

The Madras Forest College Journal.

Vol. I.

OCTOBER 1916.

No. 1.

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SIR,

We send a specimen copy of "The Madras Forest College Journal"—to be issued quarterly. The details of subscription will be found on cover page. We trust you will subscribe. If you decide to subscribe please send a post card to The Editor, The Journal, Madras Forest College, Lawley Road P. O., Coimbatore. You may either send the subscription and entrance donation by M. O. or authorise us to send the next issue per V. P. P.

"The Managing Committee."

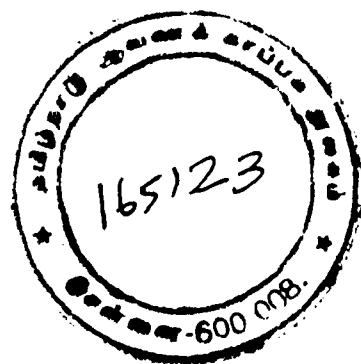
We regret that owing to the unavoidable delay in getting paper from Madras, we could not publish this number as expected in time.

Editor.

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THE
Madras Forest College Journal.

Published Quarterly

Vol. I.

October, 1916.

No. 1.

N. B:-Contributors are requested to send in their contributions written legibly in ink on one side of the paper only.—Editor.

Ourselves.

Mr. F. A. Lodge, C. I. E., Late Conservator of Forests, Western Circle, Coimbatore, recognized as early as 1909 the necessity for the institution of a Forest College in Southern India, the conditions of whose forests are varied from the North of the country; and as men trained to the habits and requirements of species of the temperate regions of the Himalayas find themselves as fish out of water when suddenly transported into the midst of a bewildering variety of species and conditions. The solution of this difficult problem was begun in March 1912 by the opening of the "Madras Forest College" in the heart of Coimbatore; and in a couple of years, the first batch of students who were trained in the typical forests of Southern India was sent out with their mental and physical faculties developed and with a "Forest eye" that will constantly endeavour to ascribe to their true cause or causes whatever comes under their observation in the midst of surroundings in which they were trained.

Every great problem is beset with difficulties. Mr. Cowley Brown, now Conservator of Forests, Northern Circle is possessed of zeal and earnestness of purpose and before his dauntless spirit difficulties waned. Our thanks are also

due to the Government of Madras for the ready response made to his requests; and we are as comfortably situated as any well-equipped institution in India.

We are now relieved of our physical shortcomings and we can concentrate our attention more and more on justifying our existence. Hitherto we have been isolated and now we want to be in touch with our brethren who went out of the College and in whose hands are entrusted the destinies of the vast expanses of the Vegetable Kingdom; and also with our other professional *confreres*.

This, we propose doing through this medium, a common platform on which we can meet, not bodily but mentally and winnow and re-winnow our ideas and opinions on the many conflicting problems of forestry which the forester in Southern India has to confront, and we can also keep our readers in touch with the research and other experimental works we are doing in the districts we tour in and be benefitted by their suggestions.

With the above object we have started in our humble way "the Madras Forest College Journal" which, to begin with, shall be a quarterly publication and we hope that full support in the shape of articles shall be extended to us by our members for its successful maintenance and rendering the Journal useful to the department at large.

Prize-day at the Madras Forest College, Coimbatore.

The annual distribution of prizes and certificates took place on the 29th June 1916. His Excellency Lord Pentland, P. C., G. C. I. E., Governor of Madras presided.

Among those on the platform were the Board of Visitors—The Hon'ble Mr. H. F. W. Gillman, I. C. S. Messrs P. M. Lushington, F. L. C. Cowley-Brown, H. B.

Bryant and H. A. Latham; Mr. C. E. C. Fischer, the Principal, and Messrs. C. M. Hodgson, H. F. A. Wood, the Hon'ble Mr. J. H. Stone, Director of Public Instruction and Mr. A. R. Cumming, I. C. S.

The Principal opened the proceedings with the following address:—

"YOUR EXCELLENCY,

"I had the pleasant duty of welcoming Your Excellency on behalf of the Forest Department in October last on the memorable occasion of the formal opening of these buildings and we all feel very grateful that Your Excellency has consented, at the cost of no slight inconvenience, to come again to day to distribute the prizes to the deserving students.

"We have further tangible evidence of Your Excellency's kindly interest in the Forest Department and the Forest College in the magnificent shield which you have generously presented for annual competition in all-round athletics, a gift which is greatly appreciated by all.

"The most important events of the past twelve months have been the removal to the new College buildings and the transfer of the Principal, Mr. Cowley-Brown, who nursed the College through the crucial period of its infancy.

"With the willing co-operation of all concerned the move to the new site was effected with surprisingly little friction or disorganisation. The buildings are still not quite complete; a residence for the Principal is under construction, improvements to the quarters for the Instructors have been proposed recently and apparatus has yet to be set up in the Gymnasium. Nevertheless, the change has very greatly improved not only the comfort of individuals but also the facilities for instruction. Lectures are delivered in large, airy and well lighted halls and spacious laboratories. The splendid museum hard by gives scope for valuable demonstration, especially in Forest Utilisation. Finally

the students are lodged in excellent hostels in open and healthy surroundings away from the congested streets.

"It was under the guidance of Mr. Cowley-Brown that the College was started in July 1912 in unsuitable temporary quarters in the heart of the town and he remained at the helm, with a short interval due to ill-health, for over three years. It is due mainly to his zeal and energy that the College has reached its present efficiency and his name will ever remain connected with it.

"Besides a change of Principal there were changes in the lecturing staff. Messrs. Crothers and Cornwell replaced Messrs. Venkataramana Ayyar & Aranha; and Mr. Srinivasa Rao ceased to lecture in Botany and Science in October.

"I take this opportunity of expressing my gratitude at the way the members of the staff have carried out their difficult and often tedious duties and have rendered cheerfully any assistance required.

"Following the precedent established in past years the students were taken out for tours of instruction to the most important forests within reach.

"At Nilambur they visited the famous teak plantations and the adjacent natural forests. They marked a coupe for thinning, laid out the trace for a new road and carried out improvements to an existing one.

"In the mixed teak forests of the Anamalais the difficult problem of the natural regeneration of teak and rosewood was studied. Here also a trace was made to improve an awkward curve on the tramway; and the approaches of a bridge were partly constructed by the students.

"They saw the interesting pure teak forests that characterise the Terai of the Tinnevely District, laid out the boundaries of a new Working Circle, investigated a project for a road to tap this area and carried out a short length of fire-line clearing.

"In the Javadi Hills of the South Vellore Division the, senior students became acquainted with the conditions and the working of sandal forests and the management of a well ordered sandal wood depot. Here too they marked about a square mile of forest under the new Working Plan for the extraction of sandal wood.

"At Walaiyar and Bolampatti conversion forests were inspected. During the final tour of the course spent in the Nilgiris the successful plantations of exotics were visited. The senior class underwent its final survey work; and the Juniors besides surveying recently worked coupes laid out a section of a new export road and made useful measurements of growth in some of the plantations.

"At all these places experimental plots have been laid out and the recorded observations, copies of which are communicated to the District Forest Officers concerned, should afford basis for valuable conclusions in course of time.

"I trust, therefore, that our visits prove of material assistance to the local staff owing to the work thus carried out.

"I desire to tender the thanks of the College to those District Forest Officers and their subordinates who helped to make the tours instructive and comfortable.

"By the kind permission of the managers, the senior students visited the St. Joseph's Industrial School in Coimbatore and the juniors a similar institution in Trichinopoly and also oil and saw mills in Calicut.

"It is a regrettable fact that the life of a Forest Officer in this country necessarily entails a certain amount of ill-health owing to malarial fever; often the most valuable and the most instructive forests are situated in tracts noted for insalubrity. The conditions vary from year to year and depend to a great extent on seasonal factors. The past year

proved, unfortunately, an unfavourable one from this point of view and most of the students were prostrated by fever at one time or another. It was with the greatest regret that I had to report the death in March of one of the leading Senior students who succumbed to acute pneumonia, despite the fact he was sent in as soon as possible to the Coimbatore Hospital where he received every attention. Both in character and aptitude he was a distinct loss to the College and to the Department.

"Before stating the results of the two years' training of the students about to depart from the College, I wish to say that the standard has been very considerably raised by the elimination of grace marks. The average number of grace marks allotted to the students of the previous two batches were 405 and 449, out of a maximum of 3500 marks. This has very materially affected the actual results. It does not account entirely, however, for the rather poor results as all but one of the failures to obtain any certificate are due to deficiency in individual subjects and not in the aggregate. This is accounted for by the falling off in the standard of the students who gained admission to the College in 1914.

"The elimination of grace marks makes comparison with past years impossible. The actual results are that one student has achieved honours; seventeen receive the higher standard certificates; five obtain the lower standard certificate and six have failed altogether.

"Athletics have been encouraged as usual; indeed, the playing of games is compulsory twice a week when in headquarters. The lengthy touring does not permit our teams to get well together. Consequently, we were not very successful at Hockey and we lost four and won but a single one of the five matches played.

"On the other hand we met with a far better fate at association football, which was the chief game in May and

June. We played six matches of which five were won and but one lost.

"The annual Marathon Race was run at Bolampatti in March over the same course as last year, a distance of about seven miles. It was won easily by junior student K. S. Nanjappa in the good time of 57 minutes, half a minute better than last year's record.

"I will now request Your Excellency to be so good as to distribute the prizes and certificates.

Prize Winners.

1. Gold medal offered by Government to the best senior student—C. M. Kunhiraman Nair.
2. Silver medal for honours—C. M. Kunhiraman Nair.
3. The Campbell-Walker Gold medal for the student likely to make the best all-round Ranger—C. M. Kunhiraman Nair.
4. The Brazier Gold medal for the student likely to make the best out-door Ranger—K. Kunhirayan.
5. The Indian Forester Gold medal for the best essay on "Forest Fires"—senior student C. M. Kunhiraman Nair.
6. The Lodge Gold medal for the best student in Practical Engineering—C. M. Kunhiraman Nair.
7. Silver medal offered by Government for the best student in Forestry—C. M. Kunhiraman Nair.
8. Silver medal offered by Government for the best student in Engineering—T. E. Varadachari.
9. Silver medal offered by Government for the best student in Survey—C. M. Kunhiraman Nair.
10. Silver medal offered by the Principal for the best student in Range Administration—T. E. Varadachari.

11. Gold medal presented by the Board of Visitors for the best junior student—S. Ramachandra Iyer.

Certificates.

C. M. Kunhiraman Nair.	Honours Certificate.
T. E. Varadachari.	Higher Standard Certificate.
T. K. Parameswaran Pillai.	"
Kerala Varma Thamburan	"
D. Krishna Ayyangar	"
C. T. Thiruvengadam	"
M. N. Raman Pillay	"
P. A. Krishnaswami Mudaliar	"
S. Srinivasa Rao	"
K. Kunhiroyan	"
A. Swami Kutty	"
S. V. Sigbatullohi	"
C. H. Ashe	"
G. Devamayagam Naidu	"
Korah Fenn	"
Syed Manavar	"
B. Sambamurthi	"
A. P. Srinivasa Ayyangar	"
W. Balakrishna Mudaliar	Lower Standard Certificate.
K. Raghava Rao	"
Gulam Rassool	"
K. Ramachendriah	"
T. S. Narayanaswami Chetty	"

"It remains for me to request Your Excellency to present to the winner for the year the Pentland Shield and the miniature copy which the Athletic Club is offering as a permanent record.

"The Shield is won by the student securing the largest number of marks in Athletics of all kinds. In this the first year of the competition it has been won by senior student

C. H. Ashe, who was closely pressed by junior student K. S. Nanjappa."

His Excellency having distributed the prizes and certificates, spoke as follows :—

"MR. GILLMAN, MR. FISCHER, LADIES AND GENTLEMEN:—It gives me great pleasure to be here to-day to distribute the prizes to the students of the Forest College and to have this opportunity of showing my cordial interest in the success of this institution and of its students. My colleagues and I greatly value the work which is here carried on, and I may claim in it a special personal interest, for this College came into existence only a few months before I arrived in India, and I have thus been able to watch its progress from the time that the proposals of Mr. Lodge and other supporters took shape. On the 1st July, 1912, the first batch of students was enrolled. These fine buildings were not then in existence, and I have had the double privilege of laying the foundation stone and of formally declaring them open. For the first years of its existence the College had to be content with temporary accommodation and somewhat makeshift arrangements, but these and other difficulties which attend the initiation of all great experiments were successfully overcome by Mr. Cowley-Brown, the first Principal, and it had already attained a thriving and vigorous maturity when after three years of hard and successful work he delivered it into the capable hands of Mr. Fischer. It must, I feel sure, afford justifiable gratification to Mr. Cowley-Brown to know that the students recognise their debt to him and to his devotion to their interests, and that his connection with the College as its first Principal will, at their instance, be duly commemorated.

"The report to which we have just listened deals with the first year of Mr. Fischer's term of office, and I know you will all heartily join me in congratulating him on the fact

that in spite of the dislocation caused by the move into new quarters, changes in the staff and some malaria, he has been able to report favourably on the work of the staff and the students alike. Not the least important and encouraging feature of the year's working is the attention which has been paid to the physical well-being and athletic training of the students.

"It was only a generation ago that the Forest Department, as we now know it, was constituted. The intervening years have been full of that arduous and often dull and monotonous labour which is the lot of the pioneer. Even now much remains to be done, but the foundations have been truly laid, and in the light of the knowledge and experience so laboriously acquired we may look forward confidently to rapid progress in that great work of development and productive effort which the pioneers have laboured to render possible. In that task, thanks to what they have achieved, you will enjoy ever increasing opportunities of taking part. Your labours will, I feel certain, be rendered easier by the greater spirit of comprehension which is abroad. Wide and increasing interests in matters industrial has led thinking men to realize on the one hand that the interests in silviculture and agriculture are closely inter-related, and on the other, that the conservation and improvement of those sources of motive power for which we must look to our forest clad hills and perennial streams alone is essential to any perennial industrial development in this presidency. Much, therefore, is in your favour. You have here enjoyed advantages of sound instruction and practical training which were not open to your predecessors, and you have before you wider opportunities to show that you have profited thereby and to win for yourselves honourable and useful careers. But in proportion to the benefits you have enjoyed much also will be expected of you—integrity and honesty in work and purpose; on these fundamentals I need not

dwell. But there are other qualities also which I would urge upon you. Cultivate the great gift of sympathy. In many ways the work of the Forest Department intimately affects the daily life of the people. Their ignorance may be great, but their needs are real and your aim should be to dispel the one and supply the other. Seek to secure their understanding and co-operation; for without these a full measure of success will be unattainable. Patience and optimism too are essential. In those great processes of production and regeneration with which Forestry is concerned, nature works slowly, sometimes unperceptibly and a forest officer can seldom hope to fell where he has planted. Enough, however, has already been accomplished to justify that robust faith which has happily characterised the department in the past, and will, I trust, never desert it. Lastly, courage and self-reliance must above all be yours. Your duties will make large demands upon your endurance and tenacity and the standard to which you will be expected to conform is high and rightly so. The department has no room for arm-chair officers but your compensations will be large. I don't suppose that any member of the forest department here present would exchange his lot for a sheltered life of greater ease. Devote yourselves fearlessly and in all sincerity to the noble career which you have chosen and you will indeed be able to claim that you are men in a world of men. To you in special ways will nature reveal her secrets and those subtle influences, by which she enlarges the understanding of her worshippers. Time will show your work and the value of your work for your country."

The Hon'ble Mr. Gillman then called on for three cheers for His Excellency and then the proceedings terminated.

