and one hundred grafted trees were placed at the disposal of the Director of Land Records and Agriculture, Punjab, and 2,094 distributed to the stations mentioned below:—

Deputy Commissioner, Kangra	425	
,, ,, Hazara	300	
,, ,, Rawalpindi	200	
,, ,, Gurdaspur	225	
,, ,, Simla	725	
,, ,, ,,	19	Previous year's orders.
Conservator of Forests, Kangra	200	
	2,094	

FRUIT. | **Fruit Culture in the**

SIMLA. Mahasu orchard.

In the Simla district the trees were sent to the following States, etc. :—

The Rana of Jubbal	45
,, ,, Tiroch	45
,, ,, Bashahr	45
,, ,, Madan	45
,, ,, Keonthal	45
,, ,, Dhami	45
,, ,, Kote	30
,, ,, Balsan	45
Tika of Theog	45
Mr. Goad	50
,, Taylor of Erki	10
Pir Buksh Dukani	27
Kasim Beg	5
Thakuria	2
Deputy Conservator of Forests, Simla	100
Naib Tehsildar, Kotkhai	160
TOTAL	744

A balance of 25 trees remain of those placed at the disposal of the Deputy Commissioner, Simla, applications having been made too late in the season to allow of their being transplanted with safety.

Nine hundred trees were sold and the proceeds credited to the orchard produce accounts, and 100 were sold and the value placed to the credit of the Director of Land Records and Agriculture, Punjab.

The total number of young trees sent out during the past season is therefore—

DISTRIBUTED FREE.

To out-stations	1,350
,, Simla district	744
Sold	1,000
TOTAL	3,094

The total number of trees supplied to Government to the end of March 1893 was	7,303
Supplied during 1893-94	2,194
Total number supplied to 31st March 1894.	9,497

Five thousand seven hundred trees have been grafted this season for future distribution, and there is a balance of 430 trees in hand remaining from last year, and also 600 Spanish chestnuts.

A certain proportion of the grafted trees always fail, owing partly to imperfect work, and partly to dry weather, following so soon after the operation is performed, but allowing for these casualties it may be anticipated that something like 5,000 trees will be available for distribution next winter.

It was not until the end of 1889 that the Government stated what number of trees would be expected, and it is only now that it has been possible to approach the number required.

The young seedling trees required for grafting the better varieties on did not exist in sufficient numbers at the time to enable any one to give immediate effect to the requirements of Government, as it takes from 3 to 6 years to grow these of sufficient sizes, for grafting purposes, while water and manure, which would hasten their growth, is only obtainable to a very limited extent.

The number of young trees now coming forward for grafting purposes is about 4,500 of different sizes, and there is every probability that the demands of Government will soon be met in full.

The grafting this season has been chiefly carried out on the old catchment area, but the work will be transferred to the new catchment area when the older stock has been worked off.

North-West Himalaya. (*A. Smythies.*) | FRUIT.

SIMLA. Mahasu orchard.

During the past winter upwards of 40,000 young trees have been planted on the new ground and a large quantity of seed sown, both imported and collected locally while 4,300 young trees remain in the old nurseries.

The store house for fruit has been practically completed at a cost of R1,967-1-3.

The orchard pupil who has been learning fruit tree growing and propagating since April 1891 and paid by Government was utilized during the last few months by being sent to inspect the fruit trees in some of the native States near Simla, and to assist in grafting any trees which were available for the purpose.

There is now a sum of R1,330-12 in the hands of the Municipality to meet the pay and travelling allowance of this man, and there appears to be no immediate necessity for dispensing with his services.

The new catchment area which was taken over by the Municipality early in 1893 has been partly utilized for nursery work.

Several villages at wide distances apart were vacated in January 1893, and the ground in the lower part of the valley only has been taken up for the above purpose.

Some fruit trees planted by the former tenants existed at this place, and generally it was the most suitable for the work. A portion of the land was first taken up for sowing fruit tree seed, and apple, pear, almond, Spanish chestnuts, peach, plum, and apricot seeds were sown from time to time in 1893, while during the past winter the following seedling fruit trees have been transferred from older nurseries to the new ones at Pati and Thaltu, and approximately about 3 acres have been planted with young trees and seeds.

The trees consist of:—

15,750 apples.
6,293 pears from English seed.
6,700 „ „ Hill „ .
6,580 peach „ seed collected locally.
513 „ „ American seed.
1,903 plums, various sorts.
2,060 cherries.
633 almonds.
950 apricots.

41,382 trees in all.

Fifty-six pounds of Spanish chestnuts were imported from France in January 1893, and from these 440 trees have been raised. The apple and pear seed sown in April of 1893 germinated after being sown one year, and generally fruit tree seeds remain from 6 to 12 months in the ground before germination takes place. A few fruit trees, 1,000 artichoke plants and 388 rhubarb roots, have been removed from some of the outlying villages and planted on the old catchment area.

Artichoke. Rhubarb.

The income from the new catchment area was as follows:—

	R	a.	p.
Apples	7	7	0
Peaches	25	12	0
Pears	36	4	0
Apricots	45	10	0
Miscellaneous	71	15	0
TOTAL	187	0	0

and the expenditure in coolie labour only R596.

Under present arrangements the expenditure on this place will probably always exceed the income, as most of the stock grown will be distributed free.

As no manure will be applied to these nurseries, and irrigation is only possible over a very small portion, it will take about the same number of years to produce a tree fit for distribution as in the older nurseries, but it is an advantage to have the work more concentrated and at a lower elevation."

F. 706

BASHAHR AND KUNAWAR.

VI.—BASHAHR AND KUNAWAR.

The following note on fruit trees and orchards in the Bashahr State has been written by Mr. G. G. Minniken, Deputy Conservator Forests, Bashahr Division :—

"In order to make these notes at once intelligible it is as well, in the first place, to mention that Bashahr comprises two climatic divisions—the portion to the west of Wangtu and south of the left Sutlej range has a comparatively moist climate with a rainfall of probably 77 inches, while the portion to the east-north-east of Wangtu, known as Kunawar, has a more or less arid climate; the transition from moist to arid is, however, gradual, particularly along the upper zone of the mountains, but probably more sudden on the lower and hotter slopes, where the rainfall varies from 21 inches to probably half this quantity. Both climates are suited to the cultivation of nearly all European fruit trees, but experience has shown that in the country east of Wangtu in localities having a moderate rainfall, fair soil, and means of artificial irrigation, the fruit matures, ripens better, and is of better flavour and quality than in the lower part of Bashahr, where the heavy rainfall delays the ripening and impairs the flavour of some fruits. And many species, for instance, the grape, almond, and olive will not succeed at all, while the chestnut is not nearly so prolific as it is to the east. In Kunawar every stream-watered area is taken up for village sites and cultivation, and, except forest areas, the only available land is on steep dry slopes covered chiefly with **Artemisia** (wormwood), etc., and in some places sprinkled with the wild olive, edible pine and ash. The soil on these slopes is poor and shallow, and before orchards of any extent could be made, it would be necessary to construct irrigation channels, and adopt a moderately high cultivation, the expense of which would be considerable, and might to some extent defeat the object in view, which is to provide an addition to the food-supply and a support in time of partial famine to which this valley is very liable. It would therefore be better, I think, to establish small orchards throughout the valley in suitable localities where the produce would be available for the people of the adjacent places, and from which they could obtain plants for stocking their own orchards. I propose that all Forest Rangers and Foresters should be encouraged to make small orchards in their respective ranges, and that they should be taught something of the branch of horticulture applicable to fruit trees, for unless orchards are carefully tended, most species will produce more wood than fruit. Orchards are common in Kunawar; some of them are acres in extent and are usually stocked with apricot, peach, walnut, and occasionally a few apple trees. Their produce supplemented by the fruit of the wild peach, indigenous pear, cherry, horse-chestnut, hazel* and the berries of several species, together with the seed of Gerard's pine, form a large part of the food of the people. The apricot, peach, and apple are dried for winter use and for exportation. The Kanawri would not be able to exist on the produce of his fields alone, so it is of vital importance to him to maintain productive orchards and to introduce new kinds of fruit, and this doubtless accounts for the apple, grape vine, peach, etc., that are found in the village orchards. He can and does appreciate the efforts that have been made, but has not sufficient enterprise in himself to take advantage of improvements at once, and it has to be forced on him before he awakes to the knowledge that such and such trees are profitable and necessary to his wants.

Climate.

Pear.

Peach
Cherry.
Horse-chestnut.
Hazel.
Apricot.
Apple.

In the western and southern part of Bashahr, the Kochi makes no attempt at growing orchards: he is satisfied with the apricot, peach, and wild pear that grow up along the border of his fields, and, as long as they give fruit, protects them in his careless, happy-go-lucky-way.

Grape.

The grape vine flourished in Kunawar forty years ago, until it was attacked by a disease which appears to be a combination of insect and fungus. A few vineyards still produce good grapes, but the pest continues vigorous. All vineyards were situated in the lower part of the valley near water on soil formed of the debris of the cliffs above. In such places the sun had full power in autumn to ripen the grape, and it is in such places that we must now carry on experiments in grape culture.

The vine-disease.

In 1882 Mr. Coldstream called my attention to the vine disease, and asked me to ascertain whether the disease was due to the ravages of the **Phylloxera**. Some notes were sent him on the subject in 1882, and also appeared in the Indian Agriculturist. An attempt was made to discover what the cause of the disease was, and whether it could be arrested. Several vines were treated with sulphur, etc., but with

* The Indian hazel, **Corylus Colurna**, *shurli*, grows into a large tree.—ED.

BASHAHR AND KUNAWAR.

no success. It was found that the grape split, and on examination a white grub was discovered embedded in the pulp; these grubs with their pupa and perfect insect (a fly) were submitted to Mr. Coldstream, who had them examined and reported on.

Introduction of Foreign Vines.

Last year (1890) Government sanctioned R250 for expenditure by the Deputy Commissioner on the vines in Kunawar. A gardener has been employed to especially attend to the culture of the grape-vine in Kunawar, and Mr. Coldstream sent up last January and March (1891) 3,000 vine cuttings, of which some 90 per cent. have struck and are now being planted out near Skibba, Ribba, etc.; and in order to give them a fair chance, it was suggested that the diseased vines in forest gardens should be rooted up; this, however, was not done thoroughly.

Spanish Chestnut.

With regard to the Spanish chestnut, I reported in April 1882 as follows:—

'In the year 1873 seeds of the sweet chestnut were distributed by Government for experimental cultivation to some, if not all, the hill divisions in the Punjab. In these divisions (Sutlej) 50 seedlings had been raised by April 1875, of which, in the same year, 30 were put out at Nachar, in good soil, on terraces facing the north, at an elevation of 7,400 feet, with a rainfall of 77 inches, and protected on the east and west by mountain ridges from the prevailing winds.

'The remaining twenty were transplanted on the north-east slope of a hill (in a loose sandy loam) in the vicinity of holm oak, vine and wild olive, at an elevation of 6,200 feet, with a small rainfall.

'In the latter situation the plants have made the best progress, and a few of them are 10 feet high, and of a shrub-like appearance. In both places several bore fruit in October 1881, but on opening the thorny cases I found in each of them from three to four shrivelled empty rinds, and I have heard that in Kulu the same has occurred in two gardens.'

Nurseries.

Since then I received from Mr. Coldstream three plants of a different variety to those first introduced, and they have succeeded, but have not fruited as yet.

From 1884 to 1888 the Kilba and Nachar nurseries were made and sown with some of the seed of trees in the Kilba and Nachar orchards, but not more than 1 per cent. germinated. The few plants raised were planted at Nachar and Kilba, and distributed as follows:—

Headman of Bhaba, village Yangpa	2 plants.
Parmsukh of Kilba	3 ,,
Muthu of Kilba	1 plant.
Debi Sarn of Pandrabis	1 ,,
Wazir of Poari	3 plants.
,, of Taklech	6 ,,
,, of Sapni	10 ,,
,, of Tulamira	2 ,,
Jûld-Miru	2 ,,
Pir	2 ,,
Urni	2 ,,
Pangi	2 ,,

Seed was sent to the Rana of Dhami, Deputy Commissioner, Simla, Tehsildar of Kotgarh, Indian Museum, and to Burma, but nothing has since been heard.

In 1888 a nursery was raised at Sholtu, 5,600 feet, and the seed germinated better than it had done before, but grubs attacked the seedlings and killed a good number before the cause was discovered. When it was, the grubs were picked out, and a fair proportion of the seedlings were saved; these were planted out in an area of 6 acres, in which there are also vines, Eucalypti, etc., and 50 were sent to Sir Edward Buck, who promised to have other varieties grafted on them, and to return one-half of the grafted plants, but they are probably now too large to lift.

The success of the attempt made to introduce fruit and chestnut trees and new varieties of the grape vine are given below:—

NACHAR.

Altitude	7,000 feet.
Rainfall	77 inches.
Aspect	North-east. Sheltered moist.
Area	2 acres.

FRUIT. | Fruit Culture in the

BASHAHR AND KUNAWAR.

Chestnuts.

SHOLTU.

Altitude	5,600 feet.
Rainfall	21 inches.
Aspect	East. Open on bank of river.
Area	Of fruit and other trees, 6 acres.

KILBA (1).

Altitude	6,500 feet.
Rainfall	21 inches.
Aspect	North-east. Open.
Area	1 acre.

KILBA (2).

Altitude	6,500 feet.
Rainfall	21 inches.
Aspect	North-east, more or less sheltered by holm oak.
Area	1½ acres.

Besides the above there are chestnut trees at Choling, Urni, Mirui, Pang, Poari, Pandrabis, Taklech, Rampur, and a large tree in a zemindar's field at Kilba. But the total number of trees in the valley does not exceed 200 or 250. A few years ago there were nearly 300, but many have died from drought, and from the roots coming in contact with rocks.

Last year (1890) was a bad seed-year, and as only a few of the trees seeded, there are no nursery plants of the year, and none available for transplanting. This year, however (1891), the trees are laden with fruit, and if it can be protected from the zemindars, there will be plenty of seed for sowing in November, and I hope by next rains to have a large number of plants ready to put out. In many places, at first, the chestnuts were planted too close, and their crowns now interlace and are cramped instead of having plenty of room to expand. Many of the trees have now double stems, and in the early stage of their growth had several. They should be pruned early and require some care, and in dry soil an occasional watering.

Grape.

As early as 1880-81, I introduced into Bashahr the Muscat grape and the grafted olive. This vine has yielded some good crops of delicious grapes, and has now an unusually good crop. It was attacked by the disease, and so badly in 1888-89, that not a grape ripened, but it seems vigorous and shakes off the disease, more or less

Olive.

producing good grapes in some seasons. The olive has not yet fruited, and the trees are not thriving as I would wish; possibly the aspect is too cold and the situation too windy for them. Several other varieties of vine have been planted, and one, a small wine grape rather sour, has not been attacked by the disease, but they are suffering from too cold an aspect.

In 1889, at Sholtu, 10 pine plants were put out between rows of Eucalypti, and are doing well.

Appended is a statement showing number and kind of fruit trees in the Bashahr orchards:—

Orchards.

	No. of trees.	REMARKS.
1. KILBA.		
Spanish chestnut	32	Yield 300 chestnuts per tree.
English apples	7	,, excellent fruit.
Plums	9	,, plenty of fruit.
Almond	3	Produce good fruit.
Olive	13	Not yet fruited.
Apricot	2	Yield good fruit.
Quince	5	Fruited first time, 1891.
Miscellaneous	7	
Vines	11	

	No. of trees.	Remarks.
2. Nachar.		
Spanish chestnut	33	Fruit good size and quality.
Plums	14	Very fine greengages.
Peach	27	Some bear fruit.
Apricots, Ladakhi	8	Have sweet vernels.
Apple	1	A good kind.
Cherry	3	Fruit copious, but does not ripen.
Vines	73	
3. Sholtu.		
Spanish chestnut	80	Most of the trees in this orchard are as yet too young to bear fruit.
Peach, English	22	
,, Native	32	
Apricot	17	
Pear, English	12	
,, Native	5	
Hazelnut	3	
Oranges	2	
Lemons	2	
Citron	3	
Apples	44	
Loquat	11	
Plum	5	
Olive	2	

Orchards.

Two hundred and fifteen Australian gum trees have also been planted as a protection to vines, chestnuts, etc.

Eucalyptus.

Vine Culture in Kunawar.

Kunawar Vine culture.

Since the submission of my last report some trouble has been taken to induce zemindars and others owning vineyards to root up and destroy the old diseased vines, and in three villages, Jani, Ramni, and Prinang, this has been done. But so long as partially diseased vines continue to produce grapes in varying quantities, and until the experiment of introducing and establishing new and healthy stock has been practically proved a success, it is not likely that the people will listen to my arguments in favour of replacing the old vines by new ones; they, however, already show a keen appreciation of what is being done to revive grape-culture, are quite alive to their own interests in the matter, and will doubtless, when facility is given them for obtaining cuttings from the new stock, plant up many of the abandoned vineyards. They say that prior to 1850 abundant crops of 13 varieties of grapes were annually collected; that besides the dry fruit sold or bartered in India and Tibet, from which they realized good profits, the grape wine was a luxury that cheered them on fair days and other festive occasions.

Consult the Agricultural Ledger No. 5 and No. 7 of 1893.

The failure of the grape in a wild and mountainous country like Kunawar, where the area of grain crop land is comparatively small, producing hardly enough to feed the population (18,512), must therefore have been a serious calamity, causing many to relinquish trading, which is a Kunawari's chief ambition, or to continue to do so on borrowed capital obtained at ruinous interest.

One of the objects aimed at in the introduction of new stock is to revive this trade, and in order to make the experiment a success, the areas selected for the new vines, received from the Deputy Commissioner, Simla, in 1890-91 and 1891-92 are, as far as possible, isolated, and all the diseased stock in the immediate neighbourhood has been destroyed, and it is hoped by these measures, and the adoption of a system of high cultivation, to prevent infection. Much, however, will depend on the efforts that are now being made to force ripening before the monsoon sets in, and in protecting the vines from high east winds, which are so destructive in all fruit-culture.

BASHAHR AND KUNAWAR. Vine culture.

The plan of vine culture adopted, and which seems most practical and well suited to this part of the country, is one that appeared in an extract from the *Indian Agriculturist* of 23rd May 1891, purporting to be written by Mr. C. S. Walters in the American Cultivator, and received from the Deputy Commissioner in June 1891. In the Sholtu Garden the vines have been planted in deep holes 8 feet apart, and trellising posts sunk at 12 feet apart. A single wire for supporting the vines, and for them to trail on, has been run from post to post at 2½ feet from ground. By this method of training, and by careful pruning when the sap is low, it is hoped to strengthen the vines and increase the stem growth, so that in time, if necessary, they can be left to stand alone without a trellis, and being low will be less exposed to winds. It has been observed this year that dry and moist winds play a very important part in lessening or increasing the disease; the winter was very mild, and hot and dry weather prevailed until the 25th of July, causing the grape to ripen three weeks earlier than usual, and two weeks before the south-west winds came up the valley, owing also to this favourable weather the disease has been much less severe, and in many villages old vines have yielded good crops of fruit, which I think may be probably due to the ripening process, beginning before the insect or fungus developed sufficiently to split the grapes.

It is not easy to find land suitable for grape culture, and with water handy for irrigation, as all such sites are wanted by the people for grain, consequently the plots available for my purpose require the employment of labor to bring them up to the required standard of fitness necessary to obtain good results, as well as for making irrigation channels, hoeing, planting, watering, trellising, etc., weeding, collection of manure, manuring, pruning. The gardener, Nizam-ud-din, sent me from the Lahore gardens was almost useless, and the loss of many of the vine-cuttings was due to his carelessness in planting, and I am sorry that his pay absorbed so much of the money given by Government; this year no máli has been engaged and the strictest economy has been exercised in order to carry on the allowance made, which, however, is barely sufficient for the preliminary work of preparing the ground, planting, clearing and staking, and does not cover the expenditure on supervision, watering, etc., which is done by the Forest establishment.