**Dr. Coleman's experiments in regard to the
"spike" disease of sandal.**

There are few subjects of greater importance or interest to Forest Officers in Southern India than that of the "spike" disease in sandal. The mystery of its nature and origin has baffled the best efforts of all investigators for a period of 16 years and beyond a number of theories (many of them mere assumptions) and a few observations we did not seem to be more advanced at the beginning of the current year than at the time of the first report of this insidious disease.

It was natural, therefore, that the news that one investigator had succeeded in imparting the disease to a healthy sandal tree should cause a sensation and quite a flutter of excitement among the cognoscenti and other interested parties; the more so as all attempts at artificial infection made hitherto had met with failure. The successful experimenter is Dr. Coleman, Director of Agriculture to the Government of Mysore. Not only because "seeing is believing" but because the scope and limitations of the experiments can be grasped best by personal inspection, every Forest Officer who heard of these experiments must have been anxious to pay Dr. Coleman a visit. By the kind courtesy of that gentleman, 8 students of the 1915-17 division of the Madras Forest College were able to accompany the Principal on a visit to the site of the experiments in the compound of the Director's office and laboratory in Bangalore. The following notes are the result and are printed in our magazine with Dr. Coleman's kind permission.

We saw several sandal plants suffering undoubtedly from "spike;" some partially affected, others completely spiked and finally several that had died as a result of the imparted disease.

Now it is important to note that at the time the experiments were started there was no "spike" in Bangalore (I believe that town is still free of it) itself and the nearest "spiked" tree was not less than 7 miles away.

Dr. Coleman procured "spiked" shoots from diseased trees and grafted them in the usual way on to healthy sandal plants in the compound. He had previously attempted budding, just as Dr. Butler had done in 1902; but had met with the same want of success. The grafting operations, however, were at once successful. In grafting, all the leaves of the standard were removed so as to force the food materials ascending from the roots to the graft and give it the best chance of success. In many cases the "spiked" grafts joined up successfully and new growth on the graft took place. This new growth, of course, exhibited the usual symptoms of "spike" disease.

The standards also produced new shoots in due course. These new shoots usually present apparently normal leaves at first, but very soon the "spiked" leaves appear on the nearest shoots and then throughout the plant and before long the whole plant dies.

I have advisedly stated that "apparently" normal leaves are produced at first, because though normal in shape, size and appearance, actually these leaves usually, if not always, already contain the elements of disease, as on microscopic examination they are found to have the characteristic symptoms of starch surfeit.

With some of the larger plants on which grafting has been done, the leaves of the standard were not removed; one shoot only was cut off and the diseased shoot grafted on it. In this case the grafts frequently die without making connection and fail to communicate the disease. But even here some of the grafts have connected up and put out new "spiked" shoots. One such case of grafting

on a sapling 8 to 9 feet high was shown us. The graft was made on one of the lowest shoots; the new leaves from the graft are "spiked" and though none of the other branches showed obvious "spike" at the time of our visit, yet we were informed that the leaves on the lower branches on examination showed the usual accumulation of starch. Some of the cases show spike descending from grafts made near the apex of the healthy plant and others ascending from grafts made low down. One small plant thus grafted was completely spiked throughout the original stem, but the leaves of a root sucker which had sprung up a foot away were all apparently normal.

In order to test the presence of some toxic substance, an extract of diseased leaves was injected into healthy plants, but no spike has appeared from these operations. This, of course, is not conclusive and further experiments will be carried out.

In the laboratory, it has been ascertained that extract from "spiked" leaves has less power to dissolve starch than that from healthy leaves.

A number of other experiments in several directions are being carried out or are projected, but as no definite results have yet been obtained it would be neither useful nor fair to Dr. Coleman to refer to them here.

Now though Dr. Coleman has here made a big stride towards the elucidation of the "spike" disease it is advisable to be very cautious and he himself will be the first to exercise that caution.

We are justified only in adopting belief as far as the facts warrant. What Dr. Coleman has enabled us to say with certainty is that "spike" is communicable by contact. Beyond that we can hardly go, though it is justifiable to base an hypothesis on the results, to be tested by further

experiments. We cannot, for instance, conclude that the disease is communicable by contact only.

It is not my purpose here to discuss the subject or to draw conclusions but merely to record what we actually saw at Bangalore.

It has been known almost from the beginning of the history of spike, that accumulation of starch in the leaves and shoots and inability of the plant to convert it into soluble glucose and thus use it for growth, was a symptom and presumably a result of the disease. We know now that by graftings this effect as well as every other feature of the disease can be induced in a healthy tree. We do not yet know, however, what the actual causative action is. Is it the failure of the plant to produce the necessary enzyme or is it the presence of a toxic neutralising substance? This remains to be ascertained, as well as a host of other facts.

With this one great step behind us we may now feel confident that Dr. Coleman, or other investigators, will solve the problem before long. It must not be thought that I wish to belittle the results, far from it, they are of the greatest importance, but I do wish to caution my readers against going too fast and imagining that the end is achieved.

I gladly embrace this opportunity to thank Dr. Coleman most heartily for his courtesy and kindness on behalf of myself and the students, in permitting us to inspect his experiments and allowing our magazine to have the benefit of this advance note. Dr. Coleman's results up to date are to be published shortly in full in the memoirs of the Mysore Agricultural Department.

C. Fischer.

Underplanting Nilambur Teak Plantations. Whether it is necessary or not?

One of the main principles of silviculture is the maintenance of the productive capacity of the soil. Adopting artificial means for improving the soil, as is done in agriculture, is out of question in Forestry. Errors in forestry are detected only after years and it takes years to rectify them. In forestry, protective measures wisely carried out win our object of maintaining the productive capacity of the soil.

Certain species are endowed with soil protecting qualities. We have nothing to consider about the soils under such species.

Even though the soil be very fertile to begin with, to maintain its fertility should be the Forester's anxious care, as otherwise the yield of timber per acre must decrease with the age of the crop.

I venture to suppose that a soil with a uniform even aged deciduous crop throughout its whole period of development until its maturity would not have contributed anything—taking the factors of the locality as well into consideration—for the betterment of the soil.

In most of the plantations of Nilambur the soil is alluvium; it may not retain enough moisture in the warm months to help forward the formation of humus, thus rendering the soil less fertile as time goes on. This would merely be the effects of exposing the soil to direct sunlight and the drying action of wind, as usually happens under a pure even aged crop of teak.

So long as a permanent sustained yield of timber is possible we do not usually bother ourselves much about considering the other aspects of the question, for with regard to many of our forests the proverbial stable door was locked only after the steed had been stolen.

Much has yet to be learnt about the action of the defoliating insects of *Hyblaea Puera* and *Pyrausta machaeraulis*. The solution of the problem of annihilating them is still in the dark. No one ever dreamt of the devastation of the *Casuarina* plantations in Ganjam until the thing actually happened; and then only the question of growing a mixture of species in the plantations received the attention of the authorities.

The best means at hand in conserving the productive capacity of a soil under a deciduous species like teak is underplanting with ever-greens or semi ever-greens which would be in leaf when the teak would be leafless, protect the soil against exposure during the warmest months of the year and provide sufficient vegetable mould for its enrichment by the annual defoliation of leaves.

The question of underplanting has to be considered from two standpoints (1) from the undergrowth merely serving to retain or improve the productive capacity of the soil as in the case of shrubs such as *Helecteris Isora* and others and (2) ever-green trees that would in time yield some monetary returns either before the teak crop, or with it. Underplanting in Nilambur claimed the attention of Forest Officers years ago. We saw there *Suicetia macrophylla*, *Hevea Braziliensis*, *Manihot glaziovii* and *Castilloa elastica*, underplanted, but these have proved failures, as they were equally light demanding as teak.

With regard to the younger plantations, the question of earlier thinnings is now engaging the attention of the authorities to lessen the struggle for existence and to procure better shaped trees; and thinnings in any plantation ought to be done when the trees most abound in leaves. Thus we begin to expose the soil earlier in this case and therefore the question of underplanting has to be considered *pari passu*.

The species to be underplanted should have the following requisites.

(1) It should be a shade-bearer.

(2) It should be ever-green.

(3) It should not be faster growing than teak or it should not attain a greater height growth, or, if faster growing than teak, it should be introduced only after the latter has a good start.

(4) It should improve the quality of timber of the light demanding species by forcing it up and pruning the lower branches.

(5) It should bring in satisfactory monetary returns.

The species that answer or partly answer the above purposes may be any of the following :—

(1) *Artocarpus hirsuta*.

(2) *Dalbergia latifolia*.

(3) *Hopea parviflora*.

(4) *Xylia dolabriformis*.

I am conscious of having attempted the discussion of a problem not easy of solution. My suggestions above are given for what they may be worth. I beg my readers to favour me with their criticisms particularly mentioning what objections would rule out each of the species which I have suggested for underplanting the teak plantations with.

C. Karunakara Menon.

Fire as a Stimulant.

Many look upon fire as a dreadful enemy of our forests, sowing the seeds of devastation wherever it passes; but this has also been with its bright accompaniments.

There are certain species for the growth of which fire acts as a stimulant in the early stages, for instance the seeds of one of our most important Forest species viz. Teak is slightly burnt by a light fire before they are put in the nursery for germination. In the cultivated and abandoned fields below the slopes of the Silent valley in Mannarghat Range, Malabar District, *Xylia dolabri formis* is growing in gregarious patches, for fire has encouraged the germination of the seed by destroying the thick outer covering of the pods.

In Coorg one of the Divisional Forest Officers had the moral courage to set fire to a plantation of teak one year old; and the Range Officer like many of us was thunder-struck to see that all his seedlings were burnt and dead to all appearances; but the Divisional Forest Officer stuck to his faith in the use of fire as a stimulant and he had the report from his Range Officer a few months after the monsoons that for every teak seedling burnt he had a more vigorous shoot with which no seedlings of the adjoining plantations bore any comparison, either in vigour or in health. The same officer inspected the area and found to his satisfaction that his faith was no longer a chimera. After this, they went a step further and repeated the same thing in plantations of one year old and found the same results repeated. Here stopped the use of fire as a stimulant and any step in advance in this direction over the same area would result in the bruising and maiming of boles, which with the development of the tree would develop and make the timber unsuited to markets. The fire in the first instance applied as a stimulant only burnt the stem of the small seedlings; but did not affect the roots and the latter had enough stored-up energy to throw up vigorous shoots with the advent of the monsoons.

Fire as a stimulant to growth must be applied cautiously. It is not advocated as a treatment except in the

case of seedlings of about a year old even though observations on fire lines point to its growth.

C. Karunakara Menon.

Minor Forest Produce.

Much attention is being paid nowadays to the development of the extraction of Minor Produce from Government Forests. Special impetus has been given to various trades hitherto in the hands of enemy nations. Many Forest Officers have useful information which is not recorded anywhere because it may be on one point alone and seems too insignificant for a special article. We hope that all our readers will bear in mind that all accurate information, however trivial, has its importance and any notes, however short, will be welcomed for insertion in the pages of our magazine. Already one important firm has asked to be supplied with this journal so as to keep in touch with any possible source of supply of the produce it is interested in.

We would ask therefore, that any special information available be sent to us, on a post card if that gives sufficient space.

Information is sought particularly regarding tanning materials or materials used for dying leather; also with regard to other dye stuffs, fibres, wood for pencils and matches etc. etc.

All that is asked is that the information should be *accurate and precise*. It would be useful if localities where they are obtainable are mentioned and a rough estimate of probable quantity available is made. Specimens of the raw (and finished) material will be welcome in the Gass Forest Museum.

C. Fischer.

Cowley-Brown Memorial.

We congratulate the Students of the Madras Forest College on the praiseworthy decision they have arrived at to commemorate the connection of the late Principal Mr. F. C. L. Cowley-Brown with the College; for in the words of His Excellency Lord Pentland, Governor of Madras "It must, I feel sure, afford justifiable gratification to Mr. Cowley-Brown to know that the students recognize their debt to him and to his devotion to their interests; and that his connection with the College as its First Principal will at their instance be duly commemorated".

It is proposed that the memorial should take the form of a portrait (bromide enlargement) hung up in a conspicuous place in the College and a recreation room called "the Cowley-Brown Recreation Room" attached to the Forest College. This has met with the approval of all who were and are connected with the College; and subscriptions were munificently put down by the batch of students of 15-17 and the present seniors. It has been estimated that a sum of Rs. 3500 would be required for the purpose and a sum of Rs. 900 has been promised.

We appeal for funds to all those who have gone out of the college; trust that those who have promised will make early remittance and wish the endeavour every success ere long.

Elephant Sale at Walaiyar.

Though, to the general public there is nothing attractive about the little village of Walayar, it has come into prominence of late. Once in a year here, meet the heads of Forest Administration of the Western Circle for the sale of Government elephants-captured and nursed in the ranges of Mudumalai, Thunacadavu, Nedungayam and Chedalath.

Situated on the boundary between Coimbatore and Malabar and easily accessible to the public by the advantage of its position on the railway line, and this augmented by its suitability for a temporary elephant camp with plenty of fodder and water, the authorities very rightly selected this place for conducting the annual auction sale of elephants which has been a success for the last four years. This year His Excellency Lord Pentland, Governor of Madras graced the occasion with his presence. The sale lasted for six hours and realised Rs. 30,960 as the price of 15 elephants. Considering that most of the animals were under 4 years of age and the majority were calves, the average of Rs. 2000 must be considered satisfactory.

Another important feature of the occasion was the spirit displayed by the students of the Madras Forest College who never spare any opportunity to contribute what mite they can to the War fund. Two refreshment stalls were run entirely under their management—one on English and the other on Indian lines—which were patronised by Europeans and Indians alike and the latter was honoured with a visit by His Excellency.

The total proceeds of the sale were Rs. 85 which is to go to the War Fund.

Committee of Management, M. F. C. Journal.

At a meeting held at the Madras Forest College, in the Principal's Lecture Room on the 10th October 1916, it was decided to carry on the Madras Forest College Journal and the following Officers were proposed and appointed unanimously.

1. The Principal.—*President.*
2. E. M. Crothers Esq.—*Business Manager.*
3. C. Karunakara Menon, Senior Student and Editor.

4. C. Srinivasa Rao, Junior Student and Assistant Editor.

At the meeting were present.

C. Fischer Esq., Principal.

H. C. Bennett Esq., Second Imperial Instructor.

E. M. Crothers Esq., First Provincial Instructor, and all other students in residence.

Athletics at the Madras Forest College, during 1915-16.

College games suffered from the same drawbacks as last year. Many of the students are too old to be proficient at games and the College has no playing-field of its own. Although the College Motto is "Mens sana in Corpore sano" and the Madras Government recognise the importance of games, the construction of a playing-field has not yet been begun. The question of converting black cotton soil into something which will serve as a playing field has been difficult to solve, and has perhaps led to the delay. The Coronation Park in Coimbatore where the students have to go for their games is over a mile from the College and the road is far from good. The College Athletic Club has had to spend a good deal of money in putting the pitches in the Coronation Park in order and maintaining them.

While at Coimbatore the students play compulsory games twice a week. Hockey was the compulsory game during the Autumn term and football during the Summer term. Whenever suitable ground could be found these games were played in camp.

The following gives the result of the hockey matches played :—

M. F. C. & Reserve Police. M. F. C. lost by 4 goals to 1.
M. F. C. & Stanes High School. M. F. C. lost by 4 goals to 3.

M. F. C. & Agricultural College. M. F. C. lost by 2 goals to 0.
 M. F. C. & Stanes High School. M. F. C. lost by 4 goals to 2.
 M.F.C.&Coimbatore Gymkhana. M. F. C. lost by 3 goals to 0.
 M. F. C. & Do M. F. C. won by 8 goals to 3.
 M. F. C. & Agricultural College Match unfinished with Agricultural College leading by 2 goals to 1.