In the first experiments made from 1881 to 1890 the vines occupied too cold a situation, and the fruit was late in ripening. I therefore think they had not a fair chance, and that in the Sholtu garden the result should be satisfactory if the wind does not blow off the flowers, and if the experiment is perseveringly and intelligently worked out. So far, fair success has been attained, 6 vineyards varying from 6 poles to 1½ acres have been started, and contain 904 established vines. At Sholtu, in July 1892, the following varieties fruited, the fruit being of good flavour and showing no sign of blemish:—

1. Husaini (Cabul variety).
2. White Frontignac.
3. Dutch sweet water.
4. Muscat Hamburgh.

Vines have been given to zemindars, who have got rid of the diseased stock. Nearly all vines have made good growth during the year, and many are 10 feet high.

The Raja Sahib has made over to me a very good site at Choling, which has a southern aspect, and where formerly the grape vine flourished. But it will cost a good deal to get water to it, and if this can be managed, I hope to be able to arrange for other fruit trees."

VII.—KULU.

Mr. Fisher's note.

The following note has been written by Mr. C. P. Fisher, Assistant Conservator of Forests, chiefly from information, very kindly furnished by Captain Lee of Bundrole, Mr. Donald of Dobi, Captain Banon of Monali, and Mr. Mackay, also of Monali. It was not possible to obtain any data concerning the garden which belongs to Revd. Mr. Carleton of Ani in outer Seoraj. But this garden is not really situated in the Kulu Valley, and moreover it is believed that full information concerning it has been supplied by Mr. Carleton to the Deputy Commissioner of the Simla Hills District (see above, pp. 17 and 18.)

General Information concerning Fruit in Kulu.

1. Fruit is grown at the following places in the Kulu Sub-division: (1) Ani; (2) Banjar; (3) Bajaura; (4) Sultanpur; (5) Bundrole; (6) Aramgarh; (7) Dobi;

(8) Nagar Forest House; (9) Nagar Castle; (10) Monali Forest House; (11) Monali, Captain Banon's garden; (12) Monali, Mr. Mackay's garden. Of these the first is situated in the Sutlej Valley, the second in the Sainj Valley, while all the others are in the Beas Valley. The only gardens at which cultivation is carried on seriously are those numbered 5, 7, 11 and 12 above. The others may be said to contain only a few fruit trees, mostly of recent growth, which are not cultivated for market purposes, and concerning which no detailed information is available. KULU. Fruit-growing localities.

2. KINDS OF FRUIT FOUND IN KULU.—The following kinds of fruit are grown in Kulu: (1) pears; (2) apples; (3) plums; (4) cherries; (5) sweet chestnuts; (6) quinces; (7) pomegranates; (8) peaches; (9) apricots; (10) strawberries; (11) raspberries; (12) greengages; (13) walnuts; (14) loquats; (15) grapes; (16) figs; (17) currants; (18) gooseberries; and (19) olives. This note deals with the cultivation of pears and apples, for these two fruits are the only ones which can be exported, and which consequently are of any commercial importance. Indeed, with the exception of Captain Banon at Monali, none of the fruit-growers can be said to cultivate any fruit but these two. Captain Banon has delivered cherries at Simla, but unless sent by parcel post they do not arrive in proper condition; this, of course, renders it useless to cultivate them for export. In all gardens, however, peaches, apricots, etc., are found, while throughout the district peaches, apricots, and walnuts are found. The last-mentioned trees yield fruit of fairly good quality, which is consumed locally to a considerable extent; but the peaches and apricots have little flavour, and are, practically, of no account. The wild apple (*pala*), wild pear (*shegal*), and wild quince (*bihidána*), are also found in both forests and fields: their fruit is just eatable but no more. Kinds of fruit.

3. EXPORT OF FRUIT FROM KULU.—All fruit has to be exported from Kulu to Simla by mule or cooly carriage. Mules are difficult to procure, so coolies generally are used. They take about eight days making the journey to Simla, and are paid R4-8 for carrying a load of 200 seers of fruit, exclusive of the weight of the box, etc. It would, doubtless, be advantageous to export some of the fruit by the Kangra Valley, so that it would be more quickly placed on the railway, but Kulu zemindars do not care to go to so hot a place as Pathankot. The length of time occupied in placing fruit in the market is a very great handicap to the profitable growing of fruit in Kulu. In the first place, as the least injury in picking or packing will cause a blotch to appear on the fruit before it can arrive at Simla, the utmost care is necessary for both these operations. Each fruit has to be packed in a separate piece of paper before being placed in the moss with which the fruit boxes are filled up before they are despatched. This is an operation involving the expenditure of considerable time and care: and however carefully it may be done, a good deal of fruit (especially of pears) is usually spoiled before it reaches Simla. Secondly, it is impossible to send fruit, however slightly damaged, to the market; and as there must be in all orchards a large quantity of such fruit, a considerable source of revenue is lost, there being absolutely no local sale for fruit. Export.

4. NEW ROAD REQUIRED.—The present road to Simla could be considerably shortened at an expenditure of what is believed to amount to about R50,000. For this purpose a new road would leave the present one between Larji and Manglaur going *vid* the Chirag Pass (about 8,000 feet high) in Suket to a point on the existing Suket-Simla road at Tatapani or Suni. Such a road would shorten the distance to Simla by about 40 miles or 3 days; and there is no doubt but that its construction would give great impetus to the Kulu fruit trade. Roads.

5. FUTURE PROSPECTS OF THE FRUIT TRADE.—Indeed it seems that the future prospects of the trade are to a large extent dependent on the shortening of the road to the market. As time goes on, and more fruit is grown in the Simla Hills, Kumaon, and other places, prices will undoubtedly fall; and, although the undeniably superior quality of Kulu fruit will always enable it to command higher prices than other fruit can do, yet there must be an inferior limit to these high prices, and it seems likely that such a limit will hardly enable Kulu fruit-growers to obtain sufficiently remunerative prices for their produce, a probability which is much enhanced by the cost of carriage over the present road, and the loss caused by fruit being spoiled while in transit over it. Prospects.

6. JAM.—Neither does there seem to be much likelihood that the Kulu zemindars will ever be able to make much profit by a jam industry. The superior quality of their fruit would not appear when it was made into jam, and therefore they could not hope to obtain higher prices than Simla, and other cultivators could get for theirs. At the same time the cost of carriage of sugar and tins to and from Kulu, together with the cost of the carriage to the market of the jam itself, would be against them. In Kulu sugar costs about Ro-2-6 a pound, a pound-sized tin Jam industry.

KULU.

about Rs-2-0, and carriage to Simla about Rs-1-0 per pound, which means that an outlay of Rs-5-6 per pound of jam must be incurred before placing the jam on the market, without counting the cost of the fruit, of making the jam, and of the various other charges necessitated by undertaking an industry of this sort on a large scale. Enquiries are now being made with the object of finding out whether the sugar-maple (**Acer saccharinum,** *Wang.*) could be introduced into Lahoul or Kulu. If it would flourish, sugar, well suited to jam-making, could doubtless be obtained from it at a considerable less cost than has at present to be paid for such sugar; and thus a jam industry might have some chance of success.

Prospect of fruit-growing by zemindars.

7. FRUIT GROWING BY NATIVE ZEMINDARS.—At present no real efforts have been made to induce native zemindars to undertake fruit cultivation in Kulu; and it is extremely doubtful whether they are likely to be induced to take to it. Extreme care is necessary in all the operations connected with fruit culture, such as the pruning of trees, the thinning, picking and packing of fruit, a liberal and proper use of manure, judicious budding and grafting, the proper maintenance of nurseries, and so forth; and when in addition to this the considerable time that has to elapse before any return for the capital invested can be expected, and the conservative nature of the inhabitants of Kulu are taken into account, it certainly appears very problematical if any success in this direction will ever be attained.

METHOD OF CULTIVATION.

8. As it is not known whether the Kulu fruit-growers employ any method of fruit cultivation differing from those ordinarily in use, the following notes on their general practices are given for what they may be worth. It will, of course, be understood that the methods described are only general, and the practice differs in detail according to the variety and nature of each tree treated.

Nurseries.

9. NURSERIES.—For propagation, seeds or cuttings of the following indigenous trees are used:—

(1) Hawthorn (**Cratægus Oxyacantha**), (2) Pálá (**Pyrus lanata**), (3) Shegal (**Pyrus Pashia**), and (4) Quince (**Cydonia vulgaris**). Of these the first-mentioned appears to be very rare,* though Mr. Donald says he uses it: while the last is only found in the fields, and was probably originally imported. The beds in all nurseries are put three feet apart, so as to leave room for a person to sit between them when budding or grafting. Cuttings are put in six inches apart, in similar lines. They are put into the ground in a slanting direction pointing towards the south, and are about 10 inches long, which includes the whole shoot of one year together with a small piece of the previous year's shoot. Captain Lee puts them down in February or March, but Captain Banon and Mr. Donald prefer putting them down in the rains. The latter finds that cuttings from English varieties do not do well, and always uses indigenous tree cuttings. Captain Banon, on the other hand, prefers the English variety, a difference of opinion which it is not easy to account for. Mr. Donald, however, makes little use of cuttings. He finds that young plants grown from the seed of indigenous varieties are the best to bud on, because they are altogether stronger, have better roots, and give less trouble, it not being necessary to water or to shade them. Captain Banon buds as much as possible on naturally sown indigenous seedlings, and on root suckers from indigenous or imported trees.

Budding.

10. BUDDING.—Budding is always done in the nursery: on seedlings when they are about 1½ years old, and on cuttings at 1½ or 2 years after they have taken. It may be done in the spring, the rains or the autumn. Captain Lee buds in the spring, but Captain Banon and Mr. Donald prefer the rains. In this connection Mr. Donald observes that 95 per cent. of buds will take in the rains to 80 per cent in the spring. Captain Banon thinks that the spring is too dry a season for really successful budding. Mr. Donald prefers budding on the quince or the hawthorn; the former for choice, as he finds that the buds on these trees shoot sooner than those on the other indigenous trees, and make better and shorter trees.

Grafting.

11. GRAFTING.—Grafting is very seldom done by the Kulu fruit-growers. They all prefer budding as being less troublesome and giving fruit sooner. Even when big trees, or rather unsuccessful varieties, have to be cut down they prefer to bud on the coppice shoots rather than to graft on the stools.

Planting.

12. PLANTING OUT.—Planting out from the nurseries is done from six months to one year after the bud has taken. It is done between October and January by Captain Lee and Mr. Donald, and during November, as soon as the leaf falls, by

* The Hawthorn (indeed 2 species of it) are very plentiful bushes in Pangi, Lahoul. —*G. W.*

KULU.

Captain Banon. Pear trees are put out about 15 feet apart and apples from 20 feet to 30 feet. Captain Lee has some apple trees closer together than this, but thinks it was a mistake to put them so near to one another.

Transplanting.

13. TRANSPLANTING.—Mr. Donald has had occasion to transplant some big trees on account of their tap root, and surface roots having gone too far down and of their bearing badly. The largest tree he has so transplanted was 2 feet 4 inches in circumference, at a height of one foot above ground, and the cost in no case exceeded Rı. He starts by digging up the surface roots below the ends of the longest branches and works inwards towards the stem of the tree, cutting off all the small tap roots as he goes, and putting a mixture of equal parts of *kail* (**Pinus excelsa**) gum and beeswax on to the part cut. By these means he gets out all the surface roots. Then he cuts off the main tap root at a length of about 3 feet and removes the tree.

Pruning.

14. PRUNING.—The chief feature of the pruning of fruit trees is the removal of the inside and cross-growing branches, to allow of air and light to get into the tree; and the tying down, by means of string, of the outer branches, for the same purpose. Mr. Donald, who has some very tall old trees in his garden, is now cutting the top shoots of his young trees in order to prevent them growing tall, since he finds that flying foxes almost confine their attention to high growing fruit. Captain Lee usually leaves the top shoots alone, except in the cases of those varieties which tend to grow upwards instead of outwards, when he sometimes removes the whole of the central branches and shoots of the tree in order to encourage outward growth. In some varieties the main shoots are cut in order to encourage the formation of numerous fruit buds; in others such a procedure would cause the production of very poor fruit, so it is not carried out.

Root pruning.

15. ROOT PRUNING.—Root pruning is carried on by Mr. Donald, for the benefit of some of his old trees that do not bear well. He removes about half the length of half the surface roots in one year. The result of which is that more surface roots appear near the stem, which are the main feeder roots. Should this not produce the desired effect, the remaining old surface roots are treated in a similar manner the following year. Mr. Donald, however, prefers to transplant trees rather than to root prune them, since he finds the former procedure to be more effective.

Thinning of fruit.

16. THINNING OF FRUIT.—Thinning out the young fruit is commenced when they are the size of peas, and should be completed before they are as big as cherries. There is nothing in particular to be said about this. The quantity removed varies according to the crop. If the fruit is evenly distributed over the tree not much is removed; if it is bunched together, a large part of it has to be cut off. Captain Lee has sometimes removed as much as 90 per cent. of the crop of one tree.

Manure.

17. MANURE.—Manure is given to trees in bearing. Captain Lee gives almost as much as the weight of the crop taken off the tree. Mr. Donald gives 5 or 6 maunds to each tree in full bearing. When planted out a young tree gets about 10 seers, and then no more is given to it until it is in bearing. Captain Banon thinks it unnecessary to manure a tree until it is 10 or 12 years old. Captain Lee and Mr. Donald use ordinary farm yard manure. Captain Banon uses pine needles and bracken for litter in his farm yard, and then gives it to the trees. The pine needle manure is probably better than the ordinary farm yard manure, but the available quantity of it is strictly limited. The manure is put down in October or November and hoed or raked into a depth of 6″ to 9″. It is spread out round the stem of the tree as far as the branches extend. In addition to the annual manure giving, Captain Lee cultivates and keeps free from weeds the ground beneath the branches of each tree. In all the Kulu gardens snow falls during the winter: it may be about 6″ deep, and may lie for a day or two. In 1891-92 no snow fell, but the want of it does not appear to have made much difference. Mr. Donald noticed that the fruit of the Blenheim orange apple all rotted on the tree. Captain Banon noticed a large increase in the number of insects about his garden which did a proportionate amount of damage to his fruit.

18. IRRIGATION.—All the Kulu gardens are irrigated as necessity requires.

FURTHER PARTICULARS OF THE VARIOUS GARDENS.

19. The various minor gardens in Kulu contain certain varieties of apples and pears together with peaches, etc. No information is available about the two former.

FRUIT.	Fruit Culture in the

KULU.

Some of the gardens contain no yielding trees—as Banjar, Sultanpur, and the forest gardens at Monali and Nagar. The others contain varieties which have all been obtained from Bundrole or Dobi.

Spanish Chestnuts.

20. SPANISH CHESTNUTS.—At the Monali forest garden (6,200 feet) there are a number of Spanish chestnuts (**Castanea vulgaris**). This tree is also found at Bundrole (5,000'), Aramgarh (4,700'), and Dobi (4,800'), also at the Nagar Forest House (5,530'), and Mr. Mackay's garden (6,700') at Monali. No detailed information as to the annual yield of this tree can be obtained from any of the above-mentioned gardens. Indeed, except at the Monali forest garden, there are only a few trees at each place, and these are not cultivated for profit, but are regarded as ornamental trees. As far as casual observation can be trusted, it may be said that the trees at the Monali forest garden give the best yield; though at the other gardens the trees appear to be healthy and to yield a normal quantity of fruit.

21. SPANISH CHESTNUTS AT MONALI FOREST GARDEN.—The Monali forest garden is situated at the bottom of the Beas valley, some 200' above the river, and at a height of about 6,200' above sea level. The soil is a lightish loam, fairly deep. The aspect is south, towards which the garden slopes gently. In the summer the sun is on the garden from 7 A.M. to 5 P.M., while in the winter it is about a couple of hours later and earlier. The annual rainfall at Monali is not known. It is probably about 70 inches. Snow lies for about two months in the year and is sometimes several feet deep. There was no snow at all in 1891-92, but that was an abnormal year. There is no record of the maximum temperature, which is probably 90°. In March 1877 an unknown weight of imported Spanish chestnut seeds was sown at Monali. The seed beds were shaded with matting, and in August of the same year produced 368 young plants from 6" to 8" in height. In September 1878 the plants are said to have 'lost their vitality,' but in January and February 1879, 143 were planted in holes 2' wide and 2' deep, being well manured. At this time their average height was from 18" to 2'. From this year (1879) onwards no record concerning the chestnuts can be found. At the present time (August 1892) there are 190 trees, of which 51 are not bearing fruit this year. They vary in height from 4' to 25', the average being 18'. It is not known whether these trees were all grown from the original imported seed or not. All, or almost all of them, are bushes rather than trees throwing out four or five branches, about 7" to 8" in girth, from the ground. It is believed (there is no record on this point) that all efforts to raise young plants from the seed of these trees have failed. In any case the Deputy Commissioner of Kangra, and Captain Lee of Bundrole, have both tried to do so, but have not succeeded. In 1891, 17 of these trees were layered, of which layers 11 have taken. These layers will be removed in November 1892, and should succeed. Cuttings were put down in 1891, but all failed. It is not known for what reason. In 1891 about 15 seers of fruit were gathered from the trees in bearing; but the fruit was not strictly looked after, and it is probable that some of it was stolen from the trees. A large quantity of the fruit did not ripen owing, apparently, to fertilisation not having been effected. Thinnings of the fruit have been made this year (1892), and the effect of this procedure will be watched.

Important fruit gardens.

22. IMPORTANT FRUIT GARDENS.—As stated in paragraph 1 there are four gardens in Kulu cultivated for market purposes, but detailed information could only be obtained concerning three of them, *viz.*, Bundrole, Dobi, and Captain Banon's Monali garden. The following details concerning these three are given in order to show how different varieties of fruit are affected by varying conditions of climate, altitude, etc. The figures for the rainfall, etc., have been obtained by guess work, as no meteorological records have been kept in the valley. The year may be divided into four periods, of which two, *viz.*, the months of July, August, and September, and again the months of February, March, and April are the rainy ones; while the remaining months may be said to be dry. At the same time snow falls in the upper part of the valley, *i.e.*, at Monali, towards the end of December and in January. The rainfall at Monali is probably nearly double the rainfall at Bundrole and Dobi, while the maximum temperature at these places is probably at least 10° higher than that at Monali. The prevailing wind, as far as there is one, blows up the valley, *i e.*, from the south.

Bundrole.

(*a*) BUNDROLE.—About 5,000' above sea level, is situated on the west bank of the Beas on the slope of an old moraine, about half way down the side of the valley, and is a good deal exposed to the action of the winds. The ground slopes gently to the north, south, and east. The soil is a light loam with large scattered boulders in considerable numbers. Rainfall about 40". Snow sometimes 6", seldom lies for more than a day. Maximum temperature about 100° or less. In summer the sun

KULU.

is on the garden from the early morning till about 3-30 P.M. In winter it is about an hour later in the morning and earlier in the evening.

Important Gardens.

(*b*) DOBI.—About 4,800' above sea level, situated on the west bank of the Beas at the bottom of the valley. The ground is almost level with a slight slope to the south. The soil is a somewhat heavy loam, about 2' deep, with clay underlying it. Rain and snow similar to Bundrole. The maximum temperature is probably a degree or two less than that of Bundrole. The sun is on the garden early in the morning and off it at about 5 P.M. in summer, somewhat earlier in winter.