In the annual hockey match for the Cowley-Brown Cup, the Senior Division students beat the Junior division students in a very keen game by 2 goals to 0.

At football the College was more succesful and the results of the matches played are as follows :—

M.F.C. & Malayali Club, Podanur. M.F.C. won by 1 goal to 0
 M.F.C & Police Recruit School. M.F.C. won by 6 goals to 0
 M.F.C. & Coimbatore Gymkhana. M.F.C. won by 6 goals to 4
 M.F.C. & Stanes High School. M.F.C. won by 2 goalsto 1
 M.F.C. & Nilgiri Volunteer Rifles. M.F.C. lost by 2 goals to 0
 M.F.C. & Stanes High School. M.F.C. won by 2 goals to 1

While both divisions were in camp together at Bolampatti a six-a-side tournament was played for prizes given by the Vice-President. The side captained by Korah Fenn won.

Cricket was practised by the Junior Division students when in camp in Ootacamund in April but no match was played.

The Marathon Race was run at Bolampatti camp in March along jungle paths, some 3 miles of the course being very steep, and in spite of the weather being very hot Junior student C. S. Nanjappa won in record time.

The Annual Sports were held on the Coronation Park, Coimbatore on 23rd October and were a great success. One of the best and certainly the most amusing event was the obstacle race. As usual, the prizes were of a useful

nature and Mrs. McCarthy, wife of the Conservator, Western Circle kindly gave them away. C. S. Nanjappa with 19 points easily carried off Mr. Richmond's Cup for the student who gained the largest number of points in the Sports and won the only "Colours" for Athletics awarded during the year. C. H. Ashe was second with 8 points.

The results of the different events are given below :—

- | | |
|----------------------------------|--|
| 1. 100 yards race. | 1. C. H. Ashe, Winner's time 12½seconds. |
| | 2. H. D. Patell. |
| 2. Long jump. | 1. C. S. Nanjappa. Winner's jump 16½". |
| | 2. C. H. Ashe. |
| 3. ¼ mile race. | 1. C. S. Nanjappa. Winner's time 64½ seconds. |
| | 2. T. R. Naganatha Iyer. |
| 4. 120 yards Hurdle Race. | 1. Sambamoorthi. Winner's time 20½ seconds. |
| | 2. C. S. Nanjappa. |
| 5. High jump. | 1. F. Burgess. Winner's jump 4'5" |
| | 2. T. R. Naganatha Iyer. |
| 6. ½ mile Race. | 1. C. S. Nanjappa. Winner's time 2' 38½" |
| | 2. Gulam Rassul. |
| 7. Invitation Race, ½ mile. | 1. D. John. (London Mission School) time 2' 26½" |
| | 2. Narasimmulu. |
| 8. Three-legged Race, 100 yards. | 1. C. H. Ashe and Korah Fenn. |
| | 2. Paramasivan Pillai and Duraswami Iyer. |
| 9. Obstacle Race. | 1. B. Sambamoorthi. |
| | 2. T. R. Naganatha Iyer. |
| 10. 1 mile Race. | 1. Gulam Rassul. Winner's time 5' 47½" |
| | 2. C. S. Nanjappa. |

11. 100 yards Race, 1. K. Joseph.
for past students. 2. K. S. Ramiah.
12. Relay Race. Won by Senior Division students' team.
13. Tug-of-War. Senior Division students beat Junior Division students.

His Excellency Lord Pentland evinced his interest in College Sports by presenting a very handsome shield to be known as the Pentland Shield and to be awarded annually to the student showing the greatest all-round proficiency in games. Marks are awarded for Football, Hockey, the Marathon Race, the Annual Sports and Cricket and Tennis, provided matches are played in the last two and marks are allotted by the staff. C. H. Ashe was the first winner of the shield.

During the year "Colours" were awarded to H. D. Patell, C. S. Nanjappa and K. G. Srinivasa Rao for Hockey, to Syed Manavar and H. D. Patell for Football and to C. S. Nanjappa for Athletics.

Games at the Madras Forest College during August and September 1916.

Hockey is the chief game of the Autumn Quarter. As there is a strong nucleus from last year's team and as a few of the Junior Division students had previously played the game and were able straight-away to take their places in the Eleven the New Year opened with bright prospects for College hockey.

During August four hockey matches were played.

On 10th August the Police Recruits School was tackled in the Coronation Park and they defeated the College to the tune of 4 goals to 2.

Mr. Bennett and Mr. Cornwell scored the College goals. It was only towards the close of the game that the College players got going.

The next match with the Agricultural College on the Agricultural College ground on 15th August ended in a draw, 3 goals all. It was a keen and good game all through, the goal scorers for the Forest College being Mr. Bennett Mr. Cornwell and Thimmayya.

A poor game was played against the Coimbatore College in the Coronation Park on 22nd August resulting in a draw of 1 goal each. The Forest College goal was scored by Mr. Bennett.

The last match was with the Coimbatore United in the Coronation Park on 29th August and the College team played up well and won by 2 goals to 1. Mr. Cornwell scored twice.

C. S. Nanjappa is Hockey Captain and U. Timmayya Vice-Captain. The chief deficiencies in the play is lack of combination in the front rank, bad centering by the wing men, poor shooting and slowness on the part of the halves. That "rara avis" a good goal keeper seems to have been found in the person of J. Venugopal Naidu.

The Junior Division includes several good cricketers and this game which has languished for two years has been revived. Matches were played against the Police Recruits School on 12th August and against Stanes High School on 26th August. The former was won by the Forest College by 87 runs against 37 and the latter after a most thrilling finish resulted in a win for Stanes School by 2 runs, scores 72 and 70. Narasinga Rao displayed prowess with bat and ball in both matches.

In the Grigg's Memorial Sports C. S. Nanjappa carried off first prize for the Forest College in the open mile,

while U. Thimmayya annexed second prize in the open $\frac{1}{4}$ mile and third prize in the open 100 yards.

The Senior Division students were lucky to have a good playing-field at their September camp at Komuttiur and indulged in much hockey and cricket practice. A nine-a-side hockey tournament for a prize kindly presented by Mr. Dawson produced some exciting and in cases amusing incidents. T. Paramasivan Pillai's side was the victors and as the prize was in cash they had the pleasure of acting as hosts to the rest of the students at a most enjoyable social gathering.

For the Junior Division, game at their September camp, Anaipadi, was an impossibility, but good practice for coming events was obtained in tug-of-war, sprinting and jumping.

"A Conversation on Insurance."

(Contributed.)

Any father: "Now, my boy, you are started in life. You have secured a Government appointment and it rests with you as to how your future will develop. Judging from your school and college career, I do not think that it is only prejudice that makes me confident that you will meet with success.

There is one point, however, which, I confess, gives me some little cause for uneasiness. I have noticed that you are not of the provident sort but are somewhat apt to display a lack of thrift."

Any son: "Well, Father, it is not easy when others are generous with their money to be a skinflint and one has to stand well with ones fellows."

Father: "There are of course limits to thrift, as to everything else. But there is a big margin between stingi-

ness and lavishness. I do not want you to make a fetish of thrift, but I would like you to consider deeply the question of putting by a reserve for a rainy day. It would be as unwise to live wretchedly in order to save money which (*absit omen*) you might never live to enjoy as it would be to spend all you get, with nothing to show for it, and perhaps even run into debt."

Son: "But Father, remember that my salary will be small for some years to come, it will not do much more than meet my actual wants and what little I could spare would not be worth the trouble of setting aside and watching"

Father: "Now that is just where you young fellows make a big mistake and start the germs of a habit of carelessness that, when encrusted, cannot be broken. If you will only be moderate in your desires and shape your pleasures by your competence, you can easily set aside a small sum, say a tenth of your salary, every month."

Son: "Well, yes I think I can manage 1/10 of my salary, but what is that, five rupees—it is hardly worth thinking about, and how am I to put it by and where?"

Father: "I quite admit that not very much is to be done with Rs. 5 but consider that Rs. 5 a month is Rs. 60 by the end of the year. Now Rs. 60 a year paid into a good insurance company will secure you quite a respectable policy."

Son: "But what do I want with a policy? It will only fall due when I die and meanwhile I could have got some enjoyment out of the amounts paid in."

Father: "My boy, there are two errors you have just voiced. You do want a policy, and that is precisely the point I am driving at. I want you to insure. You may not want a policy now and you do not see why you should

be bothered with one. But later on, you will be very glad if you have followed my advice. You are still very young, but you will probably marry, and, let me tell you, I rather think you will marry early. Well, when you are married you have no longer yourself alone to think of, you have to consider the possibility of your dying early and leave a destitute widow and perchance orphans.

Remember that I shall not be able to leave you much."

Son: Oh! Father, I never gave that a thought."

Father: "I am quite sure you have not. You are, as I have said, perhaps a trifle too generous-minded. But I particularly wish you to think of it. Does it not become the duty of a man who marries to make provision for his wife?"

Son: "Yes, certainly, but I am not married yet or intending to; will it not be time to insure when I contemplate taking that step?"

Father: "No, it is most unwise to defer insuring. Firstly, every year added to your age adds a certain amount to the premium you will have to pay. The reason is obvious as each year brings you nearer to the day when the sum assured must be paid. Secondly, you are now in sound health. Who can guarantee that you will remain so? At present you are what is termed "A first class life" but supposing you meet with some accident or contract some disease which leaves permanent effects, you will find that either you cannot effect an insurance at all or else only at a very high rate of premium. Therefore, insure at once, insure for as much as you can afford now and increase your insurance later."

Son: "H-m!"

Father: I see that you are still only half convinced, but I hope to bring you round completely before I have done.

Now, for your second error. You seem to think that you can only insure in favour of heirs, or in other words, that any sum you insure for is only payable at your death and can never be enjoyed by you. That is not the case. You can make insurance a provision for your old age while in the meanwhile it is also an assured provision for any one dependent upon you should you die in the interim.

Son: "That sounds better, and I should like to know more about it."

Father: "Well, I will try to make it clear.

Supposing you take out what is called a whole life policy. As you are young and healthy the insurance office has every reason to expect that you will live to a normal age, that is, say, another forty years and during all this time you will be paying every month, quarter or year as you decide, the premium agreed upon and that they will not have to pay out to your heirs anything until that remote date. It follows that on the average of the large number of people insuring, the company can afford to demand only a small premium."

Son: "Yes, that is quite clear."

Father: "But you may think to yourself; I shall be retiring when I am 50 or 55 and my income will drop immediately from the amount of my salary to that of my pension, and I may not be able to afford to pay the premium out of my pension. Well you can meet the case by an arrangement to pay the total premium you would have to pay in the first case in a definite number of payments ceasing at the age of 50 or 55, as you may decide. It follows that as there will be fewer payments the amount of each payment will be larger."

Son: "Yes, I understand, I think that would be preferable. But I do not yet understand, where the provision

for old age comes in, as I presume the amount insured would still only be payable at my death."

Father: I am just coming to that point. I see that the idea of some personal return for your money has attractions for you. You may consider that at the time you retire a lump sum would be a most opportune happening to enable you to set up house say, very well. You have the option of a policy that will fall due on any date you care to fix. But here again it is obvious that the earlier the sum assured falls due the shorter the period during which the company has the use of your money. It must be clear, therefore, here again, the earlier the sum assured has to be paid out the higher will be your individual payments."

Son: "Yes I understand now. But, tell me, what happens should I die before the date fixed for the payment."

Father: "Why then the full amount insured for is paid to your heirs. There is still a further point for consideration. There are what is called "participating" and "non-participating" policies, or in other words "with and without profits policies." In the latter case you are paid simply and solely the amount insured; but for a somewhat higher premium you are paid in addition a certain percentage, over and above the sum insured, the amount depending on the actual profits made from time to time by the Insurance Co. In a sound office this amounts to very considerable increase on the sum insured and offers quite a sound investment for your money.

Son: "That sounds like a bit of all right."

Father: I have not quite done yet. Now in Government service you have, as you know, the option, and in some cases no option, of putting by a certain proportion of your salary in the Provident Fund, at 4% interest. Now this is very excellent-it is a good investment and encourages

thrift. But a good insurance with profits is better. With insurance not only are you assured a definite sum at a fixed date or at death but your heirs are assured of the whole sum at your death however early it may take place.

Son: "Please explain that further. I do not quite understand."

Father: "I will explain in this way. Say you put Rs. 5 a month, or Rs. 60 a year, in the Provident Fund. At the end of five years you have to your credit Rs. 300 plus interest, say about 330 in all, and if you unfortunately were to die then your heirs would receive that sum only. But Rs. 60 a year would give you a policy with profits of about Rs. 2000 and were you to die in five years or even in less than one, your heirs would receive the whole of that sum."

Son: "By Jove, yes, I see now."

Father: "Well then my very earnest advice to you is:—Take out at once a "with profits policy" for as much as you can manage at present payable at age of 55, or 50 if you prefer it. Then later on, say when you marry take out another "with profits policy" payable at death only. Increase your policies as you can afford it. Be sure, however, that you are dealing with a good company.

Son: "You have quite convinced me, Father, and I will gladly follow your advice. I can see that you have thought the matter out and I shall be grateful if you will help me through the necessary steps, and advise me as to the office to select."

We draw attention to the advertisements at the end of this issue. As we look to a certain amount of revenue from this source we request subscribers who obtain any articles advertised to mention this Journal when ordering.

**Means of Offence and Defence which nature
has furnished to Plants.**

The whole of the vegetative activity of the plant is directed towards one end viz., the reproduction of seed in sufficient quantity to ensure the perpetuation of its own species. A few instances of these are quoted from an article in the *Scientific American*, which might be regarded as a means of defence, though defence of a passive nature. Means of offence are also provided in some plants which commonly take the form of spines, prickles, thorns, acrid juice etc.

In our extract below we have merely confined ourselves to show the adaptations in plants for the perpetuation of their own species leaving out of account the many adaptations of protection against enemies who might destroy the plant itself. With these preliminary remarks we quote the following.—

The fruit of the wild cucumber or *Ecballium* is “supported by a peduncle recurved in the form of a bishop’s cross* in such sort that the point of attachment is turned upward. When ripe the fruit detaches itself from its support and through the gaping aperture thus produced it projects with very great force the seeds which it contains in the midst of a mucilagenous liquid to a distance of 1 or 2 meters (a yard or two). This vegetable ‘cracheur’ † is exploited by children, who direct the jet at the face of a comrade by way of a pleasantry.”

More familiar in this country ¶ is the common balsam of our gardens. Its curious fruit is doubtless known to most of our readers. When ripe it splits in five longi-

* what in the shape of a sickle.

† french meaning; one who spits.

¶ This refers to America; in India we have a number of wild balsams,

tudinal lines and five valves separated twist suddenly upon themselves, thus launching in every direction the seeds which are slightly attached to them.

‘Shortly before maturity is reached the slightest touch causes the rupture to take place immediately; it is for this reason that the expressive name of ‘impatient touch-me-not’ is often given to the balsam—a name which the botanists have translated into Latin *Impatiens noli—tangen*. All the other species of balsam act in the same manner§.

Not less singular is the Sandbox (*Hura crepitans*) a large tree of America, whose extremely hard fruit look like a tomato. At maturity the fruit opens suddenly with a noise loud as a pistol shot, and projecting its valves and seeds to a distance. To preserve the fruit of the sand box (*sablier*§) in collections it is necessary to encompass it with several windings of iron wire, and disastrous instances are quoted where the force of the fruit was sufficient to break these bonds and smash the glass frames that contained it.”

As a final instance of vegetable projectiles, Mr. Coupin refers to the parietary†, a modest plant growing on runied walls. If the stamens of the freshly opened blossoms be touched with a pin they immediately rebound like wire springs, scattering to the winds a light cloud of pollen, destined to fecundate the ovules of more distant flowers.