(*c*) MONALI—CAPTAIN BANON'S GARDEN.—About 6,400' above sea level, on the west bank of the Beas, near the bottom of the valley. The ground has a slight slope to the south. The soil is a lightish loam, about 3' deep, with gneiss underlying. Rainfall about 70 inches. Snow lies for a couple of months sometimes, and may be several feet deep. Maximum temperature about 90°. The sun is on the garden about 7 A.M, or earlier in the summer, and off it about 4-30 P.M. In the winter it is somewhat later and earlier.

Cost.

23. COST OF UP-KEEP.—It has not been possible to obtain the average cost of the up-keep per acre of the Kulu fruit gardens. Pruning, thinning, etc., are practically done by the fruit-growers themselves, and the value of their labor cannot be appraised. The amount of manure used and the cost of it varies for each garden. It is found to be necessary for the fruit-growers to keep a considerable number of cattle in order to obtain manure at all; this number of cattle is in excess of what they would keep under ordinary circumstances, that is to say, that they give an excess of dairy products, for which there is no market; consequently, in order to make an accurate estimate of the cost of up-keep, it would be necessary to calculate what loss is incurred by their maintenance. Again, some fruit-growers are large landholders and really keep the land in order that they may be able to avail themselves of the services of their tenants when they have need of their labour; and in order to obtain a cheap supply of grain to feed their cattle on. Under these circumstances no cost of up-keep can be given.

Value of outturn.

24. VALUE OF OUTTURN.—For somewhat similar reasons it is not possible to obtain the value of the outturn per acre. In the first place a large number of the trees in the garden are not yet bearing at all, so that it would be necessary to enumerate these and eliminate them from the calculation, allowing so much area of land to each non-bearing tree. Again, of the trees that are in bearing many only give a few seers, or less, of fruit. No separate record has been kept of such trees, the total outturn of each garden being only known. Therefore, in order to arrive at figures on the outturn per acre, which would be of any practical service, it would be necessary to estimate the outturn from such trees, to subtract that from the total outturn, and to treat the trees as if they were not in bearing. Evidently such an estimate would be altogether unreliable. Finally, to give the figures of outturn, without being able to say whether the full-bearing trees had arrived at their limit of capacity, would be useless. Now with most of the trees in the Kulu gardens it is not known whether they have reached their limit of capacity or not, because the gardens have not been long enough in existence for experience on this point to have been acquired.

Appendix I.

Explanation of Appendices.

25. Appendix I shows the age at which trees attain their age of full bearing in each garden, and the weight of fruit they will give at that age; of course in their bearing years only, that is to say generally, every alternate year. It must be understood that in Appendix I by "full bearing" is not meant the maximum possible yield; a tree may be, and is, in full bearing long before it has attained its greatest size or maximum yield of fruit. It is believed that Appendix I contains information about all the pears and apples which are known in Kulu. From it a comparison can be made of the effect of the varying climates, etc., of the gardens on the different varieties of fruit. Varieties which have failed have been noted; but the very large number of new varieties which are now being tried, but have not yet come into bearing, have not been mentioned. In five or six years' time information concerning these varieties will be available.

Appendix II contains some short notes on other fruit grown in Kulu, which fruit, as stated in Section I of this note, has not and is not likely to have any commercial importance in the valley.

APPENDIX I.

Pear and Apple cultivated in Kulu.

Variety of fruit.	Name of garden.	Month in which fruit ripens.	Length of time fruit will keep after being picked.	Kind of bearer.	Age of full bearing.	Weight of fruit per tree at age of full bearing.	Remarks.
				PEARS.			
Marie Louise	Bundrole	August	1 month	Abundant	12 years	2 maunds	Does very well. Captain Banon thinks this pear is Louise Bonne of Jersey.
	Dobi	Ditto	Ditto	Ditto	Ditto	3 maunds	A very large tree. Captain Banon thinks this pear is Louise Bonne of Jersey.
	Monali	September	Ditto	Ditto	...	...	A very large, fine flavoured dessert pear. At age of 7 years tree gives about 15 seers of fruit. .....
Knights' Monarch	Bundrole	September, October.	...	Heavy	10 years	½ maund	
	Dobi	Ditto	...	Ditto	4 or 5 years	5 maunds	Very large dessert pear. Large tree.
	Monali	October	1 month	Ditto	7 or 8 years	½ maund	Medium sized, fine flavoured dessert pear. A failure; the trees gave huge pears, which rotted inside while on the tree. They were grown on both north and south aspects. Captain Lee thought the soil was too light for them and gave 1,700 [illegible] of clay to 150 trees; this [illegible] the defect, and the trees were cut [illegible].

F. 706.

North-West Himalaya. (*C. P. Fisher.*) FRUIT.

KULU.

Winter Nelis	Bundrole	...	...	...	...	...	...	...	Probably the sun was too hot for this variety to succeed.
	Dobi	...	...	...	...	...	...	...	A failure; the trees give a huge pear which rots on them.
	Monali	...	...	...	...	...	...	...	A medium sized dessert pear. The tree blossoms freely, but does not set fruit. The fruit splits on the tree, probably because the climate is too wet; still being tried.
Stuttgart de gerstein	Dobi	July	A bad keeper	Abundant	8 or 9 years	1 to 1½ maunds.	...	...	A very small good flavoured dessert pear. Tree small. This pear is too small for market purposes.
	Monali	June	15 days	Ditto	5 or 6 years	¼ maund	...	...	Small dessert pear. Captain Banon calls this pear the summer Doyenné. It seems probable that each owner has correctly named his own pear.
	Bundrole	July	1 month	Ditto	10 or 11 years.	2 to 3 maunds.	...	...	Trees on the north slope give ripe fruit 10 days earlier than those of the south slope, because the former is more sheltered.
Bergamotte (?)	Dobi	Ditto	Ditto	Ditto	8 years	2 to 2½ maunds.	...	...	A very large, fine flavoured dessert pear. Captain Banon calls this the William's Bon chrétien, which may or may not be correct.
	Monali	August	Ditto	Ditto	6 years	¼ maund	...	...	A good pear if picked unripe. The tree is small and does not do well.
	Dobi	End of August.	10 days	Shy	8 or 9 years	5 seers	...	...	A failure.

F. 706.

FRUIT. | Fruit Culture in the

KULU.

APPENDIX I.

Pear and Apple cultivated in Kulu.

F. 706.

Variety of fruit.	Name of garden.	Month in which fruit ripens.	Length of time fruit will keep after being picked.	Kind of bearer.	Age of full bearing.	Weight of fruit per tree at age of full bearing.	Remarks.
PEARS—*continued.*							
Louise Bonne of Jersey	Monali	September	1 month	Abundant	6 or 7 years	½ maund	A very good medium sized dessert pear. Captain Banon says this is the same pear that Messrs. Lee and Donald call the Marie Louise.
	Dobi	Ditto	...	...	...	...	A failure; the pear rots at the core while on the tree.
Doyenné du Cornice	Monali	August, September.	1 month	Somewhat shy.	...	...	A large dessert pear, which ripens on the tree. At 7 or 8 years of age bears a few pears. Not yet in full bearing.
Clapp's Favourite	Dobi	July	25 days	Abundant	8 or 9 years	2 to 3 maunds.	A very large heavy dessert pear.
Beurré du Congrès Souvenir du Congrès	Ditto	August	1 month	Ditto	5 to 6 years	5 maunds.	These two pears are practically similar. An extremely large cooking pear; a pear of this variety, weighing 26 oz., has been picked.
Grumkaw	Ditto	July	15 days	Somewhat abundant.	10 or 12 years.	1 to 1½ maunds.	A small pear, more suited to cooking purposes than to dessert. Is not doing well.
Angélique cavour	Ditto	August	...	...	...	...	Fruit rots at core. A failure.
Alexander Muscatel	Ditto	September	...	...	...	...	A small delicious dessert pear. The tree bears abundantly but soon rots. A failure.
Beurré blanc	Ditto	Ditto	1½ months	Abundant	5 or 6 years	2 to 3 maunds.	A good dessert pear, apple shaped.

North-West Himalaya. (*C. P. Fisher.*) FRUIT.

KULU.

Gen. Todleben	Ditto	Ditto	...	...	...	...	...	...	Fruit rots on tree. A failure.
Dobi's beauty	Ditto	Ditto	1½ months	Very shy	...	...	...	...	A large irregular shaped dessert pear with peculiar lemon flavour. Trees are now 6 years old and give about 3 seers, but are not yet in full bearing. This tree was grown by Mr. Donald from seed obtained from an imported Marie Louise.
(Name unknown)	Ditto	October	1 month	Shy	12 years	10 seers	...	...	A large irregular shaped dessert pear.
Duchesse de Bordeaux	Ditto	Ditto	2 months	Ditto	10 or 12 years.	½ maund	...	...	An excellent dessert pear, the largest grown.
Winter Bergamotte	Ditto	October, November.	2 to 3 months.	Abundant	7 years	1 maund	...	...	A very large and good dessert pear. Tree small. If fruit is picked green it will not ripen.
Winter Beurré	Ditto	October	1 month	Ditto	8 or 9 years	5 to 6 maunds.	...	...	A large dessert pear. If left on tree to ripen it rots, so it is picked green and ripened in straw.
Jargonelle	Monali	August	Bad keeper	...	...	...	...	...	A failure. The tree blooms profusely, but does not set fruit; what fruit there is rots on tree. Monali is too warm for it. Lahoul would most likely suit it.
Pitmaston Duchesse	Ditto	September	...	...	...	...	...	...	A very big dessert pear. Has been in for 5 or 6 years, and now gives half seer of fruit. May or may not be a success.
Mme. Treyre	Ditto	Ditto	...	...	...	...	...	...	Has been in for 6 years and has given 6 pears. Will probably succeed.
Marie Louise d'Uccle	Ditto	August, September.	...	...	...	...	...	...	A failure. Has not the flavour it should have. Inclined to rot at centre.
St. Swithin	Ditto	July	Bad keeper	Abundant	...	...	...	...	A small dessert pear, without flavour. Rots on tree. A failure.

F. 706.

KULU.

APPENDIX I.

Pear and Apple cultivated in Kulu.

Variety of fruit.	Name of garden.	Month in which fruit ripens.	Length of time fruit will keep after being picked.	Kind of bearer.	Age of full bearing.	Weight of fruit per tree at age of full bearing.	REMARKS.
APPLES.							
Ribston Pippin	Bundrole	September, October.	Good keeper	Abundant	...	...	The trees are now 15 years old and are not yet in full bearing at Bundrole. This apple is called Ribston Pippin by Messrs. Lee and Donald, but they both say it is not the real one. It has been said that it is either Warner's King or Golden Reinette.
Ribston Pippin	Dobi	September	Good keeper	Abundant	13 or 14 years.	1 maund	A very large cooking apple, which has been in for 4 or 5 years, and now gives 5 seers. Captain Banon says this is Warner's King Pippin, but that it is not the same as the Bundrole and Dobi apples of that name.
	Monali	August	Bad keeper.	Heavy.			
Cox's Orange Pippin	Bundrole	September, October.	Very good keeper.	Abundant, but uncertain.	8 or 9 years	1 maund	Will keep through the winter.
	Monali	September.	2 months	Abundant	...	...	An excellent medium sized dessert apple. At 6 or 7 years of age gives about 10 seers. Captain Banon says this is not the same apple as that at Bundrole.

F. 706.

North-West Himalaya. (*C. P. Fisher.*) | FRUIT.

KULU.

Elsheim Orange	Bundrole	September, October.	Good keeper	Very heavy	12 years	1½ to 2 maunds.	A large dessert apple.
	Dobi	Ditto	Ditto	Ditto	7 years	...	Ditto ditto.
Lady Henniker	Dobi	July, August.	Ditto	Abundant	7 years	1½ maunds.	A large, good dessert and cooking apple. Trees will give much more than 1½ maunds when older.
	Monali	August, September.	1 month	Ditto	...	...	At 5 years of age gives about 5 seers.
Winter Hawthornden	Bundrole	August	Fairly good keeper.	Very heavy	8 years	1 maund	Not yet in full bearing. .....
	Monali	September	20 days	Very shy	...	...	This apple is not the same as the Bundrole one, the former being a large, flat, sour cooking apple.
Cellini	Dobi	August, September.	Good keeper	Abundant	...	...	Not yet in full bearing. Will be a very large tree. At 6 years of age gives 10 seers.
	Monali	Ditto	20 days	Heavy	...	...	Not yet in full bearing. At 3 years of age gives 10 seers.
King Pippin	Bundrole	August	Good keeper	Abundant	10 years	1 maund	A small tree.
Autumn Pippin	Ditto	August, September.	Ditto	Fairly abundant.	9 or 10 years	1 maund	An excellent dessert apple. Big tree.
Reinette de Canada	Ditto	...	...	...	...	...	A failure. Apples large and with fair flavour, but won't keep. Climate probably too wet. .....
Corn Apple	Dobi	End of June	Bad keeper	Abundant	6 or 7 years	1 maund	
Red Astracan	Ditto	Beginning of July.	Fairly good keeper.	Ditto	9 years	1½ to 2 maunds.	A very good juicy dessert apple. Slightly acid.

KULU.

APPENDIX 1.

Pear and Apple cultivated in Kulu.

Variety of fruit.	Name of garden.	Month in which fruit ripens.	Length of time fruit will keep after being picked.	Kind of bearer.	Age of full bearing.	Weight of fruit per tree at age of full bearing.	REMARKS.
APPLES—*continued.*							
Dutch Codlin	Dobi	Beginning of July.	Bad keeper	Abundant	7 or 8 years	½ to 1 maund.	A very large cooking apple. Fruit generally gets stained.
Gravenstein	Ditto	July	Fairly good keeper.	Ditto	7 years	½ maund	An excellent medium sized dessert apple, which, however, rots on the tree in a wet season.
Golden Pippin	Ditto	Middle of July.	Ditto	Ditto	5 years	½ to 1 maund.	A small dessert apple.
Bonsdoffer	Ditto	Ditto	Ditto	Ditto	5 years	1 to 2 maunds.	A medium sized good flavoured apple. Fruit grows in clusters.
Autumn King Pippin	Ditto	August, September.	Good keeper	Ditto	5 years	2½ maunds.	Excellent medium sized apple. Tree is large. Captain Banon says that this apple is incorrectly named.
Golden Reinette	Ditto	Ditto	Ditto	Shy	10 to 12 years.	2 to 3 maunds.	A very large, very fine flavoured apple. Very large tree.
Beauty of Wilts	Ditto	Ditto	Fairly good keeper.	Fairly abundant.	12 to 13 years.	1½ to 2 maunds.	A very heavy apple.
Golden Maunday	Ditto	September.	Ditto	...	...	...	A small heavy dessert apple. Trees not yet in full bearing; are now 8 years old and are giving 15 seers.
Stormer Pippin	Ditto	September, October.	Ditto	Heavy	8 or 9 years	1 to 1½ maunds.	A medium sized, light dessert apple, with very fine flavour.

F. 706.

North-West Himalaya. (*C. P. Fisher.*) FRUIT.

KULU.

White Colville	Ditto	September.	Ditto	Abundant	9 years	2 to 3 maunds.	A very large cooking apple.
Lee's yellow	Ditto	October	Very good keeper.	Fairly abundant.	7 to 8 years	2 maunds.	A fine large dessert apple.
Newton Pippin	Ditto	...	...	...	...	...	A failure. Fruit cracks all round.
Russet de Russet	Ditto	...	...	...	...	...	A woolly apple, no use for anything.
Grey Reinette	Ditto	...	...	...	...	...	A late woolly apple. A failure.
Vande Vere	Ditto	...	...	...	...	...	Apple without flavour, like a turnip. A failure.
Whorle Pippin	Monali	July, August.	1 month	Heavy	...	...	A medium sized dessert apple. At 5 years of age gives 10 seers.
Adam's Pearmain	Dit to	September, October.	2 months	Shy	9 or 10 years.	5 seers	A good medium sized dessert apple. Probably not yet in full bearing.
Devon Quarrenden	Ditto	July, August.	Bad keeper	Fairly abundant.	6 or 7 years	5 seers	Probably not yet in full bearing.
Kerry Pippin	Ditto	August, September.	1 month	Ditto	5 years	5 seers	A small dessert apple. Probably not yet in full bearing.
Lord Lutfield	Ditto	August	Bad keeper	Heavy	4 years	5 seers	A big cooking apple, with very delicate skin. Probably not yet in full bearing.
Mére de Menage	Ditto	August, September.	14 days	Fairly abundant.	7 years	10 seers	A cooking apple, very heavy.
Passgood Nonesuch	Ditto	September	1 month	Heavy	...	...	A large flat dessert apple. At 5 years of age gives 6 seers of fruit.
Emperor Alexander	Ditto	Ditto	Ditto	Shy	...	...	A large cooking apple. At 5 years of age gives 1 or 2 seers.
Monk's Codlin	Ditto	September, October.	4 or 5 months.	Fairly abundant.	...	...	A large cooking apple. At 8 years of age gives 10 seers.

F. 706.

FRUIT.	Fruit Culture in the

KULU.

Appendix II.

Other Fruits cultivated in Kulu.

Apricots. APRICOTS.—The apricot (**Prunus armeniaca**) is very common in the jungles of Kulu. The fruit is largely eaten by the people mostly in its green state. Oil is expressed from the kernels, and it is used for eating and burning purposes as well as for anointing the hair: it is an excellent application to rub on a sprained ankle. Captain Banon says that he sent a sample home, and it was sold for 1*s.* 6*d.* a pound in London. The fruit is small and has little flavour. English apricots do not do well in Kulu; they are stringy and have little flavour. Mr. Donald finds that German forms (variety unknown) do better and have more flavour. The Ladak apricot is said to do well high up the valley and to have better flavour than the Kulu, which latter, however, makes good stock.

Peaches. PEACHES.—Are very common and are eaten largely by the people; they are eaten both green and dry. Oil is also made from their kernels, but it is inferior to apricot oil. They make good stock. An American peach, the Wellington, has been successfuly grown at Dobi. At Aramgarh too an excellent peach—variety unknown—is grown. The soil of this garden is somewhat heavy loam, 2′ deep, with clay underlying. A lot of manure is given to the trees every spring, and the roots are opened up in the winter. Peaches of most excellent flavour, 11′ girth, have been grown at Aramgarh. Loquats of good flavour are grown at Aramgarh.

Plums. PLUMS.—The plum (**Prunus communis forma bokhariensis**), or Alu Bokhárá, are common in Kulu, ripening in August. They make good stock, but have no flavour. English varieties do very well at Monali, and generally bear abundantly. Captain Banon notes that such cooking plums as the Victoria and yellow Magnum Bonum are dessert plums when grown in Kulu.

Cherries. CHERRIES.—Are found wild* in Kulu: the fruit ripens in June. They are of no value, except that they make good stock. Captain Banon has some English ones at Monali, which have succeeded.

Grapes. GRAPES.—Two varieties are said to be indigenous. English varieties do well at Bundrole and other gardens, but the fruit is generally spoiled by the rain. At Dobi and Monali the Muscat Alexandria has given good fruit, ripening after the rains; the latter place, however, is hardly hot enough for it.

Walnut. WALNUT.—The **Juglans regia** is common in Kulu. There are two varieties of it, (?) one of which furnishes an excellent nut, which is largely consumed by the people.

Oranges. ORANGES.—Are grown successfully at Bajaura and in the lower part of the valley. Some have been put down at Katrani, about 5,000′, and are doing well, though they have not yet borne any fruit. There are also a good many Limes in the lower part of the valley, *i.e.*, at Sultanpur (4,000′), at Bajaura lower down, and in Lower Rupi.

Figs. FIGS.—The **Ficus Carica** is common, and there is said to be another species of fig. The fruit is eatable. English figs do well at Monali. Captain Banon, however, has been successful with the brown Turkey.