§ One of our South Indian wild balsams, common in parts of the Anamalais, has been named by col. Beddome. *Impatiens Tangashi* (the impatient little tister). The specific name was given after one of two peaks in the Anamalais (Akkamalai and Tangachimalai) on whose slopes Col. Beddome first found the plant.

§ french=sand box.

† The plant referred to as parietary is probably *Pilea muscosa* (Urticaceae) also known as “the gunpowder plant.” which has become naturalised in parts of India i. e. Tea estates on the Anamalais.

Extracts from Fort St. George Gazette.

The following Forest Officers are granted privilege leave for the period noted against each, under article 260 of the Civil Service Regulations:—

Mr. T. Clear, District Forest Officer, West Kurnool, for six weeks from 14th July 1916.

August 1, 1916.

Mr. G. W. Thompson, District Forest Officer, South Kurnool, for six weeks after the return of Mr. T. Clear.

M. R. Ry., K. Desika Achari, Deputy Ranger, first grade, and acting Ranger VIth grade, on relief of the Srihanikota Range charge, Nellore District, is posted to Sattenapalle range, Guntur District, *vice* Ranger Mr. E. W. Fernandez on leave.

Mr. C. S. King, Ranger, fifth grade, on return from leave, to the Bontha range, Ganjam district.

M. R. Ry., N. K. Sarma, Ranger fifth grade on return from leave to the Kukuluba range, Ganjam district.

M. R. Ry., B. V. Nagrajam, *Sub-protem* Ranger, third grade, on the completion of the session of Vernacular Training School, to Giddalore range, Kurnool South Division.

M. R. Ry., C. Rajagopal Nayudu, Ranger second grade, on return from leave is posted to Santavasal Range South Vellore Division.

Mr. E. Dawson, Ranger, third grade, on return from leave, is posted to Attur range, South Salem division.

M. R. Ry., C. A. Ramakrishna Ayyer, ranger 3rd grade on relief by E. Dawson is posted to special duty for the demarcation of the new Attur reserves.

M. R. Ry., S. Doraisami Ayyar, Ranger fifth grade, on return from leave, is posted to Chitteri range, South Salem division.

August 8, 1916.

Under article 260 of the Civil Service Regulations, the Board directs privilege leave for 21 days with effect from 14th July 1916 to Mr. T. N. Hearsey, Extra-Assistant Conservator of Forests on special duty.

To Mr. E. A. Davis I. C. S., Personal Assistant to the Forest Commissioner, Board of Revenue, Madras, privilege leave for one month with effect from date of relief from special duty.

M. R. Ry., P. Venkataramanan, Extra Assistant Conservator of Forests working under the District Forest Officer, Vellore South, to work under the District Forest Officer, Ganjam.

M. R. Ry., E. V. Padmanabha Pillai Avergal, Probationary Extra Assistant Conservator of Forests, is posted to do duty under the Conservator of Forests, Central Circle, in connection with the preparation of Working Plans in Bellary district.

Acting Ranger Mr. H. McBride is posted to the charge of Hospet range to hold charge as a temporary measure in addition to Sandur range until further orders.

Acting Ranger M. R. Ry., L. Govindaswami Pillai, on relief of Hospet range charge to the charge of Harapanahalli range.

Ranger M. R. Ry., K. Ramayya on relief by L. Govindaswami Pillai is placed under suspension pending enquiry and disposal of serious charges pending against him.

M. R. Ry., S. Jothinayagam Pillai, supernumerary Ranger, sixth grade, Kurnool East, is granted privilege leave for one month with effect from date of relief.

Mr. Mhammad Asadullah Sahib Ghattala, Ranger, sixth grade transferred to the Northern Circle, is posted to the Kurnool range of the Kurnool West division.

M. R. Ry., W. Balakrishna Mudaliyar, acting Ranger sixth grade, transferred by Board from Northern circle to southern circle, is posted to Musiri range, Trichinopoly district.

M. R. Ry., M. Ambu, Ranger, fifth grade, south Coimbatore is granted privilege leave for one month from 4th July 1916.

M. R. Ry., M. N. Raman Pillai, holder of higher standard certificate of the Madras Forest College, is appointed to act as Ranger sixth grade, *sub pro-tem*, on probation for six months and posted to work under the orders of the Working Plan Officer, Western circle.

August 22, 1916.

Under article 237 (c) of the Civil Service Regulations, Mr. J. S. Scot, Deputy Conservator of Forests, is granted extension of furlough for four days, *i.e.*, from the 6th to the 9th July 1916.

Consequent on the application of Ranger D. C. Bhide for extension of leave the transfer of M. R. Ry., B. Chenchurama Nayadu, ranger, fourth grade, *sub pro-tem* from Chittoor district to Nellore district and the reversion of acting ranger K. Desika Achari cancelled.

The transfer of acting rangers Messrs. Henry McBride and L. Govindaswamy Pillai, are cancelled.

M. R. Ry., K. R. Viswanatha Ayyar, ranger, fourth grade, Bellary district, on return from leave is posted to Guntur district to the charge of Sattanpalle range; vice Mr. E. W. Fernandez on leave.

The posting of Deputy ranger K. Desika Achari to the above range is cancelled.

M. R. Ry., C. D. Parthasarathy Chetty, fourth grade, in charge of Cuddalore range, is granted combined leave for six months, from date of relief.

M. R. Ry., T. V. Govinda Rao, acting Ranger, sixth grade, North Salem is posted to the charge of Cuddalore range, South Arcot district.

Mr. A. P. McKey, Deputy ranger, first grade, Trichinopoly division is transferred to South Arcot and posted to the charge of Tirukkoyilur range to relieve M. R. Ry., M. Ramaswami Chetty, granted leave; who to revert to his permanent appointment from date of relief as Deputy ranger, second grade.

M. R. Ry., K. Ramaswami Ayyar, ranger second grade Coonoor range, Nilgiris.

M. R. Ry., K. Karunakaran Nambiar from Coonoor range, Nilgiris to Udipi range, Mangalore North.

Mr. C. B. Lafrenais, Ranger sixth grade under suspension to Sankaranarayana range, Mangalore North.

Mr. B. D'Sa, Ranger, fourth grade on leave, to Mettupalayam range, central Coimbatore division.

Mr. S. Noronha, Ranger, first grade from North Coimbatore to Erode range, central Coimbatore.

Mr. A. Swami Kutty, Ranger fifth grade from central Coimbatore to Bhavani range, North Coimbatore.

August 29, 1916.

Mr. Henry McBride, Deputy Ranger, first grade and acting Ranger, sixth grade. Sandur range, Bellary district, is confirmed as Ranger, sixth grade, with effect from 22nd August 1916.

M. R. Ry., K. V. Subba Rao, Ranger, third grade, Godavari lower, is transferred to the charge of Nugur range of the Godavari upper division.

On expiry of leave, M. R. Ry., P. Lakshmana Chetty sub *pro-tem* Ranger, fourth grade, is posted to the charge of Polavaram range, Godavari lower.

M. R. Ry., S. Doraswami Ayyar, Ranger, fifth grade, south Salem division, is granted privilege leave on medical certificate for three months from 21st June 1916.

The privilege leave for one month from 4th July 1916 granted to Mr. M. Ambu, Ranger fifth grade, South Coimbatore is extended by another month.

September 12, 1916.

Mr. J. A. Master, Assistant Conservator of Forests, Ganjam, is transferred to the central circle, to work under the District Forest Officer, East Cuddapah.

Muhammad Abdul Karim Sahib Bahadur and Mr. Woohouse, Adolphus, Probationary Extra Assistant Conservator of Forests now working in Southern and Western circle, respectively to work under the District Forest Officers, North Coimbatore and Madura respectively.

Consequent on the demise of third grade Ranger C. A. Ramakrishna Ayyar the following promotions are made in the class of Rangers with effect from 15th August 1916:—

M. R. Ry., M. Pakyanathan, from third grade sub *pro-tem* to third grade permanent.

Mr. K. P. Benjamin, from fourth grade to third grade sub *pro-tem*.

M. R. Ry., S. M. Krishnaswami from 4th grade sub *pro-tem* to fourth grade permanent.

M. R. Ry., P. Gopalasankara from fifth grade to fourth grade sub *pro-tem*.

M. R. Ry., C. G. Ganapathi from fifth grade sub *pro-tem* to fifth grade permanent.

M. R. Ry., A. Siddan Pillai, from sixth grade to fifth grade sub *pro-tem*.

Mr. C. Mahony, Ranger, third grade on return from leave, is posted to Bukkapatnam Range, Anantapur District.

M. R. Ry., C. Ramu Rao, Ranger, fifth grade, in charge of Bukkapatnam range, is transferred to Harpanahalli range, Bellary district.

M. R. Ry., L. Govindaswamy Pillay, Deputy Ranger and acting Ranger sixth grade, in charge of Harpanahalli range, is reverted to his permanent post of Deputy Ranger and reposted to Chittor district.

M. R. Ry., R. Manikkam Pillai, Ranger, fourth grade, North Salem Division, is on return from leave, transferred to Trichinopoly district to hold charge of Perambalur range.

Under article 260 of the Civil Service Regulations.

M. R. Ry., S. V. Devadasan, Extra Assistant Conservator of Forests, is granted privilege leave for 15 days in continuation of 2 months' privilege leave already granted to him.

Mr. S. Lasrado, Extra Assistant Conservator of Forests to be District Forest Officer North Malabar, during the remaining period of the absence on privilege leave of Mr. Meyers or until further orders.

September 19, 1916.

The Secretary of State has been pleased to grant to Mr. C. B. McCarthy, Conservator of Forests an extension of furlough for twelve days from 13th October 1916.

Mr. W. C. Hart is confirmed as Extra Assistant Conservator of Forests with effect from 2nd May 1914.

Mr. J. A. Aranha, Extra Assistant Conservator of Forests on probation, will revert to the post of second grade Ranger with effect from date of relief. Muhammad Abdul Karim Sahib Bahadur Extra Assistant Conservator of Forests, on probation is granted privilege leave for one month and fifteen days with effect from or after the 16th September 1916.

The Board grants privilege leave for one month to Mr. W. E. Hart Extra Assistant Conservator of Forests.

Consequent on the demise of fourth grade Ranger B. A. Duraiswami the following grade promotions take effect from 1st September 1916:—

M. R. Ry., B. Chenchurama Nayandu from 4th grade sub *pro-tem* to 4th grade, permanent.

Mr. Antony Culas, from 5th grade to 4th grade, sub *pro-tem*.

M. R. Ry., C. G. Krishnan, from fifth grade to fifth grade permanent.

M. R. Ry., R. Alagirisami Nayudu, from sixth grade to fifth grade, sub *pro-tem*.

Mr. E. W. Fernandez, Ranger, sixth grade, supernumerary, Guntur District is granted 3 months privilege leave on medical certificate with effect from 16th July 1916.

September 26, 1916.

M. R. Ry., S. V. Devadasan, Extra Assistant Conservator of Forests, to be District Forest Officer, Chinglepet.

Muhammad Abdul Karim Sahib Bahadur is confirmed as Extra Assistant Conservator of Forests with effect from 23rd July 1916.

October 3, 1916.

Mr. Malcolm Edward Couchman, I. C. S., to act as fourth Member, Board of Revenue, and to be Commissioner of Land Revenue, during the absence of the Hon'ble Mr. H. F. W. Gillman, I. C. S., on leave or until further orders.

October 10, 1916.

M. R. Ry., A. R. Narasimha Ayyangar, Ranger 3rd grade and sub *pro-tem* Ranger, second grade, to be Extra Assistant Conservator of Forests, on probation, for one year.

Mr. G. C. Robinson, Assistant Conservator of Forests, is granted examination leave for two months from the date of his relief in South Malabar.

M. R. Ry., B. V. Vaideeswara Ayyar, Ranger, fifth grade, Chandragiri range, Chittor district is reduced to the post of Deputy Ranger, first grade, for six months from the date he is relieved of range charge. Consequent on the above reduction the following postings are ordered:—

M. R. Ry., B. Chenchurama Nayudu, Ranger, fourth grade, Chittor range, and in additional charge of Palmaner range, is posted to the charge of Chandragiri range, to relieve M. R. Ry., B. V. Vaideeswara Ayyar, Ranger 5th grade, when Mr. S. M. Razvi Ranger fifth grade, return to duty in Palmaner range.

M. R. Ry., L. Govindraswamy Pillai, acting Ranger, 6th grade, Harpanahalli range, Bellary district, on relief by M. R. Ry. G. Rama Rao, Ranger fifth grade, is posted to the charge of Chittor range.

Consequent on the resignation of M. R. Ry., B. Sanniah, Ranger, 4th grade, West Cuddappah district, the following postings are ordered:—

M. R. Ry., A. Ranganayakulu Nayudu, Ranger, fourth grade, sub *pro-tem.*, West Cuddappah district, is transferred from Pulivendla range to the charge of Rayachoti range of the same district.

M. R. Ry., S. A. Ramakrishna Nayudu, Ranger, sixth grade, on special duty, West Cuddappah district, is posted to the charge of Pulivendla range.

Mr. R. E. Lemos, Ranger third grade, Ambasamudram range, Tinnevely district, is granted privilege leave for six weeks from date of relief by S. Venkataswami Nayudu, Deputy Ranger, first grade.

M. R. Ry., L. R. Narayana Ayyar, Ranger third grade, is granted privilege leave for three months from date of relief by Ranger C. Rajagopal Nayudu.

Mr. J. A. Aranha, Ranger, second grade on relief in the Western Circle, is posted to Santhavasal range, South Vellore division.

M. R. Ry., C. Rajagopal Nayudu, Ranger, second grade is transferred from South Vellore to South Salem for charge of Salem East range.

THE Madras Forest College Journal.

Published Quarterly.

Vol. I. December, 1916. No. 2.

- N. B:—Contributors are requested to send in their contributions typed or written legibly in ink on one side of the paper only.—Editor.*

Editorial Notes.

In offering the second issue of the Madras Forest College Journal to our readers we wish to thank one or two correspondents for kind remarks made.

On the other hand, we are somewhat disappointed at the response to the request that officers should become subscribers. Though a considerable number have joined, there are still many who have not. We trust that subscribers will lose no opportunity to get others to join. A post card authorising us to send the past issues by V. P. will suffice.

Another point which causes us some uneasiness, is the lack of contributions from outside. The first number necessarily had to be mainly from the pen of one or other of the committee of management (with one exception). Our astute readers will no doubt recognise that the great bulk of the present issue is also from the management. We desire to throw open the pages of the Journal freely to everyone. At the same time we do not wish in any way to challenge the *Indian Forester*. (It would be foolishness as well as presumption to do so). This is a charge that has been levelled

against us. So far is this from our intention, that we have recently sent on to the Editor of the *Indian Forester* a note which had been offered to us.

One last growse. The response to the appeal for the Cowley-Brown fund is not what was hoped. It is believed that this is due partly to putting off writing. The students who left the College in July last were the originators of the scheme and it is for them to come forward first. The Principal is awaiting full information from them before he makes a wider appeal. It is suggested that many will prefer making payment by instalments. This is quite feasible. The building will take some time to erect and the money will only be required gradually. It is hoped that many will now respond. As soon as the Principal is in a position to know what amount to expect from Students past and present he will make a wider appeal.

It is proposed to acknowledge all contributions to the Gass Forest Museum in the Journal. The catalogue of the museum is under revision, as soon as it is ready, a list of articles required will be prepared and published in the Journal and it is hoped that Forest Officers throughout the Presidency will assist in making the museum as complete as possible.

Want of a Research Institute for Southern India.