Currants. CURRANTS.—Two varieties are indigenous—(1) the black, **Ribes nigrum**, which is a shy bearer, and eatable; (2) the red, **Ribes rubrum**, an abundant bearer, but uneatable. They both ripen in June.

Gooseberries. GOOSEBERRIES.—There is one variety found in Lahoul, the **Ribes Grossularia**, which is very acid. English varieties are shy bearers.

* The so-called cherry of the Himalaya is **Prunus Puddum** and is, therefore, not the cherry of European writers which is **Prunus Avium** and **P. Cerasus**.—ED.

KULU. Strawberries.

STRAWBERRIES.—This plant is indigenous and in some places, especially in the higher hills, has a most excellent flavour. The rains, however, generally spoil it. English strawberries do well.

Pomegranates.

POMEGRANATES.—Are found in the Banjar and Sultanpur gardens; an imported variety. The fruit generally rots on the tree.

Olives.

OLIVES.—There is a wild species which is common enough. It does not bear abundantly: the fruit ripens in October. An imported form has been introduced at Bundrole, but all the trees have been attacked by a blight, and are either dying or dead.

Spanish Chestnut.

CHESTNUT.—A more detailed account of the introduction of the Spanish chestnut into Kulu is furnished by Mr. Gisborne Smith, Deputy Conservator of Forests, Lahore, as follows :—

"In 1874-75 Mr. Duff, Deputy Conservator of Forests, introduced the Spanish chestnut into Kulu, and one of the trees so introduced in the Monali forest garden (between 6,000′ and 7,000′ elevation) was reported to be 6′ 10″ in height in 1878-79, whilst trees at Bundrole (about 5,000′) bore fruit the same year.

In March 1877-78 some imported seed was sown in the Monali forest garden by Colonel Stenhouse. The seed was sown in prepared beds, and balls of arsenic and flour were strewn about the nursery to save the chestnuts from vermin. A matted roof about 3′ high was erected over the seed beds. Six hundred seedlings germinated, which were planted out in the winter of 1878-79. Out of these only 204 plants survived, and attained an average height of 4′ 9″ in 1883-84 and 13′ 5″, with an average girth of 1′ 3″ in 1888-89. Twelve of these were transplanted in the Government tehsil garden at Sultanpur (about 4,000′ elevation) and did very well. In 1878-79 four boxes of seed were imported from Europe, but found to be bad. In 1885-86 the Spanish chestnut raised in Kulu seeded freely, and has continued to do so more or less every year since.

At first the seed was annually distributed to the zemindars, in the hope that they would sow it at their villages and cultivate the tree; but this arrangement was unsuccessful, as were also attempts to distribute seedlings. When seed was given it was as often eaten as sown, and the people are too lazy and apathetic to take interest in any venture which has not more or less immediate results.

In 1888-89 sixteen Spanish chestnuts were raised in Dharmsala from seed procured in Kulu, and in 1889-90 eleven Spanish chestnut plants were transplanted from Monali to the Nagar forest bungalow compound.

In 1890-91 some interesting experiments were made with the seed which are quoted *in extenso* from Mr. Pigot's Annual Report :

'During the year efforts were made in concert with the Assistant Commissioner of Kulu to raise sweet chestnut plants from seed at Monali, Nagar, Sultanpur, and Banjar. Seed of the year 1888 was sown after ripening in the winter, while other sowings were made from the same seed which had been stored in dry sand until the spring of 1890. In neither case, however, did germination ensue. Some seed which ripened in autumn of 1890 was sown at once and kept under cover and watered, and some of these have germinated.'

It is an ascertained fact that sweet chestnuts retain their germinating power for about 6 months only, so that it is not a matter of surprise that these experiments, though carefully undertaken, were unsuccessful. At present the Spanish chestnut is distributed as follows throughout the Kulu valley :—

Monali,	Bundrole,
Nagar,	Sultanpur,
Raison,	Bajaura, and
	Plach.

The trees in Kulu, with few exceptions, are inclined to be bushy, and this may be said of the growth of this species generally throughout the Himalayas. But the defect is one that can be cured by slitting the bark of the trees with a sharp penknife down either side of the trunk. Young trees so operated shoot upwards very rapidly, and examples of straight well grown trees may be seen at Aramgarh where this experiment was made.

[The SIBERIAN CRAB.—Near the village of Phulga the Editor found several trees of **Pyrus baccata** covered with fruits.—*G. W.*]

KULU, Spanish Chestnut.

F. 706.

Mode of cultivating Spanish Chestnut.

Best method of propagating, and condition.	IF PROPAGATED BY SEED.							IF BY CUTTINGS.
	Month when seed ripens.	Time seed will keep good.	Method of storing seed and clearing, if necessary.	When to be sown.	Method of sowing recommended.	Age at which to be planted out.	Best method of planting in various situations.	Method of making cuttings, etc., and season in which made.
From seed. Grows best at 4,000′ to 6,000′ elevation.	August, September.	About 6 months only.	Should be sown when ripe; does not keep good longer than 6 months. If kept during winter, should be laid on sand out of reach of vermin.	October, November, or March, April.	Should be sown in drills 6″ apart in nurseries of fine rich soil and covered with about 1″ of earth, and leaf mould to hide from birds. Nursery should be fenced and thorns put over beds. A sure way of raising seed is to sow in boxes out of reach of vermin and birds, and when seed has germinated prick out into beds. Fencing of nurseries is necessary. Regular watering and sometimes shades over beds or boxes will be found requisite till plants are established.	3 or 4 years.	Spanish chestnut is rather a short tree, and as it is also inclined to grow bushy it should be planted close. The bark of the young tree should be slit longitudinally on either side of trunk with a sharp knife to encourage upward growth. It would do best in groves near Dâk Bungalows. Fencing is necessary, as goats eat leaves and young shoots.	

KULU.

Those readers who would pursue the cultivation of the Spanish chestnut further are referred to "Reports on the cultivation of the Spanish chestnut in Europe" distributed from the India Office in 1892, through the Revenue and Agriculture Department. Here they will find full information on the cultivation and value as food of this fruit in various provinces of Spain and Italy.

The following additional notes regarding some of the fruits grown in Kulu have been supplied by Captain Banon of Monali, and although some of the information has already been given by Mr. Fisher, they will be read with interest, as Captain Banon has had nearly 12 years' experience in that district :—

Apples.

APPLES.—"The indigenous Himalayan apple is found all about. It blossoms and ripens its fruit before any English varieties that have yet blossomed with me. The Himalayan apple is a small greenish yellow fruit when ripe. It has a faint sweetish taste without any briskness, and is much appreciated by the Lahoulis, who buy the fruit from the Kulu people in July. The Himalayan apple answers admirably as stock for budding English varieties of apples on. Whether it would be of any value as a cyder apple I cannot say. All the English varieties I have yet experimented with have answered admirably. They seem to improve as regards flavour, size, and color; and usually ripen a month earlier than in England. On the other hand, in wet years some of them betray a tendency to decay at the core and lose their long keeping qualities. Some become mealy in little or no time, and the slightest bruise will at once cause the fruit to decay. Apple trees here come earlier into bearing than trees at home (England) by one or more years. It is therefore probable that their life-term will be shorter. Even this place, in some years, is perhaps a little too warm for apples, though they seem to answer well enough at Dobi and Bundrole, places some 1,500′ lower in elevation. I think the Revd. Mr. Carleton should have experimented at Arni with apples from the southern states, U. S. A., such as Ben Davis, Greencheese, Hall, Horse, Mangum, Maverack, Sweet, Nickajack, Pryor's Red, Rawles' Janet, Shockley and others. Should these fail, I would recommend Amassia, an apple grown in Asia Minor and along the shores of the Mediterranean, or Mela Carla, an Italian apple grown in the neighbourhood of Turin, and of which Dootor Hogg speaks in the highest terms. Some English apples, as, for instance, Cox's Orange Pippin, which is considered the most delicious apple in England, the soil and climate of this place seem to suit perfectly; and if one grew apples simply for profit, one should grow nothing but this sort for the Simla market.

Pears.

PEARS.—Pears do well here, but not so well as apples. The indigenous Himalayan Medlar pear* is found in great profusion all round, and is called *Shegal* in the Kulu dialect and *Móhl* in the Garhwali language. In the autumn the Kulu people collect the fruit and ripen it by fermentation, they then pound it, extract the seeds, and use the remainder as a sort of flour when dried and cooked. The *Shegal* answers admirably as stock for English pears, medlars, and quinces. If anything, this place is a little too cold for pears in some years, as the pear seems to thrive better and bear more profusely at Dobi and Bundrole than here. Louise Bonne of Jersey is the most profitable pear to grow here for market, though Marie Louise and Williams' Bon Chrétien also grow well, and with a superior flavour to the fruit grown in England. It does not seem that the Revd. Mr. Carleton has experimented with pears at Arni; which is a pity, as some varieties would be pretty certain to have answered well there, if sufficient moisture is available. Pears grown here attain a larger size, much finer color, and superior flavour, except in very wet seasons, to fruit grown in England. Like the apples they ripen here a month before their usual time in England; and like the apples, some varieties show a tendency to decay at the core. One or two varieties, like Marie Louise d'Uccle, likewise lose the fine flavour for which they are celebrated in England, and taste here rank and insipid.

Apricot.

APRICOT.—Both the country and English varieties of the apricot grow well here, but for one drawback. For several years past I have noticed that the first ripe apricot and the monsoon rains arrive together on the same day. The effect of the rain is to wash all the flavour out of the apricot, cause the fruit to split open, and prevent its ripening properly. Sometimes after the first burst of the monsoon we get ten days or a fortnight's fine weather, when the apricot ripens perfectly and is not wanting in flavour. The Kulu people extract a fine oil from the kernels of the wild apricot ('L'huile de Marmote' of the French). It is sometimes used

* **Pyrus Pashia**, *Ham.*—ED.

FRUIT.	Fruit Culture in the

KULU.

Apricot.

to adulterate ghi, but mostly as hair oil and a body lubricant. As a hair oil it is far superior to Macassar, thus falsifying that line of Byron in Don Juan 'Naught is incomparable save thine oil Macassar.' A sample of apricot oil I sent to Calcutta was appraised at *1s. 6d.* per ℔ in the London market. It would be of the utmost value to watchmakers and others, for the oil will only freeze at a very low temperature. At present it would not be profitable to grow apricots as market produce as the fruit ill bears carriage; but perhaps in the future it might be utilised for jams, jellies, and cheese, like guavas and damsons. A good spirit, like peach brandy, could also be extracted from apricots. I agree with the Revd. Mr. Carleton in thinking that good varieties of the Cashmere, and perhaps English, apricots might be introduced into the villages, as probably the Himalayas were the original habitat of the apricot, and they seem to be able to grow here under the most outrageous treatment, and require little or no care or attention; provided, of course, that the American drying machines are available, otherwise the fruit would have little or no market value. As it is in Kulu the fruit is dried, to some extent, in the sun, and kept for home use. I have also the Ladakh apricot here, a little larger and perhaps better flavoured than the country variety, ripening at the same time. It has a sweet kernel.

The wild apricot makes a good stock to bud the English apricot on. In England they use the Muscle plum as stock. The apricot in England would perhaps become hardier were kernels of the Himalayan apricot sent there for stock purposes; any way it would be worth experiment.

Peaches.

PEACHES.—There is the indigenous Himalayan peach nearly as common throughout Kulu as the apricot. The people here pick the fruit in the autumn and dry it for home use. They also extract an oil from the kernels, only inferior to apricot oil. A very fine oil is also extracted from the fruit of a wild thorn called here *Behál*, though I do not know its scientific name.* The wild peach does not ripen here properly, though it ripens satisfactorily at Manglaur in August, at the same time as the small wild purple fig. That handsome flower, the marvel of Peru, also grows around Manglaur in August in the greatest profusion and luxuriance, as if indigenous to the country. The wild peach when properly ripened is small and green and pleasant to eat, with plenty of juice, but without much flavour or sweetness. It makes good stock to bud English peaches on; and might be experimented on in England, where they bud the peach on the plum. English peaches would do very well here, but for a disease which attacks them and kills the tree within 5 or 6 years. On this account I get peach stones from England and sow them. They come into bearing in 3 or 4 years. After the tree has borne two or three crops I cut it down, and let it spring up again from the roots; when it again bears a crop the second year after cutting down. Peaches, like apricots, will not bear carriage to any distance; and they also, like apricots, should be dried for export. Jams and chutnies could be made from them, and also peach brandy. I am surprised Mr. Carleton makes no mention of peaches, as I fancy they would do well if grown at Ani from American kernels, especially the American variety called Honey, supposed to be a China peach, of surpassing sweetness and flavour. Peaches grown at Dobi and Bajaura are less subject to disease, and apparently do better than here, requiring a warmer climate than they can get here. They stand the monsoon rains better than apricots, though they also lose their flavour after heavy and continuous rain. They ripen mostly in August and early part of September, as a general rule here.

Plums.

PLUMS.—There are immense quantities of the common hill plum, known as *Alu Bokhárá*, grown in this valley, of many kinds and colors; but they are mostly either sour or insipid, though much relished by the Kulu people. They ripen here in August and are damaged and destroyed by the monsoon rains, and the little flavour they have washed out of them. They do, however, very well as stock for English plums. English plums do very well here, coming early into bearing, and bearing heavy crops. In fact they are too ready to kill themselves by overbearing, all except the greengage, which is a shy bearer here. Cooking plums like Victoria, Pond's seedling, yellow Magnum Bonum, Denbigh seedling, and others, improve so much in flavour and sweetness here that from cooking plums they become dessert plums. They ripen here, like most other fruit, a month before their time in England. Plums, like peaches and apricots, do not bear carriage well, and so would not have much market value, except as jams and preserves.

Cherries.

CHERRIES.—The wild Himalayan cherry† is indigenous to Kulu as well as Kangra. It flowers in the autumn and ripens in the spring in Kangra and the lower

* Prinsepia utilis, *Royle*.—ED.

† See remark, foot-note, page 42.

KULU.

end of Kulu valley. When ripe it becomes black from red and bitter in taste, and has no value except for cherry brandy and stock for English cherries. All kinds of English cherries, red, black, and white hearts ripen well here; but if anything, the climate is a little too warm for them. They ripen, as a general rule, early in June, and are the first fruit to come into the market. They would not be very profitable to grow, as they do not bear carriage well. If the Post Office were to halve their rates for the parcel post, a good trade might be done with the more perishable fruit, but at present few people can afford to pay 8 annas a seer on consignments of fruit, though they would be willing enough to pay 4 annas.

Cherries.

Grapes.

GRAPES.—There is an indigenous (or long acclimatised) grape here, but of no great value. I used to grow it, but could never save the grapes from the hornets. There is also another small variety of grape that grows wild in the lower parts of the valley which I have never come across when ripe.* I have grown Gross Colmar. It bears in profusion, but the monsoon rains and mildew have always hitherto prevented the grapes from properly ripening. With the Muscat Alexandria I have had better success, it ripening after the rains; but only well in hot summers. I am experimenting with other varieties. I am glad to hear that Mr. Carleton has been so successful with his American grapes, but I have always understood that they have a peculiar foxy taste and flavour, which unfits them for English palates. I do not think they would be suitable for village culture, as they do not bear carriage well, and have many enemies among birds and insects; to say nothing of the great attention grapes require in pruning back, thinning, and heavy manuring. Some of the better sorts of American grapes, such as Catawlea, Isabella, Maxatawney, and others would, without doubt, be well worthy of introduction into the lower valleys of Kulu. Late English varieties, ripening after the monsoon rains, should do well at Dobi and Bajaura. Perhaps Black July, Scotch white cluster, and other early English grapes that would ripen before the rains would do equally well. But the cultivation would never be profitable, as grapes cannot stand carriage without the most skilled packing.

Figs.

FIGS.—There are two kinds of wild hill figs indigenous to Kulu; the little blue one ripening at Manglaur in August is liked by the Kulu people, though without much flavour; the larger reddish kind is only appreciated by the birds for its seeds. English figs, like Brown Turkey, do fairly well here, and bear two crops in the year. The flavour is all that can be wished for. I am surprised Mr. Carleton has not experimented with them at Ani, where they should do very well if saved from such insect pests as the borer, which renders their cultivation very difficult lower down in the valley, though non-existent here.

Currants.

CURRANTS.—The red and black currants are indigenous to Lahoul and Kulu at high elevations. The black currant is passable, but the other is sourness itself, like the gooseberry in the wild state. Both red and white currants do well here, bearing profusely, and ripening in June usually. The black currant is a shy bearer I have found so far."

Mr. Banon mentions several other fruits which it would be beyond the scope of this paper to discuss, and concludes by advocating a good and direct road from Simla to Kulu, whereby fruit could be sold at half its present rate.

Prospects of fruit-culture.

Mr. J. S. Mackay of Monali writes as follows :—

"Where my small orchard is at Monali is a little over 7,000′ above sea level, and I am safe in stating that in no country can the size and flavour of the apples be surpassed. I have gathered as many as 8 maunds from one tree—an old imported one from home—and from young trees budded from the same tree I have gathered one maund and ten seers in the fourth year after the bud was put on the stock. I think that at the present moment the fruit in Kulu is certainly the finest in India. I have a small orchard of pear trees which is just beginning to bear, and as the wild pear 'Shegal' grows abundantly all round, it ought to grow as well as the apple. I have seen very prolific orange trees in Colonel Rennick's garden at Bajaura, but in winter the trees have to be protected from frost and cold winds. The cultivation of this tree in Kulu would never pay at the rates quoted by Mr. Carleton. Fruit cultivation has extended considerably in Kulu during the last five years, and even now it is not easy to dispose of all the fruit grown in the valley. What we want, and what it must come to, is a company to buy up all the fruit. Last spring I got six orange trees by post from the Government Gardens at Saharanpur, and planted them in my young orchard at Katrani. All the six trees are growing splendidly."

* Vitis parvifolia—gives a small, edible grape which might by cultivation be greatly improved.—*G. W.*

VIII.—CONCLUDING REMARKS.

Summary.

In the foregoing pages numerous points connected with the growing of fruit have been discussed, such as the localities where fruit can be profitably grown; the elevation and situation suitable to each kind; cultivation, method of propagation, and manuring; and various other matters, so that it is already apparent that, with suitable precautions, fruit of the best kind can be grown for the market. We have also seen that, with a few exceptions in Kumaon, the distribution of grafts among the native cultivators has been without results, and there remain the practical questions as to how the native zemindar can be induced to take an interest in fruit-growing, and whether it is possible to show him that it is worth his while.

The prices obtainable for good dessert fruit at any of the larger hill stations where the demand is enormous, to say nothing of the large cantonments in the plains below, amply prove that cultivation of fruit may be made a lucrative profession, for however much this may be extended, the demand will be for many years to come a long way ahead of the supply, and even though the present almost prohibitive prices should not be maintained, a much lower wholesale rate would still leave to the cultivators a good margin of profit. Kumaon apples are sold in Calcutta at rates varying from two annas to one rupee each, the higher prices being paid for picked kinds, and apples from Kulu find their way as far as Quetta. So it is practically certain that with quick and easy means of transport, and good communications, the market is sufficiently large to guarantee extended cultivation.

Village cultivation.

The main difficulty with the native zemindar, besides his apathy which example may overcome, is that his outlay will not prove productive till after the lapse of some years; still the same argument holds good in the case of oranges and mangoes, and that does not prevent the native cultivator from starting gardens for those fruits in the plains. To get over this difficulty and to show the zemindar of the North-West Himalaya how to grow fruit, it is essential that Government should take the initiative and should organise orchards in suitable localities. The areas need not be large, (two or more acres in extent would be ample), and each area should be securely fenced by a six-feet-wall all round. The ground should be terraced where too steep, and good soil should gradually be brought into the enclosure. Such orchards might be made near all important bungalows wherever there is a chowkidar, as until the trees began to bear fruit the services of a trained gardener would not be required once the area had been stocked with good grafts.