At the opening ceremony of the new Madras Forest College Buildings at Coimbatore by His Excellency Lord Pentland, the Governor of Madras, Mr. C. E. C. Fischer, the Principal, in his address, laid stress on the necessity of opening a Research Institute attached to the Forest College.

We do not propose to renew the request at this juncture, when the government and the people are alike interested in seeing the culmination of the great war into which our Empire has been dragged by the Modern Huns. When William and his followers have disappeared as did Attila and his followers, then will the hour strike for us to press on the Government our request. For the present we merely desire to state the reasons for entertaining the desire for a Research Institute.

Pure water when analysed will give two parts of hydrogen and one of oxygen is a fact enunciated by science; that two sides of a triangle are together greater than the third side is a maxim the truth of which cannot be disputed in any part of the globe; but in the science of Forestry any maxim like the above cannot be safely laid down, for what has been found by experience advantageous to a particular species in one part of the same country may be antagonistic to the same species in a different part of the same country; more so with India that has in it different types of climates ranging from the burning heat of Rajputana to the brisk cold of Cashmere, then again Cherapunji with its 500 inches of rainfall down to 2 or 3 inches in Sindh. These varying factors naturally result in so many different types of forests. Facts discovered of a species, say in Northern India, might not hold good for the same species in Southern India.

The Government of India realised the importance of the reservation of forests in the interests of the country; and soon after the policy of reservation was resorted to, they opened a Forest College at Dehra Dun; and as times advanced the necessity for the opening of a Research Institute was realised and this has been doing a lot of useful work in unravelling many of the hidden mysteries; but the benefits of these researches carried on in Northern India

cannot safely be applied to the forests in Southern India and consequently we cannot always avail ourselves of the results obtained by experiments conducted by the Research Institute Staff at Dehra Dun.

The conditions that necessitated the institution of a Forest College in the Madras Presidency were referred to in our last number and now we think that a Research Institute is a desideratum in connection with the College.

Many important problems require solution with regard to many of our important forests; the regeneration of teak and rosewood, the conditions under which they would thrive, the best means of combating spike in sandal, the eradication of bamboos and kantana from many of our valuable forests—to mention a few among the many—require some successful solution. These cannot be done by a stroke of the pen; but only by actual experiments carried out for a series of years under different conditions in different localities in this Presidency; and it would be unfair to expect of the District Establishments to carry on such experiments when they have already enough to do in their regular routine of administration.

The vital problems still remain unsolved and if we do not take time by the forelock we will be wavering years hence as we are now and as we were before. We trust that one of the methods by which we could do a good deal to bring us to some determination with regard to many points is by opening out a Research Institute in connection with the College with whole time officers who could pay particular attention to this sort of work.

In Coimbatore we have a valued neighbour in the Madras Agricultural College and Research Institute. This fact, if no other, urges on us the desire to possess also a Research Institute for Forestry. Forestry is as essential for

the good of the country as is Agriculture; so it is but natural that as much may be done for one as for the other.

We console ourselves with the assurance given by His Excellency in reply to the Principal's address referred to above which was to the effect that when opportunity offers we would be given a sympathetic hearing by the Government in regard to our desire for a Research Institute.

This fact must, however, be always kept fresh in our memory so that at the earliest opportunity we might renew our request and we trust it will be possible to make this request before His Excellency, Lord Pentland lays down the reins of government. Of his interest in Forestry we have had many undoubted proofs and if we could press our request during his tenure of office success would be assured.

The Madras Forest College Camp at Komattiyeri.

"It is an ill wind that blows nobody any good," and it is due to an outbreak of plague in the Salem District that the Forest College has been introduced to the camp at Komattiyeri in the Javadi Hills. The 1914-1916 students were due at Ayyur in the Salem District in February 1916 to study sandal. But as there was plague in the vicinity it was thought advisable to find another camp and the D. F. O. South Vellore, Mr. K. R. Venkataramana Ayyar, suggested Komattiyeri. This locality was found so suitable that it has now been adopted as the regular camp for the senior students' visit to a sandal area.

The present note is a brief account of the visit paid in September 1916.

Camp was pitched for two days at Alangaiyam in order to scrutinise the new ghat road now under construction,

which is to link Komattiyeri with the Alangaiyam—Tiruppatur road. Alangaiyam is about 19 miles from Tiruppatur and 11 from Vaniambadi and lies at the western foot of the Javadi Hills. The road to Komattiyeri at present is a very rough cart track, but the new ghat road, 14 miles long, will probably be ready for traffic before the close of 1917.

Komattiyeri is on a plateau at about 2300' and the temperature in September last was delightful. There was a little too much rain during the first ten days but the last ten gave no cause for discontent. The rain fell invariably in the evenings and nights and the morning excursions were free of unpleasantness from that cause. There was a clean bill of health throughout the tour.

A fair-sized tank occupies the central part of the enclosure, and around it is a large open space, partly under cultivation and partly fallow. On rising ground in the latter an excellent site was found for pitching the tents and there was room for hockey and cricket practice. The great drawback of this camp at present is the lack of good water. There are no good draw-wells, all water being obtained from open surface wells which are liable to contamination. This defect has been realised by the D. F. O. and experiments in well-boring were being carried out during September. It was hoped that a satisfactory supply had been found for the erection of a pump. The permanency of the supply can only be verified in the hot weather, but it is confidently expected that at our next visit we will find an ample supply of good water.

A noticeable feature of the cultivation on the plateau is the excellent system of neat fencing of bamboo, which keeps the numerous cattle confined to the tracks and fallows and out of the crops.

It is only within the last three or four years that the wealth of sandal in the Javadis has come to light. This and the fact that the first elaborate working-plan for the management of sandal forest has been sanctioned for this tract make this locality so desirable for our purposes. In addition there is the complete system of forest roads, designed by the Special Forest Engineer for opening up these hills, and the fact that the hill population (Malaiyalis) is being specially dealt with from the point of view of forest conservancy. The Forest Department is to have complete control, both in forest and revenue matters, and only the judicial powers will be exercised by the regular judicial officers. The protection of the forests is to be entrusted as far as possible to the Malaiyalis and if after a few years trial this proves successful the protective forest establishment is to be withdrawn. Already the Malaiyalis have been induced to part with their goats.

It would be advisable to extend a small degree of magisterial power to the D. F. O. Detection of forest offences will be almost entirely by Malaiyalis and if the report of a forest case means that the detector has to go to the plains to give evidence, he will almost certainly not report the case at all. But if the D. F. O. holds his court in the village itself, this cause for withholding a report will disappear.

Grazing areas are being allotted to each village, each such area being clearly demarcated.

Though sandal appears to flower and fruit sporadically throughout the year there are, nevertheless, two well-marked flowering and fruiting seasons in the Javadis, i. e. from April to July and October to December. Sandal is usually described as an evergreen tree, but it was observed that some individuals at least lose all their leaves. So much

was this the case that certain trees that had been noted as leafless and dead in February were found in full leaf and health in September.

The degree of parasitism of sandal has excited considerable interest of late. With a view to testing this, with the co-operation of the D. F. O., some experiments have been started at and near Komattiyeri and it is hoped that they will be carried on to a conclusion and the periodical observations recorded in this Journal.

About two miles from the camp 6 sandal trees of average condition were selected and with a radius of 9 to 10 feet a trench 3 feet deep has been dug round each, cutting through all roots. All vegetation, except of course the sandal itself, was rooted out within the trench and this area is maintained clean weeded. It may be accepted that these sandal trees have been entirely severed from all connection with other roots. One of these trees was so isolated in February and the rest by the D. F. O. in August. The first one appeared in excellent health in September. It will be interesting to watch progress and eventually to dig out and examine the root systems.

Incidentally, it may be noted that the severed root ends of the tree trenched around in February had thrown up a number of vigorous root-shoots on the *outside* face of the trench and none on the *inside*.

In the compound of the Komattiyeri bungalow a small plot has been freed of all weeds and trenched around and sown with sandal seeds. These germinated well and there were hundreds of seedlings crowding the plot in September. All but a very few of the most vigorous were to be removed (no doubt have been by now); these are to be allowed to grow on to see how long sandal can live when prevented from becoming parasitic.

With the limited time at our disposal, it is not possible to devote much of it to the digging out and examining of root connections, a lengthy and delicate process with sandal. It was, therefore, all the more welcome to find a number of specimens of the little parasitic herb *Striga euphrasinoides*, at the camp site. Each student was able to dig up one for himself and many excellent examples of attachments on grass roots were obtained.

The measures proposed for encouraging the growth and spread of sandal will be found in the working-plan and need not be detailed here. The Students worked on some of these, and among other works marked for extraction one strip in the current year's felling area, cut creepers and demarcated and surveyed a special regeneration area, which will be fenced in by the local staff. The date of the visit did not permit of dibbling in sandal seeds, which is one of the operations to be carried out in the regeneration areas.

It is a pleasure and an appreciated privilege for the students to share to a certain extent in the care and the management of the forests while learning their future duties.

The camp at Komattiyeri of the 1915-1917 class will be memorable as a very useful and enjoyable one, not a little of the credit for which belongs to the D. F. O. and his subordinates and we all wish to express our thanks.

C. E. C. Fischer.

A possible cause of spike in Sandal.

Sir,

In the September issue of the *Indian Forester* an article under the above heading written by Mr. Govinda Menon appeared; wherein he doubts about the obligatory parasitism of sandal. I traced the roots of a number of

sandal plants and found it in every case to be parasitic upon some tree, shrub or other. The much condemned "Forest-Pests" such as, Prickly Pear (*Opuntia Dillenii*), Bamboos (*Bambusa Arundinacea* and *Dendrocalamus Strictus*) have also been found to have the honour of being the hosts of the valuable sandal. When sandal is grown in nursery beds it is never found to fare well. When every plant of the above species is found to have its roots attacking the roots of some other plants, one naturally arrives at a conclusion that this is done out of sheer necessity, if not for want of any luxury, as Nature is seldom extravagant in bestowing any superfluous gifts upon her children.

May I ask Mr. Govinda Menon kindly to trace the roots of any one of the sandal plants that is at present the subject of his observation, and see if they are not attached to the roots of some plant or other. I have my doubts that the plants in question may be taking their nourishment from the grass even when no better help is available close by.

The problem of Mr. Govinda Menon would have assumed the shape of a riddle if the three sandal plants referred to, had been grown in pots, and now as they are grown on the ground and as complete isolation is not secured, I think, that there will be an easy way for its solution.

Vellore, }
4-12-16 }

O. D. RAMALINGAM,
Range Officer, Arcot.

Editorial Note :—There are several officers of experience who have the same doubts as Mr. Govinda Menon. It is to settle this point one way or the other that the experiments referred to in the previous note have been started.

Woods for Tea-boxes.

A list of woods used to a greater or lesser extent for the above purpose in Ceylon was published in a recent issue of the *Tropical Agriculturist*. In view of the growing importance of the subject in Southern India, where for some years past planters' agents have been seeking information on the subject, it will be useful to reproduce in these columns those items of that list which occur in South Indian forests, together with a few notes on localities and quantities.

List of woods used for tea-boxes.

1. **Michella Champaca, Linn** :—Tamil, *Champaga*. In evergreen forest in the Western Ghats. Not abundant. Also planted in gardens.
2. **Michella nliagrica, Zenk** :—Tamil, *Champagam*; Canarese, *Sampagai*. In and near evergreen forests in the Western Ghats, Biligirirangans, Anaimalais, and Palnis above 4000 feet. Fairly common.
3. **Cyathocalyx zeylanicus, Champ** :—Evergreen forests of the Western Ghats below 3000 feet. Nowhere abundant.
4. **Xylopla parviflora, Hook : f. & T.** :—Evergreen forests of Travancore below 2000 feet. Too heavy to be much in favour.
5. **Calophyllum elatum, Bedd** :—Tamil, *Pun*. Evergreen forests of the Western Ghats from 1000 feet to 5000 feet. Too heavy to be in much favour and also too useful for other purposes.
6. **Bombax malabrieum, D. C.** Tamil, *Olaga, Yeluvai*. In nearly all districts. Perhaps the very best wood for tea-boxes, but becoming scarce in accessible places.

7. **Cullenia excelsa, Wight.** Tamil, *Karanai*. In evergreen forest in the Western Ghats up to 4000 feet. Very common in certain areas, e. g. Aniamalais, between 2000 and 3500 feet.

8. **Ailanthus malabarica, D. C.** Tamil, *Mattipal-maram*. In evergreen forest in the Western Ghats up to 3000 feet.

9. **Melia composita, Willd.:**—Tamil, *Malai-remba*. In all but the driest districts. Common in certain localities. Grows very rapidly and is said to reach a saleable size in 8 or 9 years.

10. **Chukrassia tabularis, A. Juss.:**—In most deciduous hill forests between 1000 feet and 3000 feet, but nowhere very abundant.

11. **Kokoona zeylanica, Thw.:**—Evergreen forests of the Western Ghats. Not very plentiful. Splits to freely.

12. **Tetrameles nudiflora, R. Br.:**—In evergreen forests of the Western Ghats up to 3000 feet. Fairly abundant in certain localities.

13. **Chrysophyllum Roxburghii, G. Don.** In evergreen forests of the Western Ghats up to 4000 feet. Abundant in Travancore.

14. **Alstonia scholaris, Br.:**—Malayalam, *Palai*. In most districts, but common only on the West Coast.

15. **Myristica laurifolia, Hook: f. and T.:**—Evergreen forests of the West Coast. Not much favoured being very difficult to dry.

16. **Machilus macrantha, Trim.:**—In and near evergreen forest in the Western Ghats from sea-level to 4000 feet. Abundant in the forests on the West Coast.

17. **Litsea sebifera, Pers.:**—Evergreen forests of the Western Ghats. Comparatively rare.

18. **Litsea zeylanica, C. & F. Nees.** Evergreen and semi-evergreen forests in the Western Ghats and other hill tracts.

19. **Aleurites moluccana, Willd.:**—Malayalam, *Katubadam*. An exotic which has been introduced and has run wild in parts of Malabar:—Nedungayam and Wynaad.

20. **Ficus nervosa, Heyne.** Evergreen forests in the Western Ghats. Not very abundant.

21. **Canarium strictum, Roxb.:**—Tamil, *Vellai-kungili-am*. This wood, though not included in the Ceylon list, has been successfully used for tea-boxes by planters in South India. It is a fairly common tree in many localities in evergreen forest from 2000 feet to 5000 feet.

C. Fischer.

Killing trees with Arsenic.

It is often desirable to kill trees without felling them or to kill them before felling so as to prevent coppice shoots or roots suckers from springing up. With many species (and these are usually just the ones one wants to get rid of) girdling is either altogether ineffective or very slow and also does not prevent root suckers arising. A quick, effective yet not too expensive method, therefore, is very desirable.

The following extracts from the *Queensland Agricultural Journal* (culled from the issue for September 1916 of *The Tropical Agriculturist*!) will be of interest to many Forest officers.

“Ordinary arsenic is not very soluble in water, and soda (either in the form of washing soda or of caustic soda) has to be used to dissolve it. Ordinary washing soda requires to be used in the proportion of three of soda to one

of arsenic and boiling is necessary to bring about a complete solution. Caustic soda, which is much dearer, need only be used in the proportion of two of the soda to one of arsenic, and the heat generated, if a reasonable amount of water is added, is sufficient to obviate the necessity for boiling. For large quantities, washing soda is preferable, because the cheaper, but for small quantities caustic soda is perhaps better because it is handier.

In dissolving the arsenic, whether for washing or caustic soda solution, there is one point worth remembering. Do not tip the whole of the arsenic into the solution in a dry state, but mix it to a paste slowly and carefully, in the same way as the housewife treats her cornflour; then pour it slowly into a solution of the soda, stirring it all the time, and being careful to stand away from the fumes, as they are poisonous. When once the soda and arsenic are dissolved and chemically combined, the balance of the water can be added to make up the required quantity.