Government orchards.

Every effort should at the same time be made to induce villagers to establish similar enclosed gardens for themselves; and even though the present generation of zemindars may not be sufficiently energetic to plant fruit trees, the next and rising generation, seeing successful orchards everywhere may do so, and we must look to the future. The old adage "Example is better than precept," should not be forgotten, and just as in many other industries—of which tea culture in the Dehra Dun may be quoted as an instance—Government took the initiative and prepared the way, so they should act in the present case; for it is by this means only that the native zemindar will be induced to believe that it is worth his while to undertake fruit culture.

SHILLONG;
June 15th 1894.

F. 706.

INDEX.

Numbers refer to pages.

G I. C. P. O.—No. 420 D. R. & A.—17-6-95—800—H. R.

All communications regarding THE AGRICULTURAL LEDGER should be addressed to the Editor, Dr. George Watt, Reporter on Economic Products to the Government of India, Calcutta.

The objects of this publication (as already stated) are to gradually develop and perfect our knowledge of Indian Agricultural and Economic questions. Contributions or corrections and additions will therefore be most welcome.

In order to preserve a necessary relation to the various Departments of Government, contributions will be classified and numbered under certain series as well as under the specific names of the products. Thus, for example, papers on Veterinary subjects will be registered under the Veterinary Series. Those of more direct Agricultural or Industrial interest will be grouped according as the products dealt with belong to the Vegetable or Animal Kingdom, or if of a collective nature they will be placed under the Agricultural, Industrial, or Forest Series. In a like manner, contributions on Mineral and Metallic subjects will be registered under the Mineral Series in addition to that of the name of the mineral dealt with.

This sheet and the title-page may be removed when the subject-matter is filed in its proper place according to the letter and number shown at the bottom of each page.

Forest Series, No. 1.)

THE

AGRICULTURAL LEDGER.

1895—No. 1.

ACACIA CATECHU.

CATECHU OR CUTCH, AND KATH.

[*DICTIONARY OF ECONOMIC PRODUCTS, Vol. I., A. 135–199.*]

Review of the Proceedings of the Government of India (Forest Department) on the subject of the isolation of **Catechu** *and of* **Kath** *from the wood* **Acacia Catechu**—*by* THE EDITOR.

CALCUTTA:
OFFICE OF THE SUPERINTENDENT, GOVERNMENT PRINTING, INDIA.
1895.

The objects of THE AGRICULTURAL LEDGER are:—

(1) To provide information connected with agriculture or with economic products in a form which will admit of its ready transfer to ledgers;

(2) To secure the maintenance of uniform ledgers (on the plan of the Dictionary) in all offices concerned in agricultural subjects throughout India, so that references to ledger entries made in any report or publication may be readily utilised in all offices where ledgers are kept;

(3) To admit of the circulation, in convenient form, of information on any subject connected with agriculture or economic products to officials or other persons interested therein;

(4) To secure a connection between all papers of interest published on subjects relating to economic products and the official Dictionary of Economic Products. With this object the information published in these ledgers will uniformly be given under the name and number of the Dictionary article which they more especially amplify. When the subject dealt with has not been taken up in the Dictionary, the position it very possibly would occupy in future issues of that work will be assigned to it.

E. C. BUCK,

Secretary to the Government of India.

(Forest Series, No. 1.)

THE

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[*Dictionary of Economic Products, Vol. I.*, A. 135—199.]

Review of the Proceedings of the Government of India (Forest Department) on the subject of the isolation of **Catechu** *and of* **Kath** *from the wood of* **Acacia Catechu**—*by* THE EDITOR.

The Extracts derived from Catechu trees

The present review is intended to make known recent information on the subject of Catechu and thus to amplify and correct the account of that substance as given in the Dictionary of Economic Products which was published in 1884. In that article opportunity was taken to impress on the reader that there exists two, if not three, extracts, obtained from the Catechu tree, which in India are known as (*a*) dark Catechu or Cutch, (*b*) pale Catechu or *Kath*, and (*c*) a natural product found within the wood known as *Kirsal*. It was suggested that a more careful examination of these trade products might reveal their independence chemically, and accordingly that the Indian experience might be found to be more than due to mere variation in degree of purity. That suggestion led to an enquiry throughout India and to the performance of certain chemical investigations both in Europe and in India. Before proceeding to review the new facts that have thus been brought to light, the writer thinks it may serve a useful purpose to give here a brief abstract of his original statements and opinions, without which the subsequent particulars might be unintelligible to persons who had not the opportunity of consulting the original.

I.—Preparation of dark Catechu, or, as in trade, it is more correctly designated Cutch.

Trees suited for extraction of Cutch.

The trees that yield this substance are regarded as mature when about a foot in diameter. They are then felled and cut up into blocks two or three feet long. In some parts of the country the Natives ascertain whether it will pay to cut the trees, by making a small notch into the heart-wood. Trees between twenty-five and thirty years old are regarded as best suited and are said to yield more or less according to the number of white lines perceived in the heart-wood. The bark and the outer sap wood are generally removed and rejected. The red heart-wood is then cut up into small chips. In certain districts the branches are not utilized in the preparation of the extract, in others they are so used.

Mode of extraction.

The chips are then boiled in water in earthen pots for twelve hours. When the water is reduced by one-half, the chips are taken out and the liquid placed in large iron pans or cauldrons and again boiled and stirred till it attains the consistency of syrup. The cauldrons are then taken off the fire and the stirring of the liquid continued till the mass is cool enough to be handled, when it is taken out and spread on leaves arranged within a wooden frame or mould and left for the night. In the morning the Cutch is dry and then exists as brick-like masses that each weigh 36 to 44lb. These are broken up into pieces ready for the market.

The process of boiling and preparation of the dry extract varies considerably all over the region where the article is made, but the principle is the same as that given above, which may be said to be the Pegu system. Occasionally the chips are boiled a second time with the production of a small amount of inferior stuff. In other cases the red liquid is poured over fresh chips and again boiled.

The stirring or beating process.

From the widespread conviction of the necessity for stirring or beating the concentrated solution (on its being removed from the fire), it might almost be inferred that some chemical change was thereby effected similar to the oxidation produced by beating the indigo-vat solution. Thus, for example, in Baroda the decoction is strained through a blanket. For this purpose the blanket is dipped into the fluid, stirred about and then wrung out, while the blanket is being held at as great a height as possible. By this process the liquid falls through the air in a greatly divided stream or shower. And this is continued for an hour or so, the liquid being repeatedly wrung through the blanket, the trough is then covered over with a lid of split bamboos and the sediment allowed to subside. The water is then poured off and the extract cut into small cakes and allowed to dry.

In Bariya (Gujarat) the thick decoction is poured into pits, five or six feet deep, in the bottom of which baskets are placed. The liquid drains off, the chips are retained in the baskets, and the solid extract formed on the floor of the pits. This is removed and dried on leaves while exposed to the sun.

Speaking of the Pegu system, it is admitted that much difference of opinion prevails as to the value and extent necessary of the beating process. One writer says it is more of a "beating up" than stirring, "but I have never been able to ascertain what the object or effect of the process is. Cooks differ, too, in the amount of beating up that is desirable, some being satisfied with half an hour's application." It will be seen below in connection with the subject of *Kath* that a peculiar system of encouraging crystallization (which may be analogous to the beating) is considered essential.

Stirring: *Conf. with p. 7.*

Season for manufacturing Cutch.

In Pegu the manufacture of this article extends from June to March, but the months of December to March are regarded as the best. In April and May scarcity of water is supposed to stop the works, while in the rainy season the difficulty of transport checks the industry.

Yield.

As to the amount of Cutch yielded by heart-wood, it had been stated that from 3 to 10 per cent. in weight would be a good average. In other words, one ton of timber, in the round, might be taken as yielding 250 to 300lb of Cutch.

Appearance of Cutch.

The Cutch of trade appears in several forms. The Pegu variety occurs in masses with layers of leaves between the successive preparations. But Cutch is also met with in cubes of various sizes which often show the markings of leaves used in the moulds, or it occurs in sharply defined cubes or blocks from having been cut up by a string or wire run through the still plastic mass. In other cases it is sold in rounded balls or flattened cakes made in the hand.

In colour it is externally of a rusty brown, internally a dirty orange to dark liver-colour, and in some cases almost black or port-wine coloured. It is inodorous, but has an astringent bitter taste, followed by a sense of sweetness. It is brittle and breaks with a more or less resinous, shining fracture.

II.—Preparation of Pale Catechu or Kath.

Preparation of pale Catechu or Kath.

This is a crystalline substance prepared from a concentrated decoction of the wood by a slightly modified process to that described for Cutch. A bunch of twigs is placed in the hot solution and the pots are then set on one side to cool. The twigs are subsequently removed and the crystalline substance adhering to them is collected and compressed into cubes of various sizes. Whether or not the liquid is rejected or afterwards boiled down to produce a poor quality of dark Catechu or Cutch does not appear to have been ascertained. The crystalline substance *kath*, as met with in the bazars, occurs in irregular pieces, in square blocks or in cubes similar to those of gambier. This is the substance eaten by the natives of India in *pán* and it is (at least in its purer forms) never exported.

Conf. with p. 14.

It seems probable, however, that there may exist an industry practised more or less as a secret in various parts of India, in preparing the crystalline article *kath* from the cruder substance Cutch, since its direct preparation from the original decoction has only been observed in Kumaon, though the substance is universally used all over India and fetches a higher price in the bazars than does Pegu Cutch.

This subject deserves to be thoroughly investigated, and the merits of *kath* and its process of manufacture made known. The dark and the pale forms of *khadira* were both well known to the early Sanskrit writers, but in modern times, and especially in the European export trade, they seem to have been confused, with the result very possibly of gambier having been substituted for catechu in European medicine.

III.—Kírsal or Khersal.

Kirsal.

The woodmen when cutting up the trees to prepare the chips employed in boiling for Cutch and *Kath* sometimes come across a substance imbedded in the wood which they carefully remove and sell under the name of *kírsal*. It is much valued by the Hindus and fetches a high price. It has apparently never been chemically examined, but is possibly a pure state of Catechin.

ACACIA Catechu.

The Isolation of Cutch,

Chemists' opinion.

The following passages from the Dictionary of Economic Products may be here republished as exhibiting the opinions of some of the leading chemists prior to 1884 :—

"Catechu contains a variety of tannic acid called *Mimotannic acid*, which is soluble in cold water, and *Catechu* or *Catechuic* acid, which is insoluble. Mimotannic acid differs from tannic acid in yielding a greenish-gray precipitate with ferric chloride, and by not producing pyrogallic acid when heated. The destructive distillation of Cutch yields *Pirocatechin*. Quercetine is stated to be contained in Cutch. This principle is the yellow crystallizable substance to which the bark of **Quercus tinctoria**, *Oliver*, owes its colour" (*Dr. C. F. Hislop Warden*)

The chemistry of the Catechus has occupied the attention of chemists for some time back, but as yet the views and conclusions arrived at are somewhat conflicting, and the subject may be regarded as still involved in considerable obscurity. The brief chemical note (above), which my friend **Dr. Warden** has supplied, may be regarded as an abstract of all that is known. In his *Science Papers*, the late **Mr. D. Hanbury** suggests that the process by which the various kinds of Cutch, Catechu and Gambier are obtained should be carefully studied by persons who have the opportunity of doing so on the spot, and that the trees yielding each of the forms of these substances should be accurately recorded; "for," he adds, "we wish to identify the trees with the respective extracts." It would seem that our ignorance upon these important points may have much to do with the conflicting chemical results which at present exist regarding the composition of Cutch. There are at least two, if not three, distinct products obtained from each of the Cutch-yielding trees, and it is just probable these may have been experimented upon indiscriminately by the chemists of Europe It would be but in keeping with other instances of two or more species (still more so of members of different Natural Orders of plants), yielding approximately the same product, to find that the trees which afford the Cutch of commerce produce substances chemically dissimilar. Some such explanation may be found in the future to account for a certain number of the conflicting opinions which at present exist regarding the chemical composition of Cutch and its derivatives. A similar example may be mentioned in the fact that **Aconitum Napellus** yields a different alkaloid from **A. Ferox**. although both species have hitherto been used in the preparation of Aconitia.

Pegu Catechu, "when immersed in cold water, turns whitish, softens, and disintegrates, a small proportion of it dissolving and forming a deep-brown solution. The insoluble part is Catechin in minute acicular crystals" (*Flück. and Hanb., Pharmacog., 243*). When the crude Cutch of commerce is subjected to a dry heat of 110° or 100°, in an atmosphere of hydrogen, it fuses and becomes transparent, losing 4 to 5 per cent. of its weight. It melts at 140° without further loss of water. On ignition there is left 3 to 4 per cent. of ash. If pure, it should be completely soluble in boiling hot water, the solution precipitating the insoluble crystals of catechuic acid on cooling. Ether extracts from Cutch its catechin or catechuic acid so that by precipitation from a hot solution, or by means of ether, this substance may be separated for chemical or industrial purposes.

Conf. with Warth's analysis, pp. 7. 9.

In addition to catechin, Cutch contains, however, other two substances, *viz.*, Mimotannic acid *plus* a gummy extractive principle (=Catechu tannin). Mimotannic acid is soluble in cold water, and by simple maceration may, therefore, be removed from Cutch. The solution will be observed to be of a thick chocolate colour. If heated to the boiling point, it is rendered quite transparent, becoming turbid on cooling. With this

Chemistry of Catechu.

solution ferric chloride gives a dark-green precipitate, which will immediately change into purple on the addition of cold water, or of an alkali.

Catechuic and Mimotannic acids are said to be present in Cutch in about equal proportions. The effect of heat upon Cutch and its compounds is most important, and, as pointed out by Etti, the chemical changes effected by heat afford the most likely explanation of the discordance of authors as to the formula for Catechin. According to Leebermann, confirmed by Etti's re-examination of the substance, the formula for Catechuic acid or Catechin is $C_{15} H_{18} O_8$. If a piece of Cutch be first heated in a crucible and then macerated it will be found to be completely soluble in cold water. This is explained by Etti as due to the formation of soluble anhydrides from Catechin, thus :

$$2 (C_{15} H_{18} O_8) = 2 H_2 O + C_{26} H_{32} O_{14} \text{ or } 2 \text{ (Catechin)} + \text{heat} = 2 \text{ (water)} + \text{Catechu-tannin.}$$

The compound thus produced is known as *Catechu-tannic acid*, and is completely soluble in cold water. By a further loss of water at 190°-200° it becomes $C_{26} H_{30} O_{12}$. Under the influence of heat the anhydride that is first formed is $C_{26} H_{24} O_{16}$, an insoluble, brownish-red, amorphous powder, a substance soluble in alcohol and precipitated in crystals by lime-water. These compounds, if formed in varying proportions in a piece of Catechu, would greatly tend to produce conflicting chemical formulæ in the results of different experiments, and *a piece of Catechu which is found to be completely soluble in cold water should be regarded as inferior in quality* (injured through heat) and most probably adulterated by the trader.

For some time Gautier regarded the Catechin of Gambier as quite distinct from that obtained from Catechu, but in his more recent publications he admits them as identical. He now corrects his formula, $C_{19} H_{18} O_8$ which he published as expressing Catechin adopted in *Flück. and Hanb., Pharmacog.*), into $C_{19} H_{20} O_8$ and suggests for this compound the name of *Methylcatechin.*

The soluble Catechu-tannic compounds constitute the active stringent principle of the drug and the tanning and dyeing property for which it justly holds so high a position for industrial purposes.

Solubility : *Conf. with pp 4, 7, 13.*

PREPARATION OF PURE CATECHIN.—Etti directs that Catechu should be dissolved in about eight times its own weight of boiling water, and the liquid, after being strained through a cloth, should be set aside for some days until the insoluble Catechin subsides. This should then be collected and placed under a screw-press, being thereafter dissolved in a sufficient amount of dilute alcohol and the filtered solution shaken up in ether. The ether is next removed by distillation, and the crystals obtained washed repeatedly in pure distilled cold water. It is then found to exist in the form of almost colourless crystals.

Adulteration.

Adulteration and detection of Catechu.—Meyer regards ether as the best re-agent for this purpose. Whether it has been partially heated or not, the whole of the Catechu-tannic compounds may be abstracted from a given weight of pulverised Cutch by repeated treatment with ether, about 53 per cent. of the original weight being thus removed. The dried residue should thus weigh about 47 per cent, the excess over this being adulterants. The chief substances used for adulteration are sand, clay, sugar, starch, and dried blood. On ignition pure Cutch should leave a residue of 3 to 4 per cent. It should be completely soluble in boiling hot water; if soluble in cold water, it may be suspected of impurities or of having been injured by heat.

ACACIA Catechu.

The Isolation of Catechu.

Necessity of chemical examination urged.

The Dictionary of Economic Products (from which the above abstract has been taken) thus advocated the necessity for a careful chemical examination of the actual samples met with in trade as being likely not only to remove the defective knowledge that has retarded progression and prevented economies in manufacture, but as calculated to reveal the existence of widely different chemical substances in certain forms of the commercial article. It also thus exhibited the injurious action of heat in reducing Catechin and manifested a simple method of separating Catechin from Catechu-tannin, owing to the latter being soluble in cold water. It was also assumed that *Kath* and still more so *Kirsal* might be found to be fairly pure states of Catechin, while Cutch would be revealed as a crude article mainly consisting of Catechin tannin. The higher price paid in India for *Kath* might be admitted as very naturally suggesting the still further enquiry as to the discovery of simple methods of separating these substances; in other words, of preventing the reduction of Catechin to Catechu-tannin, if not of raising the latter to the former state. This much-to-be-desired result has not as yet been attained, and there are chemists who even affirm that it is impossible. But investigations of the nature indicated might have naturally led to these substances being placed on the market separately, since by so doing they would meet independent industrial purposes, if indeed it were not found to be the case that the higher price paid for pale Catechu would allow of the residual product (or by-product) being sold at a considerably lower rate than at present without very materially reducing its industrial value, and to thus provide a means whereby the technical industries could use the two articles separately or in fixed combinations where a mixture of the two was found necessary.

Separation by heat, *Conf. with pp. 4, 5.*

Conf. with p. 5.

Were it possible to establish this double manufacture, then Etti's observation that Cutch, which is entirely soluble (that is to say Cutch that contains no Catechin), is of less value, would have to be accepted as the character of that article.

These, then, were some of the opinions and expectations formed by the Editor when he compiled in 1884 the account of Cutch or Catechu that will be found in the Dictionary. On the Inspector-General of Forests having had his attention directed to the above views, an enquiry was at once instituted and certain chemical investigations conducted. The passages below may be accepted as a brief review of the new information thus brought to light.

The following three reports were submitted to the Government of India through Her Majesty's Secretary of State for India:—

WARTH'S REPORT.

Reports on the yield of Catechin from five different qualities of the wood, of **Acacia Catechu** *in Oudh and Burma—by* Dr. H. Warth.

(I.)

12th March 1890.

Wood with white spots.

"Early in 1889 an inquiry was started why the professional makers of *kattah* refused 'Khair wood' without white spots, and only worked up those stems which were found to have white spots scattered all through their heart-wood. It was reported that the makers of *kath* cut into the

trees for the purpose of examination, and leave those stems unused which show no white spots. Much damage is thus done to the forests. WARTH'S REPORT.

"A preliminary examination in India showed that the wood with spots yielded more extract than the wood without spots. The relative yield of *kath* was, however, not so easily determined, and I offered to inquire more thoroughly into the matter during my furlough in Europe. I have, for this purpose, been provided with samples of wood and with extracts made by the *kath* makers in Oudh and by the cutch makers in Burma; also with printed notes on catechu and its manufacture in India.