A useful strength for quick and effective work in all kinds of timber is a solution prepared on this formula.

Arsenic		1 lb.
Washing soda		3 lb (or caustic soda 2 lb).
Water		4 gallons.
Whiting		1 lb.

The whiting serves as an indicator on the trees treated, it turns white on drying, making it quite certain what trees have been dealt with. An empty kerosene tin makes a useful measure for dissolving in, as it holds 4 gallons.

The tree that is to be operated on is first rung with a "frill ring."

(Note :—this means leaving the bark at the bottom of the cut rough and gaping so that the solution will run into and not down the stem).

"The cuts must be through the bark and well into the wood proper, and they must be as close to the ground level as it is convenient to make them, consistent, of course, with the shape of the trees; say from 6 to 10 inches up.

For trees of 4 feet diameter about a quart of solution is poured into this frilling, right round the tree, using an old teapot or kettle, as the spout makes pouring easy and less is wasted by spilling. Smaller trees, of course, need less solution.

Saplings may be cut off low down, and the solution may be dabbed on with a swab stick to kill and prevent suckering.

It is very important that this frilling and poisoning be consistently and thoroughly carried out, and not in any way scamped or slummed, if good results are to be looked for. . . . a recent report of the . . . demonstration farm records that poisoning was adopted there with success and economy. The work was done by day labour at a total cost of 1s. 5d. (Rs. 1-1-0) per acre. This must be considered very low as the country was fairly heavily timbered, and the wages were from 1s. (=12 annas) to 1s. 4½d. (Rs. 1-0-6) *per hour*. Said the manager: "The timber has all died, and mostly within 48 hours from the time of ringing."

The liquid was distributed by means of 1½ gallon watering cans with spouts made specially long, and having exit holes about the size of a No. 8 wire."

We presume that when very rapid killing is not essential the strength of the solution might be reduced and the operation cheapened, which would be desirable when working over a large area. We would like suggestions as to how this method can be adopted with bamboo.

Experiments have been carried out at the Forest College and in Tunakadavu with the poison. The results

were not very hopeful. At the Forest College attempts were made to poison several *Acacia arabica* and one *Thespesia populnea*. No signs of any kind of result were visible after 2 months, but the same can be said of the 'controls' that were deeply girdled at the same time.

At Tunakadavu no controls were used and the experiments can have no value. After 3 weeks two bamboo culms had been killed and two tree stems showed indications of discomfort, but in the absence of controls no conclusion is possible.

The failure at the College may perhaps be due to the season and to heavy rain falling within a few hours of the operation. The experiments will be repeated during the hot weather and results reported in the pages of the Journal.

C. Fischer.

Athletics at the Madras Forest College during October and November 1916.

During the short stay of 4 weeks at head quarters during October and November we played three hockey matches and four one innings cricket matches.

Hockey :—On 12th October we tackled Stanes High School on our ground in the Coronation Park. We were not a little handicapped by having to play most of the time one man short through one of our best players being obliged to leave the field on account of a hit he got during the hot contest within the first few minutes of the game. The play ended in our defeat to the tune of 5 goals to nil.

The next match was in connection with the Coimbatore tournament. We met the Reserve Police on 28th October on the Recruit School ground. The teams were well balanced and it seemed as if the game would end in a draw; but as ill-luck

would have it, circumstances accidentally led up to a penalty bully within our goal ring and this resulted in a goal to the credit of our opponents. During the second half our forwards visited the opponents' goal several times and were within an ace of putting on a goal, but our lot was but the proverbial slip between the cup and the lip. Being thus defeated by 1 goal to nil, we were denied the pleasure of taking any further part in the tournament than in the capacity of interested spectators.

The Inter-division hockey match for the Cowley-Brown cup was played at the Coronation Park on the 24th October. The good wishes of Mr. Cowley-Brown conveyed to us by wire galvanized the players so much that the game ended after a very hot contest in a draw of 3 goals all. Another game for the cup was accordingly played on the 26th with the result that the Junior Division won by 3 goals to 2. The cup was kindly given to the winners by Mrs. Fischer amidst deafening cheers for Mr. Cowley-Brown.

Cricket :—We played the Agricultural College on the 15th of October on their ground within the College precincts and won by 87 runs against 65. Junior student S. Sankar Alwa displayed skill with both bat and ball.

The second match was with the Coimbatore Gymkhana on the 25th of Oct. The Forest College played a very good game and won by 173 runs and 3 wickets against 54 runs. The game ended at 6 p. m. with Sankar Alwa (not out) scoring 60 runs after a couple of hours' hot batting.

On the 5th of November we met the Coimbatore Vakils' United Eleven on the Coronation Park and beat them by 128 runs to 37. Mr. Bennett the top scorer scored 45 runs for the College.

The return match with the Agricultural College was played on their ground on 7th November. Having scored

178 runs for 6 wickets the Forest College declared their winnings closed and against this the Agricultural College scored 71 runs for 5 wickets the game thus ending in a draw. Mr. Bennett (not out) the top scorer scored 78 runs.

Annual Sports:—The Annual College Sports were held on the Coronation Park on 21st October and went off well. The obstacle, the slow bicycle, and the children's races added to the general amusement. The prizes, which were as usual of a very useful nature, were kindly given away by Mrs. Barber, wife of Dr. Barber of the Agricultural College. Senior student S. Nanjappa, despite the wound he had on his foot, easily won Mr. Richmond's championship cup with 26 marks and Junior student U. K. Timmaya with 17 marks gained "Colours" for Athletics.

The results of the different events are given below ;—

100 yards flat race:—

1. U. K. Timmaya, Winner's time 12½ sec.
2. C. S. Nanjappa.

Long Jump:—

1. C. S. Nanjappa, Winner's jump 16' 3".
2. U. K. Timmaya.

Throwing the Cricket ball:—

1. C. S. Nanjappa, Winner's throw. 82 yds.
2. H. D. Patell.

High Jump:—

1. C. S. Nanjappa, Winner's jump. 4' 5¾".
2. A. Muthukrishnan.

120 yards Hurdle Race:—

1. H. D. Patell, Winner's time. 19½ sec.
2. C. S. Nanjappa.

100 yards Race for Past students:—

1. Korah Fenn.
2. P. Swamikutti.

¼ mile Race:—

1. U. K. Timmaya, Winner's time. 58 sec.
2. C. S. Nanjappa.

½ mile Invitation Race:—

1. W. Armstead (Stanes High School). Winner's time. 2 min. 15½ sec.
2. Ratnavelu (Coimbatore College)-

Relay Race:—

- Seniors won.
1. P. M. Mathew.
 2. H. D. Patell.
 3. N. Kesava Pillai.
 4. D. E. Lewin.

¼ mile Race:—

1. C. S. Nanjappa. Winner's time. 2 min. 29 sec.
2. U. K. Timmaya.

Slow Bicycle Race:—

1. H. D. Patell.
2. J. Venugopal Naidu.

Obstacle Race:—

1. T. Balaramaswamy.
2. P. K. Parameswaram Pillai.

1 mile Race:—

1. C. S. Nanjappa. Winner's time. 5 min. 37½ sec.
2. U. K. Timmaya.

Tug of War:—

Juniors won.

At the Coimbatore Police sports C. S. Nanjappa won the 3rd prize for the $\frac{1}{2}$ mile race and Junior Havildar V. Dharmalingam the 2nd and 3rd prizes for the veterans' and clerks' races respectively. In the tug-of-war the Forest College beat the Agricultural College in 2 long and exciting pulls.

During the autumn term "Colours" were awarded to U. K. Timmaya and J. Venugopal Naidu for hockey, C. S. Nanjappa, M. Narsinga Rao and S. Sankar Alwa for Cricket and U. K. Timmaya for Athletics.

Descriptive
List of trees, shrubs, climbers etc., met with
round the Madras Forest College camp at
Sadivaiyal (Bolampatti valley) and
Walaiyar, in the Central
Coimbatore Division.

The list is not intended to include all plants in the localities indicated, but only those which are of importance to Forest Officers. It is probable that a few that should have been included have been overlooked and the pointing out of such omissions will be welcomed.

I have found it very difficult to draw the line between plants of small importance and those of none; in such cases I have generally preferred to leave out doubtful species so as to keep the list within reasonable limits and thus facilitate identification.

The list has been split up in accordance with the scheme shown below and with the help of the few words of description added to each it is hoped that there will be no difficulty in running down any species.

Only the flora within easy reach of the camps and of the areas usually traversed during excursions has been

included, to do more would have involved an unwieldy list. For instance, within 4 miles of the Sadivaiyal camp, by ascending the hills an almost entirely different vegetation is met with.

A. Trees. Scheme of division of the flora.

I. Leaves simple or unifoliate.

(a) Leaves alternate.

1. Juice milky.

(i) Thorny.

(ii) Not Thorny.

2. Juice watery.

(i) Thorny.

(ii) Not thorny.

§ Leaves not lobed.

*** Leaves serrate or crenate.**

**** Leaves entire.**

§ § Leaves lobed.

(b) Leaves opposite or whorled.

1. Stipules interpetiolar (Rubiaceae)

2. Stipules not interpetiolar.

(i) Leaves hairy or scabrous.

(ii) Leaves glabrous.

II. Leaves compound.

(a) Leaves alternate.

1. Leaves digitate.

2. Leaves trifoliate.

3. Leaves pinnate.

(i) Leaves paripinnate.

(ii) Leaves imparipinnate.

4. Leaves bi- or tri-pinnate.

(i) Thorny.

(ii) Not Thorny.

- (b) Leaves opposite.
 - (i) Simply pinnate.
 - (ii) Bi- or tri-pinnate.

B. Epiphytic Parasites.

C. Shrubs and undershrubs.

- I. Leaves simple.
 - (a) Leaves alternate.
 - 1. Thorny.
 - 2. Not thorny.
 - (i) Leaves entire.
 - (ii) Leaves not entire.
 - (b) Leaves opposite.
 - 1. Thorny.
 - 2. Not thorny.
 - (i) Stipules interpetiolar.
 - (ii) Stipules not interpetiolar.
 - § Juice milky.
 - § § Juice watery.

II. Leaves compound.

- (a) Leaves trifoliate or fivefoliate.
- (b) Leaves simply pinnate.
 - 1. Leaves paripinnate.
 - 2. Leaves imparipinnate.
- (c) Leaves bi-or tri-pinnate.

D. Bamboos and Grasses.

E. Climbers.

- I. Leafless.
- II. Leaves simple.

- (a) Leaves alternate.
 - 1. Twining.
 - 2. Climbing by tendrils.
- (b) Leaves opposite.
 - 1. Juice watery.
 - 2. Juice milky.

III. Leaves compound.

- (a) Leaves alternate.
 - 1. Leaves trifoliate.
 - 2. Leaves simply pinnate.
 - 3. Leaves bi-pinnate.
- (b) Leaves opposite.
 - 1. Climbing by tendrils.
 - 2. Tendrils absent.

Abbreviations employed.

ab.	=above
ac.	=acute
acm.	=acuminate
alt.	=alternate
ap.	=apex
bel.	=below
col.	=colour-ed
com.	=compound
cor.	=coriaceous
cre.	=crenate
c. w.	=cold weather
d.	=diameter
den.	=dentate
dio.	=dioecious
el.	=elliptic
ent.	=entire
Fl.	=flowers
Fr.	=fruit

glab	=glabrous
glob.	=globose
h. w.	=hot weather
l.	=long
L.	=leaf, leaves
lan.	=lanceolate
lin.	=linear
Lt.	=leaflet
Mal.	=Malayalam
mon.	=monoecious
ob.	=obtuse
obg.	=oblong
obl.	=oblanceolate
obv.	=obovate
opp.	=opposite, opposed
orb.	=orbicular
ov.	=ovate
pet.	=petiole
petl.	=petiolule
pin.	=pinna, pinnae
pint.	=pinnate
pub.	=pubescent
r.	=rains
ser.	=serrate
sim.	=simple
st.	=stipule, stipular
Tam.	=Tamil
ten.	=tendril
tom.	=tomentose, tomentum
2-fol.	=bifoliate
3-fol.	=trifoliate.

The colour, dimensions and descriptions are of mature parts unless otherwise stated.

The dimensions are of length unless otherwise stated.

A. Trees.

I. L. Sim. or unifoliate.

(a) L. alt.

1. Juice milky.

(i) Thorny.

EUPHORBIACEAE.

1. *Euphorbia Nivulia*, Ham : L. fleshy, obv., ent., glab., 3-8" ; st. spines in pairs, from conical, spirally-arranged tubercles. Fl. c. w. ; Fr. r., glob., $\frac{1}{4}$ " d.
2. *Euphorbia antiquorum*, Linn : Tam: *Thirugakalli*. L. very small, falling early, ent., st. spines in pairs from conical spirally-arranged tubercles. Fl. c. w. Fr. Jan.; glob $\frac{1}{4}$ " d.
3. *Euphorbia tortillis*, Rottl, Tam: *Thirugakalli*. Similar to last but the joints of the stem spirally twisted. Fl. Jan: & Feb: ; Fr. Jan: to May, sub-glob. $\frac{1}{2}$ " d.

(ii) Not thorny.

SAPOTACEAE.

4. *Bassia latifolia*, Roxb.: Tam: *Illupai*. L. cor., el-obg., ent., 3-9". Fl. h. w. ; cream-col., Fr. r.

URTICACEAE.

5. *Streblus asper*, Lour.: Tam: *Paru*. L. very scabrous, el., rhomboid or obv., ser, 1-3 $\frac{1}{2}$ " Fl. March, dio., yellowish ; Fr. April & May, pearshaped, yellow.
6. *Ficus gibbosa*, Bl: var: *parasitica*, King. Tam: *Kalperukam* Nearly always epiphytic. L. cor., rhomboid, hispid ab., scabrous bel., ent., 3-6" ; pet. $\frac{1}{3}$ - $\frac{1}{2}$ " Fl. mon. & Fr. May to July.

7. *Ficus bengalensis*, Linn: Tam: *Ala*. Aërial roots numerous. L. cor., el., ov. or orb.-ov., 4-8" ent., glab. or minutely pub. bel.; pet. $\frac{1}{2}$ -2" Fl. mon. & Fr. c. w.; receptacles glob. $\frac{3}{4}$ " d., pub., red.
8. *Ficus religiosa*, Linn: Tam: *Arasa*. L. cor., ov.-rotund, ap. produced into a lin.-lan. tail, generally curved at the end, glab., 4-7"; pet. 3-4", slender. Fl. mon. & Fr. h. w.
9. *Ficus Benjamina*, Linn: L. cor., glab., shining, ov.-el., ent., 2-4"; pet. $\frac{1}{2}$ -1". Fl. mon., Feb. Fr. h. w. Receptacles $\frac{1}{3}$ " d., blood red.
10. *Ficus glomerata*, Roxb: Tam: *Athi*. L. ov.-obg or el.-lan., ent., glab., 3-6". Fl. mon., h. w.; Fr. r. Receptacles on short leafless warted branchlets from all over the branches and the trunk down to ground level.
11. *Artocarpus integrifolia*, Linn: Tam: *Panasa*. L. el. or obv., glab., shining, ent., 4-8" Fl. mon. & Fr. c. w.

2. Juice watery.

(i) Thorny.

BIXACEAE.

12. *Flacourtia Ramontchi*, L'Hérit.: L. el., cre. or ser., glab., 1 $\frac{1}{2}$ -3" Fl. & Fr. March to May.

RUTACEAE.

13. *Atalantia monophylla*, Corr: Tam: *Kat-elumichai*. L. cor., gland-dotted, ov-obg. or el., glab., ent., 1-3". Fl. c. w., white; Fr. June to July.

RHAMNACEAE.

14. *Zizyphus xylopyra*, Willd: Tam: *Kottai*. Sometimes without thorns. L. el-obg. or suborb., cre-ser., glab. ab., with white or yellowish tom. bel., 1 $\frac{1}{2}$ -3". Fl. May; Fr. c. w., hard, glob., $\frac{3}{4}$ -1" d.

CORNACEAE.

15. *Alangium Lamarekii*, Thw: Tam: *Alinji*. sometimes without thorns. L. narrowly obg. or ov-lan., ent., glab. ab., pub. on the nerves bel., 3-5". Fl. h. w., white; Fr. r.

(ii) Not thorny.

§ L. not lobed.

* L. ser. or cre.

TILIACEAE.

16. *Grewia tilioefolia*, Vahl. Tam: *Tadasal*. L. ov., more or less lobed at the ap., more or less hairy ab., hoary tom. bel., 6-nerved at base, 3-5". Fl. h. w., yellow. Fr. r.
17. *Grewia disperma*, Rottl: L. lan., sharply ser-den., glab. 2-4 $\frac{1}{2}$ ". Fl. r.; Fr. c. w.

COMBRETACEAE.

18. *Terminalia Arjuna*, W. & A. Tam: *Vella-marudu*. L. often subop. and ent., obg. or el-obg., glab., 4-6" Fl. c. w.; Fr. r.

MYRTACEAE.

19. *Careya arborea*, Roxb. L. broadly obv. or obg-obv. glab. 6-12" Fl. Feb.; yellowish-white, 2 $\frac{1}{2}$ -3 $\frac{1}{2}$ " d.; Fr. June, glob., green, 2 $\frac{1}{2}$ -3" d.

SAMYDACEAE.

20. *Casearia tomentosa*, Roxb: L. with pellucid dots and lines, obg., pub. or glab. ab., densely pub. bel., 2 $\frac{1}{2}$ -7" Fl. Dec: to March; Fr. end of h. w.

BORAGINACEAE.

21. *Cordia fulvosa*, Wight. Tam. *Nariveli*. L. often ent. A small tree, bark smooth grey-green. L. ov-obg. or suborb., ob. or subac., scabrous with white discs ab., thinly fulvous tom. bel., 2 $\frac{1}{2}$ -6". Fl. May to Nov., white; Fr. c. w., ovoid, yellow, $\frac{3}{4}$ ".

EUPHORBIACEAE.

22. *Givotia rottleriformis*, Griff: Tam: *Karum-bathalai*. Branchlets clothed with white stellate tom. L. cor., broadly ov. or rotundate, ap. ac., base deeply cordate, den. or incised, palmately nerved, glab. ab, white woolly bel., 5-10". pet. 4-6". often with 1 or 2 glands. Fl. h. w.; Fr. r., glob.
23. *Putranjiva Roxburghii*, Wall: Tam: *Kohli*. L. cor., el.-obg., ac., ob. or shortly acm., glab., shining, 2½-4". Fl. dio., h. w., Fr. r., white.

URTICACEAE.

24. *Trema orientalis*, Bl: Mal: *Amathalai*. a small tree. L. obliquely ov., acm., rough ab., softly, often white, pub. bel., 2½-5". Fl. c. w., usually dio.; Fr. r. glob., black.
* L. ent.

ANONACEAE.

25. *Polyalthia cerasoides*, Benth. & Hook: Tam: *Mulili*. L. obg-lan., glab. ab., glab. or pub. bel., 3-6". Fl. h. w.; Fr. r., red.
26. *Saccopetalum tomentosum*, Hook. & T. L. ov-obg., more or less pub., 4-7". Fl. March; Fr. r., purple.

CAPPARIDACEAE.

27. *Capparis grandis*, Linn: f. Tam: *Thoratti*. sometimes thorny. L. el-obv., olive-green velvety pub. when young, older more or less pub., 1-2½"; st. thorns when present hooked. Fl. March & April; Fr. June & July, glob. 1-1½" d., purple.

LINACEAE.

28. *Erythroxylon monogynum*, Roxb.: Tam: *Sembullichan*. L. obv. or cuneate-obv., glab., shining, 1-2". Fl. Jan: to Sept.; Fr. Sept: to Jan:, ellipsoid, red.

OLACINEAE.

29. *Mappia foetida*, Miers. L. cor., ov. or ov-obg., thinly pub. or glab., 2½-7". Fl. Jan: to March, with a very bad smell; Fr. c. w., red.

ANACARDIACEAE.

30. *Mangifera indica*, Linn: Tam: *Ma-maram*. L. cor., obg. or obg-lan., ac., glab., 5-10". Fl. Jan:-Feb:, mon.; Fr. May-June.
31. *Anacardium occidentale*, Linn: Planted only. L. cor., obv. or el., ob., glab., 4-6". Fl. Jan: to March; Fr. r.
32. *Buchanania latifolia*, Roxb.: L. thinly cor., broadly obg., ob. glab. ab., villous bel., 5-10". Fl. Jan:; Fr. h. w.
33. *Semecarpus Anacardium*, Linn.: Tam: *Sheru*. L. cor., obv-obg., ob., glab. ab., pub. bel., 7-13". Fl. h. w.; Fr. r.

COMBRETACEAE.

34. *Terminalia belerica*, Roxb.: Tam: *Thani*. L. cor., broadly el. or el-obv., glab., 4-8". Fl. h. w.; Fr. r.
35. *Terminalia tomentosa*, W.&A. Tam: *Karumarudu*. Bark cracked into oblong sections and appearing like crocodile skin. L. cor., ov-obg. or el-obg., rarely obv., with usually 1 or 2 glands, which are sometimes stalked, on the mid-rib bel. near the base, glab. or nearly so, 3-8". Fl. h. w. & r.; Fr. r. & c. w.
36. *Terminalia paniculata*, Roth: Tam: *Pillamarudu*. Upper L. alt. lower subopp., cor., obg., ac. or acm., usually with 2 glands on mid-rib near base bel., glab. or nearly so, 4-9". Fl. Oct:-Nov:, white; Fr. Jan: to March, red, tom.

37. *Anogeissus latifolia*, Wall: Tam: *Velnagai*. L. el. or obg-el., ob. or shortly cuspidate, glab. $2\frac{1}{2}$ -4". Fl. Oct:- Nov.; Fr. Jan:

EBENACEAE.

38. *Diospyros montana*, Roxb.: Tam: *Vakkanai*. A small tree, sometimes armed. L. ov-obg. or el., subac. or acm., glab., Fl. h. w.; Fr. Dec.; glob. 1-1 $\frac{1}{2}$ " d.
39. *Diospyros melanoxylon*, Roxb.: Tam: *Wondai*. L. often subopp., cor., el. or el-obg., ob. or subac., glab. ab., pub. bel., $2\frac{1}{2}$ -6". Fl. h. w.; Fr. c. w., yellow.

BORAGINACEAE.

40. *Cordia Wallichii*, G. Don. L. orb-ov., glab. ab., stellately white or fulvous tom. bel., 3 to 5 nerved at base, 4-5" Fl. h. w., white; Fr. r.
41. *Ehretia laevis*, Roxb.: L. very variable, el-obg or obv., subac. acm, ob. or emarginate, glab., $2\frac{1}{2}$ -5". Fl. May, white; Fr. c. w., black.

LAURACEAE.

42. *Litsea tomentosa*, Heyne. Branchlets densely, softly tom. L. cor., el-lan., or obv., shortly acm., glab. ab., finely yellowish-white tom. bel., 4-9". Fl. dio., c. w.; Fr. early h. w., black.

EUPHORBIACEAE.

43. *Bridelia retusa*, Spreng. Tam: *Mullu-vengai*. Young stems & bases of old trees often thorny. L. rigidly cor., el-obg., ob., nerves prominent, straight, numerous, glab. ab, usually finely tom. bel., 3-6". Fl. mon., h. w.; Fr. c. w.
44. *Cleistanthus collinus*, Benth: Mal: *Odugu*. L. cor., orb., broadly obv. or el, ap. rounded or retuse, glab., $1\frac{1}{2}$ -4". h. w.; Fr. r., ellipsoid, white, tom.

45. *Phyllanthus Emblica*, Linn.: Tam: *Nelli*. L. subsessile, distichous, close set on the branchlets, appearing like compound L., narrowly lin., ob., glab., $\frac{3}{8}$ - $\frac{1}{2}$ ". Fl. mon., Jan: to March; Fr. c. w., glob., $\frac{1}{2}$ - $\frac{5}{8}$ d.
46. *Mallotus philippinensis*, Muel-Arg.: Tam: *Tirichina-mara*, Mal: *Shendura*. Branchlets tawny or rusty pub. L. ov. or ov-lan., acm., at times slightly toothed, glab. ab., pub. with numerous orb. red glands bel., base strongly 3-nerved, 3-6"; pet. 1-2", with a small sessile gland at each side of ap. Fl. dio., July to Jan:; Fr. Dec: to July, glob., covered with bright red powder.

URTICACEAE.

47. *Holoptelia integrifolia*, Planch. Tam: *Aya*. L. el., acm., on young [shoots sometimes ser., glab., 3-5". Fl. h. w. Fr. c. w., nearly orb., winged all round.
- § § L. lobed.

BIXACEAE.

48. *Cochlospermum gossypium*, D. C. L. palmately 3-5 lobed, lobes ent., ac., glab. ab., white tom. bel., 3-7"; pet. 4-7". Fl. Jan: to May, 4-5" d., golden yellow; Fr. May-June; seeds with a mass of white silky wool.

STERCULIACEAE.

49. *Sterculia urens*, Roxb.: Tam: *Vellaibuthalai*. Bark smooth, white, papery. L. shallowly palmately 5-lobed, lobes caudate acm., glab. ab., velvety bel., 8-12" d.; pet. 5-9", velvety, Fl. c. w., while the tree is leafless, yellow; Fr. May, of 4-6 ovoid follicles, woody, covered with dense pub. mixed with stinging hairs.

LEGUMINOSAE.

50. *Bauhinia racemosa*, Lam.: Tam: *Athi*. L. divided about half way down into 2 rounded lobes, broader than long, ent., glab. ab., white & minutely pub. bel., $\frac{3}{4}$ -2". Fl. h. w., white; Fr. c. w., 6-10", 10-20 seeded.

COMBRETACEAE.

51. *Gyrocarpus americanus*, Jacq: Tam: *Thanaku*. Bark smooth, greenish-grey. L. ov., ac., nearly as long as broad, often irregularly lobed, especially those on coppice and young shoots, base 3-nerved, ent., glab., 4-6"; pet. 1-5". Fl. mon., c. w., when the tree is leafless; Fr. h. w., glob-ovoid $\frac{1}{2}$ - $\frac{3}{4}$ " d., with 2 striate oblan. or spatulate wings, 2-3".

(b) L. opp: or whorled.

1. St. interpetiolar.

RUBIACEAE.

52. *Adina cordifolia*, Hook: f. Tam: *Manjakadambai*. L. orb. shortly acm. pub., ent., 4-10"; pet. 2-4"; st. obg., ob., pub., $\frac{1}{2}$ - $\frac{3}{4}$ ". Fl. July, in glob. heads Fr. c. w.
53. *Stephegyne parvifolia*, Korth.: Tam: *Nirkadambai*. L. very variable, el., suborb. or obv., ap. rounded. ac. or bluntly acm., glab., ent., 2-5"; pet. $\frac{3}{4}$ - $\frac{3}{4}$ ". St. deciduous, obg-spathulate, crimson when young. Fl. April-May, in dense glob. heads; Fr. r.,
54. *Nauclea purpurea*, Roxb.: Mal: *Sholai-manjai-pavatto*. L. el. or lan., ac., or acm., ent., glab., 4-8". Fl. Jan: to April, in glob. dense heads; Fr. Nov:-Dec:.

55. *Gardenia turgida*, Roxb: A small tree, usually thorny. L. el., obv. or orb., cor., ob., ent., glab. ab., glab. or pub. bel., 1-4". Fl. h. w., white, fragrant; Fr. r., 1-3" d.
56. *Gardenia latifolia*, Ait.: Tam: *Kambilipissin*. L. sometimes in whorls of 3, broad el. or obv., ap. rounded, glab. ab., glab or pub. bel., 4-8"; st. connate & adnate to the pet., to form a truncate tube. Fl. h. w., white, fragrant, 3" d.; Fr. r., glob., $1\frac{1}{4}$ - $1\frac{3}{4}$ " d.
57. *Canthium didynum*, Roxb.: Tam: *Madukarai*. L. ov-lan. or sub-orb., very cor., usually obtusely caudate-acm., ent., glab., shining, ab., 2-6". Fl. Dec: to Feb:, white, fragrant; Fr. h. w., glob., black or dark purple.
58. *Ixora parviflora*, Vahl. Tam: *Karumaram*. L. very cor. & hard, obg. or el., ob., ent., glab., shining, 3-5"; st. broadly ov. with a cuspidate point. Fl. Jan: to March, white, fragrant; Fl. April-May.
59. *Morinda citrifolia*, Linn.: Tam: *Sayamaram*. L. broadly el., ac., acm. or ob., ent., glab., shining, 5-8"; st. connate, broad, ob. Fl. March to June, white, in dense ovoid heads; Fr. a syncarpium formed by the enlarged fleshy calyces, r., white.
2. St. not interpetiolar.
- (i) L. hairy or scabrous.

VERBENACEAE.

60. *Callicarpa lanata*, Linn.: Tam: *Karumpittai-chedi*. Young branches covered with thick easily detachable grey or fulvous felt. L. ov. or el-lan., acm., ent., or den., glab. and shining ab., densely

stellate tom. bel., 6-9". Fl. h. w., sessile, reddish purple; Fr. r., black.

61. *Tectona grandis*, Linn.: Tam: *Teku*. Branchlets quadrangular. L. el. or obv., ac. or acm., ent., glab. but rough ab., densely grey or tawny tom. bel., 1-2 feet. Fl. r. white; Fr. c. w., felted, enclosed in the enlarged calyx.
62. *Premna tomentosa*, Linn.: Tam: *Kolakattaiteku*. Branchlets densely stellate woolly. L. cor., ov., acm., ent., minutely glandular scabrous ab., stellate woolly bel., 4-7". Fl. h. w.; Fr. r.
63. *Gmelina arborea*, Linn.: Tam: *Kumuli*. Branchlets covered with fine white mealy pub. L. broadly ov., acm., ent., glab. ab., stellately fulvous tom. bel., 4-8". Fl. h. w.; appearing with or before the new L., brownish yellow; Fr. about June, orange-yellow.

EUPHORBIACEAE.

64. *Trewia nudiflora*, Linn.: L. sometimes quite glabrous. Seldom found away from water. L. ov., acm., base cordate, glab. ab., usually clothed with cottony wool bel., 3-7". Fl. dio. h. w.; Fr. r.

URTICACEAE.

65. *Ficus hispida*, Linn: f. L. sometimes alt., membranous, ov. or obg., 4-12", upper surface very scabrid. Fl. dio., & Fr. h. w. Receptacles axillary or on short branchlets from the old wood, yellowish.

(ii) L. glab.

MYRTACEAE.

66. *Eugenia Jambolana*, Lam.: Tam: *Naga-or Navamara*. L. cor., lan., el-obg. or broadly ov-el., ac.

ob. or shortly acm., ent., pellucid-dotted, glab., shining, 2½-4½". Fl. h. w., white, fragrant; Fr. r., dark purple, edible.

LYTHRACEAE.

67. *Lagerstroemia lanceolata*, Wall.: Tam: *Ventek*. Bark ashy or pinkish, peeling off in long strips. Branchlets quadrangular and 4-winged. L. el-lan., ac., ent., glab. ab., usually somewhat tom. bel., nerves very prominent bel., 2½-4". Fl. May to July, white or pinkish; Fr. c. w.