"I find, also, much information on record in Europe about cutch or catechu, also gambier or *Terra Japonica;* but much uncertainty exists about the composition and properties of the principal compounds, catechin and catechu tannin No record exists of any examination of wood which yields the cutch.

"The active principle of cutch is the tannin—that variety of tannin which is called Catechu-tannin, and which forms a greenish-brown compound with ferric salts. As a rule there is, however, also Catechin in the cutch. *Kath*, which is used in India for consumption with betel and lime, has catechin for its active principle. Pure *kath* is almost entirely catechin. Catechin and catechu tannin are similar in composition, and resemble each other in some of their properties. *Catechin is easily changed into tannin or a similar substance, but not the reverse. Catechin is soluble in hot water, and practically insoluble in cold water.* The tannin dissolves in water of any temperature. Active principle of Catechu. *Conf. with this the remarks on solubility, pp. 4, 5.*

"This different behaviour towards cold water enables us to separate the two substances from each other. Yet this operation is not as easy as might be thought, because the tannin in the solution retards the separation of the catechin. After long standing of concentrated extracts of the **Acacia Catechu** wood, which are mixtures of catechu tannin and catechin, all the catechin is not separated. Some appears always to remain in the final residue with the tannin.

"Two extracts, A and B, were made in Burma from the woods named A and B, and sent as prepared samples of catechu with the wood specimens. I treated these samples very carefully with acetic ether and with hot water, but I was only able to obtain 6 per cent. of catechin from them, whilst catechu is generally supposed to contain more catechin than that. Experiments with Cutch.

"When trying to extract and crystallize catechin out of small quantities of the wood of **Acacia Catechu**, complete failure is the result if the solutions are diluted, and if the wood is boiled and treated for a long time with the object of making the extraction complete. *A rapid treatment and concentrated solutions are indispensable.* The following method may be followed:—

"About two ounces of finely cut wood are boiled for half an hour with twenty times their weight of water. The decoction, freed from the wood, is reduced in bulk on the water bath until it begins to become syrupy, or until it is estimated to contain about 6 per cent. of catechin. The liquid is then allowed to stand in a cool place for four days, or at the most five days. The catechin never separates at once. Even cooling to freezing point has no effect, but after standing a night there is separation in most cases. When the proportion of catechin is small in comparison with catechu tannin, it may happen that it takes two days until the separation begins, and in such cases it will be good to let the liquid stands five days. *Stirring the liquid is advisable. Immediate crystallisation of catechin is sometimes effected by the addition of some ready crystallised catechin to the over-saturated solution and stirring.* The addition of a drop of mineral acid has also sometimes the effect of making the catechin separate. Stirring. *Conf. with p 9.*

ACACIA Catechu. | **The Isolation of Cutch,**

WARTH'S REPORT.

The chief agent in this process of separation is, however, time. After enough time has been allowed, the catechin is brought on a filter and roughly washed with cold water. The catechin is then dried by exposure to dry air. The air must not have a higher temperature than 40 degrees centigrade. Heat injures or destroys the damp catechin. The accounts of the manufacture in India agree also about the drying of the product by air and not by artificial heat. After the catechin was completely dried in warm air, I left it for some time in the desiccator. When I weighed it, it had reached such a state of dryness that it kept increasing slightly in weight on the scale pan through absorption of moisture from the air.

Experiments with Cutch.

"Once the catechin is thus separated and dried, it remains unchanged for years, as is shown by the constancy of the *kath*. *The pure catechin, after being dissolved in hot water, separates immediately on cooling.* There is no such delay as in the case of mixtures of catechin and tannin. When dissolved in eight times its weight of hot water and then cooled, the catechin separates in such numbers of microscopical crystals that the liquid becomes stiff.

"At the same time we notice how easily the *catechin is decomposed whilst in solution.* The recrystallization of catechin yielded, on the average of three trials, only 68 per cent. of the original weight. The original catechin was air-dry, and the second catechin was dried in the desiccator and was a little purer; but still the actual loss of catechin through the simple solution in hot water, crystallization, and drying cannot be less than 25 per cent.

"*If more crystallisation of catechin by means of hot water causes such a loss, it is not astonishing if the decoction of the wood with water does not yield the complete amount of the catechin.*

"The filtrate from the catechin is evaporated in the water bath, and the residue weighed. We thus know how much soluble matter was extracted from the wood, and find the proportion of catechin in the whole extract.

"Further treatment of the residue with the aid of acetic ether yielded often a little additional catechin. But it was not enough to affect the result much, and, as in some cases only the merest trace of catechin was obtained from the residue, the removal of catechin by the main process appears so far satisfactory.

"I made now with each of the woods a further trial. I treated a portion of finely cut wood with much hot water, so as nearly to exhaust all soluble matter. I desiccated the extract and weighed the residue. From this I obtained the maximum percentage of solubles in the wood During the rapid extraction of catechin I obtained less total soluble matter, but I have also placed the figures on record for the purpose of comparison.

Yield from different woods.

"From the average proportion of catechin in the extracts and from the maximum yield of extract of each wood, we calculate then the maximum yield of catechin of each. The following samples of the wood of **Acacia Catechu** were examined :—

"Oudh No. I.—Reported by the *kath* makers as unfit for making *kath*. One in a thousand of the large pores of the heart-wood filled with white substance.

"Oudh No. II.—Reported as good for *kath*. About one in six of the large pores filled with white.

"Burma A.—Reported by the Burmese as having no white spots. Has no spots, but cracks filled with white matter (*khrsal*).

"Burma B.—Reported by the Burmese as having spots. One in twenty of the pores white.

and of Kath. (*G. Watt.*) ACACIA Catechu.

"Burma C.—Selected by the Forest Officer as having distinct spots. A very beautiful specimen with large white spots. About one in every three pores white. WARTH'S REPORT.

"The following table shows the amount of extract obtained at different trials. The extract was of such dryness that it just began to increase a little in weight on exposure to the air :— Yield from different woods.

Wood.	Per cent. Extract.	Maximum per cent.
Oudh No. I	6, 9, 10, 10	14
Oudh No. II	4, 15, 15, 16, 17, 19, 23, 24	24
Burma A	12, 15, 17	17
Burma B	14, 15, 16	16
Burma C	16, 16, 20, 20	20

'The following table shows the amount of catechin separated out of the woods :—

Wood.	Percentage of Catechin in the Extract.	Mean per cent.
Oudh No. I	33, 38	36
Oudh No. II	27, 31, 38, 64	40
Burma A	9, 19	14
Burma B	17, 46	31
Burma C	21, 36	28

"From the above we calculate the total yield of catechin in these five woods as follows :—

Oudh No. I	5 per cent. catechin from the wood.
Oudh No. II	9 " " "
Burma A	2 " " "
Burma B	5 " " "
Burma C	6 " " "

"We have thus ascertained the following facts. *Woods with white spots are richer in extract and richer in catechin* than those without spots. Of all woods, catechin may be extracted by the above-mentioned method with hot water. The Oudh woods are specially favourable for the manufacture of catechin. This explains why the manufacture of *kath* has specially developed in Oudh. *Kath* should be pure catechin, containing as little tannin as possible. Wood with white spots rich in Catechin.

"I examined *kath* from Oudh, which was bought in the bazar at Dehra Dun, North-West Provinces. It consisted of rectangular pieces about 2 inches long. *The pieces are earthy inside, and they have all round their surface a hard crust, one-eighth of an inch thick, rich in tannin.*

"For the determination of catechin, I only took the inner soft portion of the pieces. Even this inner purest portion contained 3 per cent of wood splinters and sand. The recrystallization yielded the following proportion of catechin—

34, 38, 48 per cent. or, on average, 36 per cent.

"The *kath* which was manufactured for the Oudh Forest Department, and sent to me with the samples of wood of **Acacia Catechu** early this year, yielded 62 per cent. catechin. It was, therefore, much richer and purer than the *kath* of the bazar. But still it contained also 4 per cent. of wood splinters and 2 per cent. of sand.

"It would now appear advisable that in the Oudh forests *both classes of trees should be utilised for the manufacture of kath and of catechu.* The inferior trees might be treated separately. If the manufacture could be centralized, it would be possible to use machinery for cutting up the

WARTH'S REPORT.

wood, and to carry on the whole work on a large scale and with improved appliances. *That portion of the extract which would remain over after the separation of the catechin could be utilised for making common cutch or catechu for the European market.*

"In Carl Feuerlein's factory, near Stuttgart, South American woods are used for making extracts of vegetable dyes, one of them very similar to catechu. The extraction is effected with hot water under ordinary pressure,

Vacuum pans.

and the decoctions are concentrated at lower temperature in vacuum pans. The vacuum increases the outturn because it prevents much of the dyeing material from being decomposed. The imported Burmese cutch is subjected to a purifying process, and also finally evaporated in vacuum pans. It is, therefore, possible that vacuum pans would also effect a saving in the manufacture of cutch in India."

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(2)

CANNSTATT, WÜRTEMBERG, GERMANY;

11th August 1890.

"On the 12th of March last I had the honour to report on the amount of catechin and tannin contained in the wood of **Acacia Catechu** from Oudh and from Burma.

Yield from different woods.

"I found from 5 to 9 per cent. catechin and 10 to 15 per cent. tannin when using two or three ounces of the wood for each trial. To test my method further, I have now treated larger quantities—namely, 50lb of wood No. I from Oudh, and 30lb of supposed No. II, which had both been sent to me by the Oudh Forest Department. I cut the wood on the lathe into shavings of $\frac{1}{12}$th inch thickness, and boiled two or three times with water. The liquid so obtained I concentrated over the fire and finally over the steam bath until it was dark brown and thick, and began to form skin at the surface. *I then let cool, and afterwards stirred it up with a trace of ready-made catechin. Finally it was allowed to stand for five days in a cool cellar, during which period the catechin crystallised out.*

"After dilution with cold water I put the liquid through the filter press. The cakes of catechin were then dried in the open air at ordinary temperature.

Preparation of both Kath and Cutch from same wood.

"The liquid which flowed off from the catechin was put to evaporate until it was nearly solid. It was then poured into a paper mould, in which it solidified. Of the produce so obtained I have the honour to submit samples according to the subjoined list.

"The Oudh wood No. I is the poorer quality, from which the Oudh local *kath* makers declared they were unable to make *kath*, or impure catechin, I obtained 3·7 per cent. of dry pressed catechin (the purest *kath*) and 12 per cent. of pure hard catechu tannin.

Iron vessels to be avoided.

"The 30lb of Oudh wood No. II were sent by the Forest Department evidently by a mistake. Instead of being the rich kind of wood with a large percentage of catechin, and recognized by white spots, they were a poor kind of wood, in which I could recognize but the merest trace of white spots. When boiling this wood, I also used an iron vessel which I thought was not dangerous because it had been newly tinned, but the tinning was insufficient and iron rust got into the liquid. *Iron is such a great enemy in the manufacture of catechin that iron vessels, whether tinned or galvanised, will have to be absolutely avoided.* In consequence of this mishap with the iron, the supposed wood No. II yielded me only 2 per cent. of catechin, besides 11 per cent. of catechu tannin, of both of

WARTH'S REPORT.

which I have the honour to submit samples. According to my former trials on a small scale, good wood No II might have yielded me 9 per cent. of catechin and 15 per cent. of tannin.

"No serious mishap, however, took place with the 50lb of wood No. 1, and it was of chief importance to prove the usefulness of this wood No. 1, for catechin manufacture, *because the local makers refuse to use the wood, although it grows with the other in the same forests and is of the same species*, **Acacia Catechu.**

Suggestions for improved manufacture.

"I have now the honour to propose an improved method of making catechin and tannin in the North-Western Provinces.

"Whilst, according to the reports, the local *kath* makers cut into the heart-wood of the trees, and leave those trees standing injured and unused which have no white spots, it will be in the interest of the Forest Department if both trees, No. I and No. II, are used up at the same time for the same purpose.

Utilisation of wood with or without spots.

"The smaller yield of catechin from the trees No. I will be compensated for by the manufacture of tannin for the European market. This catechu tannin will fetch its price there as a catechu of superior, uniform, and always trustworthy quality. From the wood No. II the improved method will also utilize a large quantity of tannin or pure catechu, which has hitherto been wasted. The people pour their mixture of tannin solution and catechin upon sand, when the catechin remains and is dried into cakes, whilst the tannin soaks away into the sand.

Improved filter.

"The catechin itself is also very impure. Taking the whole pieces of 6lb of *kath*, softening them with cold water, and putting them through the filter press, I obtained 59 per cent. of air-dry catechin cakes, 25 per cent. of tannin in solution, and 16 per cent. of sand. *For the imperfect and wasteful method of filtering through sand it is proposed to substitute the filter press.* The filter press is now universally introduced for separating solid matter from liquids, and it is of special utility in the manufacture of catechin. The separation of catechin from the strong tannin solution by ordinary filtration is very difficult, and dilution causes loss of catechin, because the latter on standing with water becomes converted into a soluble substance. The filter press, which effects the separation of the catechin rapidly, is therefore quite indispensable. Its application alone will give quite a new start to the process of catechin extraction.

Cutting wood by machinery.

"But the cutting up of the wood by machinery will also afford a great advantage over the present method of cutting it into coarse chips by hand. If we add, for earthen pots, large copper vessels for boiling the thin shavings of the wood and for concentrating the liquid, we have all that is required for the economical production of catechin on a large scale.

Use of vacuum pans.

"The final desiccation of the tannin solution from which the catechin has been separated would also be a difficult process if done in the ordinary way. It would require many hours of stirring, *because the hot thick liquid forms skin on exposure to air*, and it is only constant tearing of the skin which renders evaporation possible. For this part of the process it is therefore advisable that vacuum pans be used. By their means the evaporation will be accelerated, and the injury done to the tannin by the boiling will be reduced to a minimum.

"The complete apparatus for the improved process does not cost much. Mr. J. Gyiketta, an expert for dye and tannin extraction, has given me the following figures:—

ACACIA. Catechu.

The Isolation of Cutch,

WARTH'S REPORT.

Cost of apparatus for improved manufacture.

"A manufactory for extracting 10 tons of wood daily consists of—

	£
2 steam boilers, each of 1,000 square feet heating surface	1,000
Setting up and chimney	250
1 steam engine of about 100 H. P. (or a turbine if there is water power)	600
2 wood cutting machines	200
6 copper vessels for extraction	450
2 copper vacuum pans, each with 500 square feet heating surface	600
1 air pump for the vacuum pans	250
1 filter pump of 100 square feet surface	200
Reservoirs	50
TOTAL	£3,600

"This sum is intended for Europe, and equals about ₹50,000 in Indian coin. No provision is made for sheds, houses, wells, etc., and there will be the cost of transport to India and to the site in the North-West Provinces. Many spare parts of machinery will also be required, to avoid delay in repairs. But all this and every possible expenditure, including the deputation of an expert for two years, will be more than met if we assume a total cost of one lakh of rupees.

"A factory costing one lakh of rupees will, in 200 working days per year, produce about 3,500 maunds of catechin and 7,500 maunds of tannin dye. The value of the former in India will be at least ₹1,10,000 considering its great purity, and the value of the latter in India for export to Europe will be about ₹90,000. The total value of produce per year will be about ₹2,00,000. The annual produce of the factory will, therefore, be worth twice the original cost of the factory.

"The conditions are, therefore, very favourable, and there is little doubt that private enterprise would readily step in if the case were made known, and it would be easy to overcome all competition and to obtain the monopoly for the manufacture.

"Catechin or *kath* is, however, an article of everydayuse in almost every household in India, and there are reasons why it would be better that the Government of India should obtain this monopoly. Moreover, the Government are either in possession of the **Acacia Catechu** forests, or else they have the control over the production and supply of the wood; it is, therefore, quite suitable that the Government should undertake the work.

"I would be obliged if you would permit my coming to London before my return to India, that I may personally report on the subject, and, if you advise, communicate with consumers of catechu and manufacturers of dye wood extracts in England for the purpose of proving still further the advisability of the proposed work."

ENCLOSURE.

List of Samples sent on the 9th of August by post via Hamburg to the Under-Secretary of State.

Wood of **Acacia Catechu**, No. I, one piece.
Wood of **Acacia Catechu**, No. II, one piece.

	Grammes.
Indian *kath*	125
Indian *kath*, taken through the filter press	600
Catechin from No. I wood	560
Catechin from No. II weod	290
Tannin from No. I wood	770
Tannin from No. II wood	350
Total weight of *kath* catechin, tannin	2,695

and of Kath. (G. Watt.) | ACACIA Catechu.

The whole was reported in the customs sheet as 3 kilogrammes catechu."

WARTH'S REPORT.

(3)

December 1890.

"In Dr. Watt's *Dictionary of the Economic Products of India* we find it stated that the merits and the preparation of *kath* deserve to be thoroughly investigated. As I have had occasion to study the subject and to make experiments, it may be useful to record the following facts.

"The *kath* of the North-West Provinces which is used with pân, and the catechu of Burma which is exported to Europe as a dye-stuff, are both prepared from the wood of **Acacia Catechu**. The *kath* is in its purest state chiefly catechin, a crystallizing substance *nearly insoluble in cold water*. The catechu is chiefly catechu tannin, a substance *soluble in cold water and not crystallizing*, but some catechin is usually mixed up with it. The difference between *kath* and catechu is partly due to the methods of manufacture, partly to the difference in the trees.

Kath and Catechu.

Conf. with p. 5.

"The trees in Burma differ from those of the North-West Provinces, and in each place there are two kinds of trees, No. 1 and No. 2, although of exactly the same species. Trees No. 2 have white spots in the wood, caused by a white substance stored up in cylindrical masses half a millimetre thick and ten millimetres long. Trees No. 1 have no white spots. Trees with spots yield an extract richer in catechin, and both kinds of trees in the North-West Provinces yield more catechin than the corresponding kinds in Burma.

Trees of different kinds ? different ages.

"I found the following proportions of catechin in the total extract:—

Yield of Catechin.

	Catechin.
Burma, No. 1	14 per cent.
" " 2 (spotted)	30 "
North-West Provinces, No. 1	36 "
" " 2 (spotted)	40 "

"The greatest amount of extract obtained from each kind of wood was as follows:—

	Extract.
Burma, No. 1	17 per cent.
" " 2 (spotted)	18 "
North-West Provinces, No. 1	14 "
" " 2 (spotted)	24 "

Conf. with p. 21.

The greatest amount of catechin obtainable from these woods is accordingly as follows:—

	Catechin.
Burma, No. 1	2 per cent.
" " 2 (spotted)	5 "
North-West Provinces, No. 1	5 "
" " 2 (spotted)	9 "

"Such a great proportion of catechin in the spotted wood of the North-West Provinces explains that *kath* manufacture is at home there. Moreover, the local *kath* makers are reported to refuse as unfit all trees which do not contain white spots, so that the trees No. 1 become wasted in the forests.

"I determined the catechin by direct separation as follows. About two ounces of the wood reduced to thin shavings were boiled, with twenty times their weight of water, for half an hour. The extract was separated from the wood by repeated settlement, and reduced in bulk on the water bath until it just began to thicken and contained by estimate 6 per cent. of

WARTH'S REPORT.

catechin. It was then left to stand in a cool place for five days for the separation of the catechin. Once the catechin had separated, the liquid could again be diluted with cold water for the purpose of filtering. The filtered and roughly washed catechin was dried at ordinary temperature, and weighed in a thoroughly air-dry condition.

Separation of Catechin.

"The high degree of concentration and the long standing are required because the catechin separates with difficulty out of an extract which contains so much catechu tannin. Once the bulk of the tannin is separated, the catechin may be dissolved in much more water, and it will separate immediately on cooling; but the *catechin is at all times a delicate substance, which changes with water slowly into soluble substance and is thus lost. The drying of the moist catechin must take place at a low temperature, as heat at once destroys the microscopic crystals.*

Conf. with p. 95.

"The manufacture of *kath*, or raw catechin, is carried on in the forest with very primitive appliances. The filtering is done through layers of sand, and much sand becomes mixed up with the *kath*. The drying is performed in the open air.

"The people say that they possess a manufacturing secret, but there seems no need for one, unless their secret consists in the mixing of some finished catechin with the thick liquid, which sometimes promotes the separation of the new catechin. Anyhow, I made out of the 50lb. of **Acacia Catechu** No. 1, from the North-West Provinces, nearly 2lb. of pure catechin, and it is from this wood that the *kath* makers of the North-West Provinces declared themselves incapable of making *kath*. For filtering larger quantities of catechin, I found the filtering press an excellent expedient. The pressed catechin dried in a few days from simple exposure to the air, and once dried the catechin is a very durable substance.

"*Contact with iron must be scrupulously avoided during the extraction of catechin.* With catechu or cutch contact with iron is of no consequence, and the reports mention iron caldrons in use for the final boiling down of the cutch in Burma.

Preparation of Cutch.

"The preparation of cutch or catechu is of course simpler than that of *kath*, because nothing but watery extraction of the wood is required and subsequent boiling down of the extract.

"After a certain degree of concentration, a skin forms over the surface of the hot liquid, and constant stirring for hours is required to effect the final desiccation. This long stirring process is also mentioned, but not explained, in the descriptions of the Burmese catechu extraction. In modern dye extraction works the stirring would be avoided by the use of vacuum pans."

The passages in the above which the Editor has ventured to render in italics seem worthy of special consideration as likely to have a direct bearing on any future expansion and improvement in the production of *Kath* and Cutch. Dr. Warth's observation that wood spotted with white deposits is richest in Catechin and that such wood is more prevalent in Oudh than in Burma shows that environment has a distinct bearing on the formation of the compounds here dealt with. From the fact that Catechin tannin is soluble, while Catechin is nearly insoluble, in cold water (a fact originally pointed out by Etti), Dr. Warth was enabled to separate these two substances. The concentrated decoction was by him simply set aside for five days, to allow of the formation of the crystalline Catechin. Cold water was then added and the solution filtered. By this simple contrivance Catechin was separated and the filtrate

subsequently boiled down to form Cutch. It is possible that it may be by some such process that some of the *Kath* sold in India is prepared from the crude Cutch, since it is hardly admissibie that the whole of the *Kath* consumed can be derived from the comparatively limited production in Kumaon. If this supposition be not correct it might be possible to organise a fairly remunerative industry in refining *Kath* from Cutch. But it may be pointed out that Dr. Warth has not touched on the further question as to the possibility, by chemical or mechanical contrivances, of increasing the yield of Catechin, or at all events preventing its degeneration—points briefly indicated in the above review of the chemistry of the subject (p. 5).

Preparation of *Kath* from Cutch.

Conf. with p. 25.

The correspondence that ensued on the publication of Dr. Warth's proposal to found a central factory for the purpose of manufacturing *Kath* and Cutch is too extensive to be here given in full. It may, however, be stated that it was brought out that except in Burma and the Central Circle of the North-West Provinces, no forests of this tree exist which, within workable limits, could yield a sufficient quantity of mature Cutch-wood to supply permanently a *Kath* factory large enough to be remunerative.

Establishment of Kath factory.

Regarding the two chief centres of **Acacia Catechu** the following opinions were advanced.

In Upper Burma some extensive cutch forests exist in the Yaw and other side valleys of the Chindwin. These have not, however, as yet been sufficiently explored, and those in the Pyinmana district are already severely worked. The recommendation was strongly opposed to create a Government *Kath* factory in competition with a well-developed manufacture and trade of considerable magnitude, in which some of the leading European firms of Burma are largely interested. It was held that the competition in the article in question was already very keen, and that it may be taken for granted that improvements in manufacture will be readily accepted by those interested without Government taking any further action than to institute investigations.

Supply in Burma.

As regards the North-Western Provinces, it was brought out that **Acacia catechu** occurs in a belt of *khair*-bearing land which underlies the sál-producing Terai forests and occupies the Duns, and which extends from the Jumna far into Assam. This area narrows or widens with the general formation of the country, and, following the banks of rivers, frequently extends far into the Terai. The forest has no doubt always been mutilated and frequently destroyed by incessant firing; but even in the latter case dead stumps and other traces of the original forests can be found almost invariably; and where the forests have been protected, they have rapidly regained possession of the soil and produced a crop of considerable density. The area of Government forests in the Kumaon district, which is still in occupation of the *khair* tree, is estimated by the Conservator of Forests to aggregate 50,000 acres. The **Acacia Catechu** is by no means a small tree by nature, but is often dwarfed by continuous maltreatment.

Supply in N.-W. Provinces.

ACACIA Catechu. | **The Isolation of Catechu,**

Further experiments.

In the correspondence alluded to the very important remark was made "that results are frequently obtained in a laboratory which cannot be realized when dealing with large quantities." It was consequently proposed that further experiments be made with Dr. Warth's process on a somewhat extended scale. It was suggested that these experiments might be carried out at Dehra, and it was held that it would be easy to calculate the saving which can be effected by cutting the wood with machinery and consequently it was agreed that for the present such machinery need not be procured. But in Burma, where such experiments were made some time ago, it was found the saving in chopping the wood by machinery was more than absorbed by the transport of the logs in bulk. It was regarded as desirable at least for the present to leave the use of vacuum pans out of consideration, and the only plant which it was thought necessary for the experiments were smoe copper vessels and a filter-press.

From the correspondence that ensued regarding the proposal to form a central factory, the following extracts may be given, since these appear to either amplify the published information or raise points for future enquiry. The Conservator of Forests, Assam (letter No. 63 A., June 9th, 1892), wrote:—

Assam—opinion about Central Factory.

"Dr. Warth's figures relating to the outturn of catechin and cutch obtained from both inferior and good woods, show that he procured from 14 to 24 per cent. of extract from the raw material, a far larger proportion than is obtained by the rough working process in vogue at present, by which the proportion of extract yielded is only about one-sixteenth, or 6 per cent. of the wood used. It has also been suggested by a Calcutta firm having large dealings in Burma cutch that this produce as manufactured by the vacuum pan process, being quite free of catechin, would be much less valuable for dye purposes than the cutch prepared in the rougher manner, as in Burma and elsewhere, by which a large proportion of the catechin is retained in the cutch; and it is certainly strange that, in the North-West Provinces, where catechin alone is made, the cutch residue is considered of no account and not worth preserving; while in Burma, where I believe cutch only is prepared, no attempt is made to extract the catechin.

"The two distinct practices certainly suggest that when either product is divorced from the other, one only retains a market value."

Failure in Assam.

"Before concluding this report, it may be well to state that the departmental experiments hitherto made in extracting cutch from Darrang *Khair* have not been financially successful. In 1890, 50 maunds were made at a cost of ₹3,700, and as only ₹539 were realised for the same, this experiment resulted in a loss to Government of ₹3,160. It would be unfair, however, to debit the whole of the expenditure to the above outturn, because it included a considerable outlay on the pay and travelling expenses of three cutch boilers brought over from Burma and on the purchase of stores, erection of sheds, etc. But when such items are deducted from the total cost, there still remains a balance of ₹1,716 to be debited against the experiments on account of labour alone, or more than three times the return realised from the produce sold. This last season five maunds were specially made for the Economic Reporter for ₹100, or ₹20 per maund, which shows a great reduction on the cost of the former year, but which is still nearly double the selling price of the article. So far, therefore, we cannot be said to have proved that cutch-boiling can be carried on in the Assam forests with much chance of success.

and of Kath. (*G. Watt.*)

Proposed working of Assam forests.

"It may also be noticed that a Calcutta firm has offered to work our *Khair* forests on the following conditions:—

(1) That a monopoly be given them for five years.
(2) That at the end of the five years, option to extend their exclusive right of working for another five years be granted.
(3) That on the expiration of the lease granted under (2) a first refusal be given the firm on whatever terms the Assam Government may impose, provided that they pay Government ₹1 per mature tree felled, or in the event of lease (2) being granted, that they pay a minimum sum yearly of ₹5,000 at the rate of ₹1 per tree, provided mature trees are available.

"I should be inclined to recommend the latter method of working the forests to attempting any further experiments departmentally; but would fix the Royalty at ₹2 per mature tree of 4 feet girth. Before, however, inviting private enterprise to step in and work for us, I think we should await Dr. Warth's opinion on the resources at our disposal mentioned in this report."

Resources of Assam forests.

The resources to which the Conservator of Forests in Assam alludes are as follows:—

Area of Khair Forests in Assam.

Goalpara	9,000	acres.
Kamrup	5,000	,,
Darrang	4,480	,,
	18,480	,,

At present capable of yielding per annum:—

Goalpara	trees of 4 feet and over	2,000
Darrang	trees of 3 feet and over	1,600

And allowing a margin for the timber of the above damaged by fire and not available for cutch-making, it may be roughly estimated that the yearly outturn of raw material obtainable from the above would equal about 46,000 cubic feet or 23,000 maunds.

Burma opinion on Warth's suggestions.

The Conservator of Forests, Pegu Circle, Burma (in letter No. 809, dated 13th October 1892), reported that—

"As the quantity of Catechin seems to vary directly with the occurrence of white spots in the wood, and the solidity and market value of Cutch also varies with the prevalence of white spots in the wood from which Cutch is extracted, it seems probable that the solidity and greater market value of Cutch depends upon the quantity of Catechin it contains. If this be the case, to extract the Catechin would be to greatly lower the value of the main product Cutch, and so far as Lower Burma is concerned, I doubt the advisability of making any experiments with a view to separate Catechin from Cutch, for even if the value of the Cutch were not greatly reduced it would be difficult to introduce a new process of manufacture and to do away with the use of iron pans now employed.

Conf. with pp. 16, 19.

"I presume too that demand for Cutch is limited, and that a greater production would certainly result in a decrease of price."

Samples of Cutch were procured from Burma and submitted to the Assistant Agricultural Chemist to the Government of India, who furnished the following report:—

ACACIA Catechu.

The Isolation of Cutch,

Analysis of Burma Cutch.

RESULT OF CUTCH ANALYSIS—*Burma Samples.*

		(a)	(g)	(c)	(p)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
		Tablets (W. C.) from Sinbyukyun, Rangoon price Rs60 viss.	Tablets (W. C.) from Myingyan, Rangoon price Rs60 viss.	Tablets (W. C.) from Sallamya, Rangoon price Rs8 viss.	Block (W. C.) from Tabekin, Rangoon price Rs7 viss.	Block (W. C.) from Pakokku, Rangoon price Rs7 viss.	Block (P. C.) from Thayetmyo, Rangoon price Rs7 viss.	Block (P. C.) from Paungdé, Rangoon price Rs7 viss.	Block (E. C.) from Mandalay, Rangoon price Rs7 viss.	Soft (E. C.) from Mandalay, Rangoon price Rs45 viss.	Soft (P. C.) from Paungdé, Rangoon price Rs45 viss.	Soft (P. C.) from Thayetmyo, Rangoon price Rs45 viss.	Soft (P. C.) from Prome, Rangoon price Rs45 viss.	Soft (E. C.) from Pyinmana, Rangoon price Rs45 viss.	Soft (E. C.) from Meiktila, Rangoon price Rs45 viss.	Block (E. C.) from Pyinmana, Rangoon price Rs55 viss.	Block (E. C.) from Kambalu, Rangoon price Rs7 viss.
Moisture	. . .	17·3	22·7	12·0	29·9	18·2	27·1	16·3	17·4	41·9	27·2	27·3	31·3	30·4	33·8	36·5	37·0
Catechin	. . .	11·1	15·8	13·6	12·5	12·7	19·0	11·3	13·0	10·5	9·7	12·2	13·7	15·3	9·2	10·3	11·8
Tannin	. . .	68·8	61·3	73·9	56·1	68·8	53·5	72·1	68·2	46·4	60·5	59·5	54·4	52·1	56·1	51·1	51·0
		97·2	99·8	99·5	98·5	99·7	99·6	99·7	98·6	98·8	97·4	99·0	99·4	97·8	99·1	97·9	99·8

NOTE—
E. C. for Eastern Circle.
W. C. for Western Circle.
P. C. for Pegu Circle.

and of Kath. (*G. Watt.*)

Analysis of Burma Cutch.

These analyses manifest an extraordinary range in composition of ordinary Pegu Cutch. In sample (*c*) there was 12·0 moisture (—a tablet of Cutch valued at ₹58 per viss), while in (*i*) there was 41·9 (—a sample of soft Cutch valued at ₹45). The range of Catechin was found to be similarly very great; sample (*j*) 9·7 Catechin (soft Cutch valued at ₹45) and (*f*) 19·0 (block Cutch valued at ₹57). It would also appear that in amount of Catechin found in the produce the three Forest Circles of Burma are very similar, thus the three highest were (*f*) from Pegu, (*b*) from the Western, and (*m*) from the Eastern Circle.

Turning now to the proportion of Catechu tannin the extremes were sample (*c*) 73·9 (a tablet valued at ₹58) and (*i*) 46·4 (soft Cutch valued at ₹45), also (*p*) 51·0 (a block Cutch valued at ₹57). There was thus remarkably little difference between the price paid for the sample with the highest amount of Catechu tannin and those with the lowest proportion of that substance. In what, then, lies the superiority? Sample (*b*) that fetched the highest price in the series has considerably more moisture than either (*a*) or (*c*) and it has less Catechu tannin but more Catechin than either of these. But sample (*f*) has considerably more Catechin than (*b*), though it fetched ₹23 per viss less, and (*m*) has the same amount of Catechin as (*b*), though it fetched little more than half the price. Sample (*k*) fetched the same price as sample (*n*), though it was found to contain 3 per cent. more Catechin and 3 per cent. more Catechu tannin.

The highest priced sample (*b*), valued at ₹80 per viss, manifests chemically nothing to justify its valuation. It is thus significant that the chemical analysis of an article which owes its merit to the presence of certain definite compounds should thus be at complete variance with commercial valuation. This result would thus appear to throw some doubt on the opinion advanced by the Conservator of Forests, Pegu, *viz.*, that the removal of Catechin would considerably lower the value of crude Cutch. This may be so, but the reason why has not as yet been demonstrated. It is true that the highest prices recorded above are for samples with a high yield of both Catechin and Catechu tannin, but even in this respect the valuations are not consistent:—

Confe. with pp. 16, 17.

	(*b*) ₹80.	(*a*) ₹60.	(*c*) ₹58.	(*f*) ₹57.	(*h*) ₹57.	(*k*) ₹45.
Catechin . . .	15·8	11·1	13·6	19·0	13·0	12·2
Catechu tannin . .	61·3	68·8	73·9	53·5	68·2	59·5
	77·1	79·9	87·5	72·5	81·2	71·7

The highest priced article, if its merit lies in the total percentage of these two articles collectively, would have to be placed fifth in the above six examples. But it is difficult to see in what way an article like Catechin which is insoluble in cold water can materially assist the dyer and tanner unless it be changed into a soluble substance at some stage of the industrial uses to which it is put.

ACACIA Catechu.

The Isolation of Catechu,

N.-W. Provinces: Opinion on Warth's report.

Mr. J. S. Gamble, *Director of the Imperial Forest School,* in a communication (No. 53, dated 3rd August 1893) furnished an instructive statement of the investigations up to that date. The following paragraphs may here be given of **Mr. Gamble's** contribution :—

1. I have the honour to reply to your No. 504 of 14th June 1893. I think it best to go over the whole subject in order to make matters somewhat clearer than they are, for I confess to have been a little puzzled about what is still required in regard to the *kath* experiments.

2. With your No. 164 of 9th March 1891 was circulated Dr. Warth's memorandum on the preparation of "*kath*" or pale Catechu, and this was followed by your No. 454 of 23rd June 1891, sending for the Forest School Museum samples of the "*kath*" prepared by Dr. Warth, as well as copies of his report on the yield given by five qualities of the wood from Oudh and Burma. Next year with your No. 323 of 16th May 1892 came ten more copies of these reports, and the request that I should arrange to continue the experiments at the Forest School, and also report my views on the subject especially as regards the details of the arrangements to be made and the plant necessary. Your letter was sent for opinion to the School Officers, and as Conservator of the School Circle I arranged for wood for the experiments and called for information as to the cost of cutting and delivery of *khair* wood in Dehra.

3. The Deputy Director and the Instructor who teaches Natural Science then submitted to me the following note :—

"We have considered this subject together and the following are our views thereon.

"Dr. Warth appears to have made conclusive experiments regarding the amount and quality of extract to be obtained from the different kinds of wood mentioned in his report, and we are of opinion that no School Officer can hope to improve on the experiments made by Dr. Warth, who is an expert in such matters. If it is proposed to make Catechin and Catechu tannin on a large scale on the lines laid down by Dr. Warth, the plant would apparently cost, at the present rate of exchange, over one lakh of rupees, and a special officer would be required to superintend the factory. Dr. Warth's experiments tend to show that Oudh would probably be the best place for a factory of this kind, the Oudh specimens being peculiarly rich in Catechin. It might, perhaps, be advisable to ascertain whether the Acacia wood available in Dehra Dún is of the kind specified by Dr. Warth, as being the best, *viz.*, that containing numerous white spots. In this case, and if this is the idea suggested in the Inspector-General of Forests' letter, a small experiment might be undertaken to ascertain whether it comes up to the Oudh wood. Two copper vessels costing £75 each (unless smaller ones could be substituted) would probably suffice, one filter press and a lathe to turn the wood into shavings. There is in our opinion no "*raisond' etre*" in experiments on a more extended scale being made in Dehra Dún, unless it be shewn that the Acacia wood of that district is quite as good as, and available in a quantity equal to, that of Oudh. In conclusion we wish to state that neither of us feel competent to undertake what must always be a difficult experiment in organic chemistry. To obtain a certain proportion of Catechin from a given weight of wood is probably not a difficult operation, but to ascertain the absolute quantity of Catechin contained in that wood is quite a different matter. This can only be done by an experienced chemist. Dr. Warth's note shows that it is the *heart-wood* which contains the white spots. It will probably be found that there are very few trees in the Dún which yield any considerable proportion of heart-wood, owing to their small size."

4. The Deputy Conservator, Dehra Dún Division, in his letter No 312, of 17th December 1892, to the Conservator of Forests, School Circle, forwarded 20 cubic feet of the heart-wood of *Khair* and reported that the cost of cutting and delivery (exclusive of royalty) would amount to ₹31-4 per 100 cubic feet, or 5 annas per cubic foot. The Agricultural Chemist to the Government of India was then asked to experiment with this sample of

and of Kath. (*G. Watt.*) | ACACIA Catechu.

Dún wood, and I beg to submit copy of his report No. 13 of 27th January 1893.*

N.-W. Provinces: Opinion on Warth's report.

5. I now turn to the Assam correspondence. In his letter No. K. 92 of 6th July 1892 the Conservator of Forests, Assam, wrote as follows:—

"In a report lately submitted to the Government of India on the possibilities of working the Assam *Khair* forests on the lines indicated in Dr. Warth's report forwarded under Government of India, Revenue and Agricultural Department, Nos. 686 to 689 F., dated 17th June 1891, attention was drawn by me to the very large difference in the proportion of extract obtained from our wood by local experiment, on the rough Burma plan, and that obtained by Dr. Warth in his laboratory experiments. Naturally our experiment showed a much less yield, the figures being 6 per cent. of extract as compared with Dr. Warth's varying proportion of from 14 to 24 per cent.† I proposed therefore that several samples of our *Khair* wood should be sent to Dehra for analysis, and I now have the honour to enquire if you would kindly undertake the experiment. In the meantime I have ordered 15 sample sections of 2 cubic feet each, to be prepared with the bark on, which will be despatched as soon as practicable, after I receive your reply. Please be good enough to state if samples half the above size would be large enough."

* See above, p. 18.

† See above, p. 18.

In reply I wrote: "Dr. Warth is no longer in Dehra, and it is rather doubtful if there is any body at present capable of conducting experiments in the way he did; we will, however, see if we can manage it, and I would suggest your sending only a few samples of one cubic foot each at first." None have, however, yet come to hand, so that I have been unable to furnish the report called for in your No. 804 of 27th September 1892.

6. Then came the Burma correspondence. Your endorsement No. 955 of 5th November 1892 communicated to me the request made by you to the Conservator of the Pegu Circle to send some samples (say, 25lb each) of Burma Cutch of different market values to this institution to be analysed by the Agricultural Chemist in order to ascertain the quantity of Catechin which each sample may contain. In February 1893 the specimens of cutch duly arrived, the boxes being marked A to P.‡

‡ For report see above, page 18.

Report by the Agricultural Chemist.

The specimens were handed over to Mr. Collins, Assistant Agricultural Chemist, in the absence of the Agricultural Chemist, and Mr. Collins was at work on them when he was ordered off to Poona. Dr. Leather informs me that his enquiries are not yet completed and cannot be completed until Mr. Collins returns.

The enquiry into this subject was then undertaken by Dr. Leather, Agricultural Chemist to the Government of India, who furnished two valuable contributions that may now be given—

As requested by you I have examined the sample of Dehra Dun wood, **Acacia Catechu**, which was sent to the Imperial Forest School. I understand that you wished to know (1) how much crude Catechin and Catechu tannin is contained in this wood, (2) by what process these substances might be most readily separated.

2. In principle I have adopted the same method as that used both by the Cutch boilers and also by Dr. Warth, that is, the wood is first reduced to small pieces, it is then boiled in water, the decoction separated, boiled down and the concentrated extract set aside for the purpose of allowing the Catechin to crystallise out. The crude Catechin is then separated from the liquid portion; washed with cold water and dried. The liquid from which the crude Catechin has been separated is heated gently until the

ACACIA Catechu. | **The Isolation of Cutch,**

Report by the Agricultural Chemist.

water is practically evaporated off and the residue contains the Catechu tannin.

3. *The total amount of crude Catechin* I found to be 7·18 and 6·43 per cent. in two experiments respectively, and of crude Catechu tannin 7·61 and 9·02 per cent., the total extract amounting to 14·79 and 15·45 per cent.

4. Regarding the most suitable method by which these substances may be extracted I have experimented (*a*) on the *form* in which the wood should be used, (*b*) the amount of water with which it should be boiled, (*c*) whether a hard or a soft water is preferable, (*d*) for how long the boiling should continue.

5. (*a*) *The form in which the wood should be used.*—The native Cutch-maker, I understand, chops the timber up with an axe. Dr. Warth in his experiments cut the wood up with a lathe. In these cases the pieces are of some little thickness and, as will be readily understood, unless the water has an opportunity of entering the cells, all the Catechin and Catechu tannin cannot be brought into solution. Dr. Warth's method is undoubtedly preferable to that of the natives and his results bear this out, for whilst the latter cannot (from *this* sort of **Acacia Catechu** timber) extract any appreciable amount of Catechin, the former obtained up to five per cent.

6. Touching this point I have experimented with the wood in the form of (1) chips $\frac{1}{8}$" × $\frac{1}{4}$" × $\frac{1}{4}$", (2) saw-dust, (3) shavings $\frac{1}{50}$" to $\frac{1}{10}$" thick obtained with the plane. From the result shown in Table I, it will be seen that the amounts both of crude Catechin and also of crude Catechu tannin are very small, about a quarter of the total amount, when the wood is employed in the form of chips. Both shavings and saw-dust gave much higher results. It is to be observed, however, that it would be practically impossible to reduce wood to the form of saw-dust, and, were it possible, it is with considerable difficulty that the saw-dust, after boiling, is separated from the aqueous extract. From the shavings the liquid may be readily poured, and it is from them that I have obtained the best results.

7. *The amount of water which should be used.*—Dr. Warth recommends that the wood be boiled with twenty times its weight of water. It will be clear that, *cæteris paribus*, the less water that is required the better, for after the extracting process is completed all the water which has been used must be evaporated again, for which fuel is required. In my experiments I have used as small a quantity as two parts of water (Table I "Chips") and have still obtained approximately as much Catechin as when twenty parts of water were used. This result was obtained from *Chips*. When boiling *shavings*, however, I found that it was not practicable (owing to their volume) to use less than ten parts of water. Nevertheless the results of all the experiments show that the use of a less quantity of water than twenty times the weight of wood used is not detrimental to the process.

8. *The description of water to be employed.*—From Table II it will be seen that the canal water (which contained 49·28 grains of solid matters per gallon, most of which was gypsum) extracted as much as pure water, and it would seem therefore to be immaterial to the process whether the water used be hard or soft.

9. *The time required for extraction.*—The native Cutch-maker boils the wood for some hours. In my experiments the wood was boiled for half an hour only and I have every reason to believe both from my experience with this wood, as also from my general knowledge of the time required to perform such operations, that this time is sufficient. In any case it is desirable to reduce the time as far as practicable.

10. *The time required to cut up the timber into shavings.*—A log of the Burma **Acacia Catechu** was cut up, one half into shavings with the plane,

Report by the Agricultural Chemist.

the other half into chips with the hatchet. A carpenter was employed for this. The weight of the log was 10 seers, of which 4 seers was reduced to shavings in two hours. The remainder, weighing 6 seers, was then cut into chips by the same man in seven hours. I was surprised at this result, for I had expected it would require a longer time, not a shorter, to cut up the wood with the plane. Whether a similar result would be attained by other men I cannot say, but the experiment shows that it would not take a longer time to cut the timber into shavings than into chips.

11. Having regard then to the results of the several experiments which I have made, I draw the following conclusions :—

1. That whether the Cutch extraction be performed by the native or in a factory, the wood should be preferably reduced to thin shavings.
2. That as little water be used as may be, ten parts or perhaps less would suffice.
3. That the boiling be continued for half an hour only.

TABLE I.

	Ratio. Wood : Water.	Crude Catechu-tannin.	Crude Catechin.	Total Extract.
Shavings	1 : 10	7·61	7·18	14·79
	1 : 20	9·02	6·43	15·45
Saw-dust	1 : 10	5·36	4·16	9·52
	1 : 20	9·30	2·72	11·92
	1 : 20	8·10	4·90	13·00
	1 : 20*	7·40	6·20	13·60
Chips	1 : 20	3·48	0·83	4·31
	1 : 10	3·29	1·23	4·52
	1 : 5	3·04	1·75	4·75
	1 : 5*	2·04	1·75	3·79
	1 : 2	1·30	1·22	2·52
	1 : 2	1·62	1·60	3·22

* Distilled water was used for these two extractions.

ACACIA Catechu.

The Isolation of Catechu,

Report by the Agricultural Chemist.

TABLE II.

	Ratio. Wood : Water.	Crude Catechu-tannin.	Crude Catechin.	Total Extract.
Saw-dust	1 : 20 (Canal-water.)	8·1	4·9	13·0
	1 : 20 (distilled water.)	7·4	6·2	13·6
Chips	1 : 5 (Canal-water.)	3·05	1·75	4·8
	1 : 5 (distilled water.)	2·04	1·75	3·79

The three conclusions arrived at by **Dr. Leather** are likely to be regarded as of considerably more practical value than the results obtained by **Dr. Warth**, since State factories are not likely to be undertaken. The labour employed by the native manufacturer is, however, scarcely likely to be easily taught the superior merits of the plane for many a long day. But the advantage of less water and consequently less boiling are two points that it might be possible to induce him to accept. By doing so there would not only be an economy of time and money, but, as shown by **Ettl**, a saving in the amount of Catechin, since by continued heat a decomposition of that valuable ingredient must take place. The injury pointed out by **Dr. Warth** caused through the use of iron cauldrons is one that Government might become the pioneers in reforming by procuring copper cauldrons and hiring these out at a low price until the people had appreciated their value. This state of affairs is not unknown to the people of India. The distillers of *rusa*-oil, for example, regularly hire copper stills from the money-lenders and rarely possess their own apparatus.

The following further analyses have been furnished by **Dr. Leather**, Agricultural Chemist to the Government of India (February 2nd, 1895), of six samples of North-West Himálayan (Dehra Dún) **Acacia Catechu** wood. "The figures in the statement below express parts per 100 parts of wood":—

Analysis of Dehra Dún Catechu Wood.

	I	II	III	IV	V	VI
	Shavings.	Shavings.	Shavings.	Shavings.	Shavings.	Shavings.
Catechin	0·47	0·97	3·07	3·61	2·5	3·38
Catechu-tannin.	2·72	2·61	7·5	5·44	8·11	5·29
			Chips.	Chips.		
Catechin	...	...	1·91	2·93	...	...
Catechu-tannin.	...	...	5·56	4·17	...	...

and of Kath. (*G. Watt.*) | ACACIA Catechu.

"For the determination of the proportions of Catechin and Catechu-tannin, the wood was reduced to shavings by means of the carpenter's plane. In this form the *total* amounts of these ingredients can be determined, whereas if the wood is reduced to 'chips', only a portion of these matters is extracted. With a view to determine the latter, a portion of samples III and IV were reduced to chips with the hatchet and the amounts of Catechin and Catechu-tannin determined in them. The results thus obtained are placed in the lower half of the statement. The quantity of wood sent was not sufficient to make similar determinations in 'chips' of the other four samples. It would be better to send samples of wood 18" long in future. Although the amounts of Catechin and Catechu-tannin are very much less than was found in the sample of wood submitted to me in December 1892, their analyses show a similar difference in amounts of extractable substances, which are smaller when they are extracted from the wood in 'chip' form, than when it is reduced to 'shavings'."

Report by the Agricultural Chemist.

The very remarkable range in yield, between No. I and No. IV, in Catechin and between No. I and No. V in Catechu-tannin, makes it extremely desirable that in all future analyses it should be definitely ascertained what are the peculiarities of each sample about to be examined. It is impossible to suppose that so great a difference could be accidental. It must be due to some such causes as age of trees, nature of soil, health or disease of trees, season of the year in which felled, part of the stem from which taken, etc. Thus, for example, had we been told that No. I was a portion of wood taken from the outer zones of the heart-wood and No. IV from the more central, we would have been justified in definitely affirming that the latter zone was richer in Catechin than the former; in other words, that Catechin was a subsequent formation produced by a process of metabolism. It is certainly striking that the analyses as they stand should manifest the peculiarity that the highest yield of Catechin is not associated with the greatest quantity of Catechu-tannin; on the contrary, that a high yield of Catechin is associated with a comparatively small amount of Catechu-tannin. These observations, imperfect and unsatisfactory though they are, would seem to justify the emphatic opinion that we have hitherto made but accidental and disconnected investigations, and that to accomplish the object aimed at we must give the subject more careful consideration. It is necessary not only to work out the chemical changes that take place in the various systems of manufacture (pursued by the people of India), but to clearly ascertain the various changes that occur within the tissues of the plant before the deposition of Catechin takes place. A definite knowledge of these changes should not only suggest the proper season and method of felling, cutting up and boiling, but might afford the key to our being able to continue these changes in the factory, if that be at all attainable, so as to secure economies of great practical value.

Causes of variation in yield.

Concluding Remarks.

In the subsequent correspondence that ensued on this subject, the author of this review suggested that the secret which the Kumaon workers are said to husband so carefully, might be in the direction

Concluding remarks. *Conf. with p. 14.*

Secret of Kumaon *kath* makers.

of converting a large proportion of the Catechu-tannin into Catechin. That suggestion was, however, purposely guarded as a mere speculation and one founded mainly on the observation that within the tissue of the plant this appears to be the order of formation. The highest percentage of Catechin would seem to be found in old trees and imbedded within the mature heart-wood; the greatest abundance of Catechu-tannin in young trees or less lignified structures. The writer further suggested that it was difficult to believe that the Kumaon manufacturers should deliberately drain off the liquid that contains, or is supposed to contain, the soluble Catechu-tannin, when its retention would so materially increase the bulk of the article they manufacture, or might be sold separately. It was pointed out at the same time that there should be no difficulty in putting these surmises to practical test For example, a quantity of the sand which the Kumaon manufacturers use as their filter should be found rich in Catechu-tannin if it be the case that they remove only the crystalline Catechin in the manufacture of *kath*, and reject the Catechu-tannin as useless. The writer also suggested another method of testing this doubtful point. The yield of *kath* to the weight of wood should give some indication of whether the Kumaon system utilized only a portion of the contained tannin material. If higher than the chemical results we should be justified in believing that they actually do convert some portion of the Catechu-tannin into Catechin. So in a like manner the price at which Kumaon *kath* is sold, as compared with Pegu Cutch, should give some indication, since the former, if it consists of only the proportion of Catechin found by the Chemist in the wood, should be considerably more than twice the value of the Pegu article.

These suggestions led to some further communications, though up to date it cannot be said that all the difficulties with which the Cutch and *kath* industries are involved have been satisfactorily solved. The question as to weight of Cutch and *kath* to the wood used has, however, been answered, though the answers appear to be conflicting. The Conservator of Forests, Central Circle, North-West Provinces, wrote (letter No. 168—dated 7th August 1894)—

Experiments in N. W. Provinces.

"The experiments made in this Circle show that a cubic foot of wood yields in the hands of the Khairiahs a quantity of Cutch varying from 0·6lb to 2·6lb. For practical purposes it may be accepted that the outturn per cubic foot of trees, such as are found in the Bhabor, varies from 1 to 2½lb, the difference being more due to the complete or incomplete boiling and using up of the material than to the varying quality of the wood."

"In suitable localities where the conditions are favourable, the Khairiahs take care to boil down all the Cutch-producing wood, whereas where the opposite is the case, much is wasted and left lying in the forest."

"From the above I consider the high rate of 2½lb per foot is the proper yield, deduced from the cubical contents of the tree, or say a little more than half that obtainable from the heart-wood only."

On this subject the Conservator of Forests, Pegu, wrote (letter No. 916, dated 8th August 1894) "that to produce a maund (82 lb) of Cutch 20 cubic feet of wood are required; this quantity of wood includes sapwood estimated to be 25 per cent. of the whole quantity."

"It has also been ascertained that the same quantity (82lb) of Cutch is produced from 917lb of wood (heart-wood only)."

It will be observed that it is not expressly stated, regarding the yield in the North-West Provinces, whether *kath* is meant, but it may be assumed that it is so and in that case the yield is considerably higher, relatively speaking, to that in Pegu than it ought to be. But there now appears to be no doubt that the manufacture in Kumaon is an extravagant one, a large quantity of valuable Catechu-tannin being regularly thrown away. We have by no means, however, learned all that we require to know, but enough has been elucidated to show that great economies and improvements are possible.

Improvements in the manufacture possible.

The Editor, in the official correspondence from which this review has been compiled, also suggested a further line of enquiry, *viz.*, whether it was possible the yield of Catechin was increased by mechanical or other injuries to the growth of the plant. The replies received would repudiate this suggestion on the ground—

Extraction of Catechin by ways other than boiling.

"that it appears to be improbable that Catechin could be drawn from the trees by wounding them, for it is a solid substance found in the heart-wood"—*Dr. Leather.* So again (Director. Imperial Forest School, No. 85, dated 30th September 1894): "If Catechin were a gum obtained by exudation and chiefly from the sapwood, no doubt wounding the trees would increase the production, but it is not a gum, but a substance found in the heart-wood, and wounding could have little or no effect. As regards diseased trees I will shortly try to find some and hand the wood over to the Agricultural Chemist for analysis."

But it may be pointed out the removal of gum or any other mechanical disturbance to the life of the plant through wounds, diseases, drought, etc., might easily enough cause a deposition of the crystalline matter within the wood. The irritation caused by sand within the oyster shell is believed to be the exciting cause to the formation of the pearl. Barus camphor is deposited within the wood of **Dryoba'anops Camphora** very much after the same manner as Catechin (*kirsal*) within that of **Acacia Catechu.** The crystals of that form of camphor are well known to occur within the heart-wood, hence it is said old trees are the most productive. In searching for trees likely to yield camphor, the Natives pierce the stems to the heart-wood, thus injuring them materially; but it is said that a tree left for seven or eight years will then be found to contain deposits of camphor freely, so that the tapping process has come to be regarded as facilitating the formation of the much-prized article. The formation *Agar* (a crystalline substance found within the wood of **Aquilaria Agallocha**) is believed to be due to some diseased condition. The formation of the crystalline substance *tabáshír* within the bamboo has been demonstrated to be due to an insect. A native merchant (according to **Mr. Peppe**) tried to imitate the action of the insect, with the result that he found that by making a small perforation above a joint in half-mature bamboos the salt formed freely. This he practised systematically and made a considerable sum of money before he finanally glutted the market with *tabáshír.* (*Dict. Vol. I, 385*). It is not unusual in fact in agricultural operations to check the growth of plants so as to cause the formation of reserve materials. In the production of *ganja* it is found necessary to remove the male plants since the fertilization of the female destroys the formation of the narcotic. But in some

Points for investigation.

parts of the country (as in Burma) this same result is obtained by injuring the stems. Without mentioning other such examples it may fairly well be said that it remains to be demonstrated that the yield of Catechin is not a matter that is capable of control. It was, however, from analogy in similar instances that the writer ventured to make the suggestion that the formation of Catechin might be facilitated by mechanical agencies or other disturbances to the life of the plant. This, however, was only a suggestion, though it is one that might still be kept in view. The most important points that remain to be definitely determined are (*a*) the chemical changes that take place within the tissue of the plant (during the formation of Catechin); (*b*) to continue the enquiry into the subject of a simple means of causing the formation of Catechin either within the tissue of the plant or during the process of manufacture; (*c*) to ascertain the age of the trees at which that substance is most freely formed and, if expedient, to frame a system of forest conservancy based upon the knowledge thus obtained; (*d*) to establish the nature of the environment most favourable to its production, and hence to draw up a map of India that would show the distribution of **Acacia Catechu** and the tracts within that area where Catechin might be manufactured and those in which the cruder article only could be produced; (*e*) to determine the nature and yield of the Catechu compounds obtained from the other species of **Acacia** that are reputed to afford these substances; (*f*) to elaborate a more exact and scientific method of manufacture than that which prevails, and one which could be adopted by the *Khair* workers; (*g*) to have a series of comparative experiments performed in both Burma and Kumaon, to ascertain whether the Native methods pursued in these centres of the trade, respectively, are interchangeable or are direct natural evolutions of local conditions that cannot be practised elsewhere; and lastly, to instruct the Kumaon *Kath* workers in the loss they sustain (if the loss be serious) through the rejection of the liquid that remains after the crystallization of the article for which they are famed.

IN CAMP ASSAM:
March 25th, 1895.

GEORGE WATT.

A. 135—199.

G. I. C. P. O.—No. 389 R. & A. D.—24-10-95.—400.—De'S.

All communications regarding THE AGRICULTURAL LEDGER should be addressed to the Editor, Dr. George Watt, Reporter on Economic Products to the Government of India, Calcutta.

The objects of this publication (as already stated) are to gradually develop and perfect our knowledge of Indian Agricultural and Economic questions. Contributions or corrections and additions will therefore be most welcome.

In order to preserve a necessary relation to the various Departments of Government, contributions will be classified and numbered under certain series. Thus, for example, papers on Veterinary subjects will be registered under the Veterinary Series; those on Forestry in the Forest Series. Papers of more direct Agricultural or Industrial interest will be grouped according as the products dealt with belong to the Vegetable or Animal Kingdom. In a like manner, contributions on Mineral and Metallic subjects will be registered under the Mineral Series.

This sheet and the title-page may be removed when the subject-matter is filed in its proper place, according to the letter and number shown at the bottom of each page.