APOCYNACEAE.

68. *Wrightia tinctoria*, R. Br.: Tam: *Palai*. Juice milky. L. membranous, el-lan. or obg-lan., acm., ent., glab., 3-6". Fl. h. w., white, fragrant; Fr. c. w. of 2 narrow cylindric follicles joined at their tips.

LOGANIACEAE.

69. *Strychnos nux-vomica*, Linn.: Tam: *Etti-Maram*. Sometimes armed with sharp strong axillary spines. L. broadly el., ac., shortly acm. or ob., ent., base 5 nerved, glab., shining, 3-6". Fl. Feb: to April, with a strong unpleasant smell; Fr. r. & c. w., glob., 1-3" d., orange-red.
70. *Strychnos potatorum*, Linn.: Tam: *Tetamaram*. Bark black, cracked & scaly. L. nearly sessile, subcor., ov., or el., ac. or subacm., spuriously 3-5-nerved at base, ent., glab., shining, 2-3". Fl. h w.; Fr. h w. & r., black.

II. L. compound.

(a) L. alt.

(i) L. digitate.

MALVACEAE.

71. *Bombax malabaricum*, D. C. Tam: *Olaga*; Mal: *Pula*. Bark pale, armed with sharp conical prickles. Lt. 3 to 7, lan., or oval, cuspidate, ent., glab., 3-7"; pet. up to 8", petl. $\frac{1}{2}$ -1". Fl. March, scarlet, 4-5" d., leafless when flowering; Fr. May-June; seeds covered with white silky hairs.

STERCULIACEAE.

72. *Sterculia foetida*, Linn.: Lt. 5-9, subsessile, obg-lan., ent., glab., 4-7"; pet 6-9". Fl. & Fr. Feb-March; Fr. bright red.

2. L. trifoliolate.

CAPPARIDACEAE.

73. *Crataeva religiosa*, Forst.: Tam: *Marali*. Lt. ov., lan. or obv., ac., ent., glab., 2-6". Fl. Feb.; $1\frac{1}{2}$ -2" d., petals greenish-white, stamens often purple; Fr. r. & c. w.

RUTACEAE.

74. *Limonia alata*, W. & A. Tam: *Kat-clumichai*. Usually thorny. Lt. obv., ent., glab., shining, 1-2 $\frac{1}{2}$ "; pet. 1-1 $\frac{1}{2}$ ", winged. Fl. h. w., white; Fr. r.

LEGUMINOSEAE.

75. *Ougeinia dalbergioides*, Benth.: Lt. cor., terminal broadly el. or roundish, 3-6", lateral opp., obliquely ov., ob., all cren., glab. ab., glab. or downy bel. Fl. c. w., white or pinkish; Fr. h. w. of 2-5 joints.
76. *Erythrina stricta*, Roxb.: Tam: *Katu-murinji*. Branches covered with whitish thorns. Lt. nearly as broad as long the terminal reniform-cordate, lateral unequal-sided ov., all acm., ent.,

glab., 3-5"; stipels rounded, gland-like; pet. up to 6". Fl. h. w., scarlet; Fr. r.

77. *Butra frondosa*, Roxb.: Tam: *Porasu*. Lt. cor., terminal broadly obv., ent., 4-8", lateral oblique, 4-9"; pet. 4-6". Fl. Jan: to April, petals flame-col., calyx dark olive-green velvety; Fr. r.

3. L. pint.

(i) L. paripint.

SIMARUBACEAE.

78. *Ailanthus excelsa*, Roxb.: Tam: *Pi-maram*. L. 1-3'. Lt. 8-14 pairs, very variable in shape, coarsely irregularly toothed or sub-lobate, glab., 4-6"; petl. $\frac{3}{4}$ -2". Fl. March; Fr. early r., winged.

MELIACEAE.

79. *Azadirachta indica*, A. Juss.: Tam: *Veppam*. Lt. 9-12, obliquely lan., often falcate, acm., ser., glab., 1-3". Fl. March to June, white; Fr. June to Aug.; yellow.
80. *Soymida febrifuga*, A. Juss.: Lt. 3-6 pairs, opp., el. or obg., ob., glab., 2-4 $\frac{1}{2}$ "; rhachis often red. Fl. March, white; Fr. June; seeds winged.
81. *Chloroxylon Swietenia*, D. C. Tam: *Porasu*. Bark deeply corky. Lt. 10-20 pairs, obg., ob., glab., glaucous, very inequilateral, $\frac{3}{4}$ -1 $\frac{1}{2}$ ". Fl. Feb-March, white; Fr. May-June; seeds winged.

SAPINDACEAE.

82. *Schleichera trijuga*, Willd.: Tam: *Puvam*. Lt. 2-4, usually 3, pairs, increasing in size from base to ap., obg., ob., ent. glab., 2-9". Fl. h. w., white or yellowish; Fr. r.
83. *Sapindus laurifolius*, Vahl. Tam: *Puchikai*. Lt. 2-3 pairs, subopp., lan. or el.-lan., ent., glab. ab.

pub. bel., ac. or acm., 3-7". Fl. c. w. dirty white,
Fr. h. w.

LEGUMINOSAE.

84. *Cassia Fistula*, Linn.: Tam: *Kinnai*. Lt. 4-8 pairs, ov.-obg., ac., ent., glab., 2-5". Fl. h. w., large, golden-yellow; Fr. c. w., 1½-2½", black.
85. *Tamarindus indica*, Linn.: Tam: *Puli*. Lt. 10-20 pairs, obg., ob., ent., glab., 1½-1¾". Fl. h. w., yellow with pink stripes; Fr. Decr.

(ii) L. imparipint.

RUTACEAE.

86. *Limonia crenulata*, Roxb.: Spinous. Lt. 2-4 pairs and a terminal, trapezoid-ov.; ap. notched, cren., glab., 1-2"; pet. & rhachis jointed & winged. Fl. June; Fr. r.
87. *Feronia elephantum*, Corr.: Tam: *Velam*. Armed with sharp straight thorns. Lt. 3-9, opp., cuncate, obv., glab., 1-2", smelling strongly of aniseed; pet. & rhachis flat, sometimes narrowly winged. Fl. March; Fr. r., glob., woody, 2-2½" d.

BURSERACEAE.

88. *Garuga pinnata*, Roxb.: Lt. 6-10 pairs, & a terminal, lan. or ov.-lan., acm., cre., glab., 2½-6". Fl. March, yellow; Fr. r., black.
89. *Commiphora (Protium) caudata*, Engl.: Tam: *Malan-kilurai*. Lt. 3-7, ov., caudate, ent., glab., shining, 2-3". Fl. h. w., Fr. r.

ANACARDIACEAE.

90. *Odina Wodier*, Roxb.: L. 10-18"; Lt. membranous, 7-11, pinkish when young, ov.-obg. acm., base often oblique, usually ent., glab., 3-6". Fl. Jan:

to March, when leafless, mon. or dio., purplish;
Fr. h. w., red.

LEGUMINOSAE.

91. *Dalbergia latifolia*, Roxb.: Tam: *Iti*. Lt. 5-7, broadly ov. or suborb., rounded, ent., glab., 1½-2½". Fl. c. w., white; Fr. r., ap. ob.
92. *Dalbergia sissooides*, Grah.: Tam: *Iti*. Lt. 7-11, ov., ac., ent., glab., 1-2". Fl. c. w., white; Fr. r., ap. ac.
93. *Dalbergia paniculata*, Roxb.: Tam: *Pachchalan*. Lt. 9-13, subcor., obv., obg. or el., ob., emarginate, ent., glab., ¾-1". Fl. c. w., blueish-white; Fr. r.
94. *Pterocarpus Marsupium*, Roxb.: Tam: *Vengai*. Lt. 5-7, cor., obg., ap. rounded, truncate or retuse, ent., glab., 2½-4". Fl. r., yellow; Fr. Jan: to April, winged all round, 1-2".
95. *Pongamia glabra*, Vent.: Tam: *Pungam*. Lt. 5-9 (usually 5), opp., ov., obg. or el., ac. or acm., ent., glab., 2½-5". Fl. Jan: to March, pinkish-white; Fr. r. flat, 1½-2.

4. L. bi- or tri-pint.

(i) Thorny.

LEGUMINOSAE.

96. *Acacia arabica*, Willd.: Tam: *Karuvelm*. L. 2-4", rhachis often bearing glands; pin: 4-9 pairs, ¾-2"; Lt. subsessile, 10-25 pairs, lin-obg., sub-ob., ent., glab., 1/8-¼". Fl. r. & c. w., yellow in glob. heads; Fr. h. w., moniliform, 3-6".
97. *Acacia leucophloea*, Willd.: Tam: *Velvelam*. L. 1-2", usually with a cup-shaped gland between

each pair of pin.; pin. 5-15 pairs, $\frac{3}{4}$ -1 $\frac{1}{2}$ "; Lt. 12-30, lin-obg., ob., ent., glab., $\frac{1}{8}$ - $\frac{1}{4}$ ". Fl. r. & c. w., in dirty white glob. heads; Fr. h. w., 4-8".

98. *Acacia Suma*, Buch-Ham.: Tam: *Odula*. Bark white, papery. L. 4-6", a large gland at or near the middle of the pet. & others between the insertion of several of the pin.; pin. 10-30 pairs, 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ "; Lt. 30-50 pairs, cor., lin., sessile, subac., ent., glab., $\frac{1}{4}$ ". Fl. h. w., in white spikes 3-4"; Fr. h. w., flat, beaked, 3-4".

99. *Acacia Catechu*, Willd.: var: *Sundra*, Prain. Tam: *Karungali*. L. 4-6", glands at the insertion of several of the pin., a large gland at or near the middle of the pet., pin. 10-30 pairs, 1 $\frac{1}{2}$ -2"; Lt. 30-50 pairs, lin., subac., $\frac{1}{4}$ ". Fl. May to July, in yellowish spikes, 2-4"; Fr. c. w., 2-3".

100. *Acacia ferruginea*, D. C. Tam: *Parambai*. L. 2-4 $\frac{1}{2}$ ", a large gland on pet & one between uppermost pair of pin., pin. 3-6 pairs, 2-3"; Lt. 10-20 pairs, lin-obg., ob., glab., $\frac{1}{4}$ -1 $\frac{1}{3}$ ". Fl. May-June, in pale yellow spikes; Fr. March, flat, 3-5".

(ii) Not thorny.

MELIACEAE.

101. *Melia composita*, Willd.: Tam: *Malai-Vembu*. L. 2- or 3- pint., 9-30"; ultimate Lt. 5-11, opp., ov-lan. to ov-rotund, ac. or aem., ent. or cre., somewhat oblique, glab., $\frac{3}{4}$ -3", terminal largest. Fl. Feb: greenish-white; Fr. May-June, yellowish.

LEGUMINOSAE.

102. *Caesalpinia coriaria*, Willd.: *Divi-divi*. Planted only. L. 3-5", pin. 11-13, 1-2", end ones longest;

Lt. 30-48, opp., lin-obg., rounded at both ends, glab., $\frac{1}{8}$ - $\frac{1}{4}$ ". Fl. June, pale yellow; Fr. c. w., contorted.

103. *Albizzia Lebbek*, Benth.: Tam: *Vaghai*. Base of pet. swollen & hairy, a large gland above base & one bel. the uppermost pair of pin.; pin. 2-3 (rarely 4) pairs, 4-5"; Lt. 5-9 pairs, glands between their bases, the 2 terminal obv.-obg., lateral el.-obg., all very ob., glab. ab., pub. bel., 1-1 $\frac{3}{4}$ ". Fl. Feb: to March, in white, fragrant umbellate heads; Fr. h. w., 4-12".

104. *Albizzia odoratissima*, Benth.: Tam: *Sellai-unjal*. Pet. with a large gland near base & glands at base of 1 or 2 of the uppermost pin.; pin. usually 4 pairs, 3-6"; Lt. 8-15 pairs, sessile obliquely obg., ap. ob., pub., $\frac{3}{4}$ -1 $\frac{1}{3}$ ". Fl. March to May, white, fragrant; Fr. h. w., 4-8".

105. *Albizzia procera*, Benth.: Tam: *Vegala-vaghai*. Bark yellowish-white. Pet. with a large gland on base, rhachis glandless. Pin. 2-6 pairs, 5-6", often with a small oval gland between uppermost pair of Lt.; Lt. 6-12 pairs, obliquely el.-obg., ap. ob., glab. ab., pub. bel., Fl. c. w.; Fr. March, 4-8".

106. *Albizzia stipulata*, Boiv.: Tam: *Niru-vaghai*. Pet. swollen at base with a sessile gland bel. middle & glands at base of all but the lowest 1-4 pairs of pin.; st. very large with a long tail, brown, soon deciduous; pin. 7-20 pairs; Lt. 30-45 pairs, lin-obg., falcate, glab. ab., pub. bel., $\frac{1}{4}$ -1 $\frac{1}{3}$ ". Fl. May in small heads; Fr. March, 4-8".

107. *Albizzia amara*, Boiv.: Tam: *Unjal*. L. 2-4", a small gland at middle of pet., a gland between uppermost pair of pin.; pin. 6-15 pairs, 1-2"; Lt.

10-30 pairs, sessile, close, lin-obg., ob. or subac., glab. ab., pub. bel., Fl. Jan: to April, yellowish-white, fragrant; Fr. c. w.

PALMACEAE.

108. *Caryota urens*, Linn.: Mal: *Irampannai*. A tall palm. L. 18-20', primary divisions 5-6', arching & drooping; Lt. fascicled or alt., cuneiform; obliquely truncate, irregularly toothed on the truncate margin, tailed, nerves spreading fan-wise, glab., shining; pet. 3" thick at base. Fl. r. to c. w., mon., reddish; Fr. glob. reddish. $\frac{3}{4}$ " d.

(b) L. opp.

(i) L. sim. pint. or 3-fol.

BIGNONIACEAE.

109. *Dolichandrone crispa*, Seem.: Tan: *Udiyai-maram*. Young parts velvety-pub. L. 8-12"; Lt. 3-7, el., ac. (rarely ob.), ent., glab., $1\frac{1}{2}$ -3 $\frac{1}{2}$ ". Fl. Jan.; white, fragrant, 1-2 $\frac{1}{2}$ ". lobes of corolla crisped; Fr. c. w., up to 18". by $\frac{2}{3}$ "; seed winged at both ends.
110. *Dolichandrone falcata*, Seem.: Tam: *Udiyai-maram*. Young parts pub. L. 3-6"; Lt. 3-7, suborb. or obv., sometimes very shortly acm., the terminal rather larger, ent., pub. or glab., $\frac{1}{2}$ -1 $\frac{1}{2}$ ". Fl. r., white 1-1 $\frac{1}{2}$ ". crisped; Fr. r., up to 18" by $\frac{3}{4}$ "; seeds winged at both ends.
111. *Stereospermum chelenoides*, D. C. Tam: *Pathiri*. Glab. L. 12-18"; Lt. 7-11, el., caudate acm., ent., glab., 4-5". Fl. h. w., yellow veined with red; Fr. h. w., subquadangular, 1-2' by $\frac{1}{2}$ ", curved, somewhat twisted.

VERBENACEAE.

112. *Vitex altissima*, Lim.: Tam: *Malamkaruvalam*. L. 3-fol. (rarely 5-fol.); Lt. sessile, lan., acm., usually ent., glab. ab., more or less bub. bel., terminal up to 6", lateral up to 4". Fl. May to Sept.; blueish; Fr. r. & c. w., purple.

Do. var: *alata*. Differs in the pet. which are broadly winged, the wings being wider at base and cordate.

(ii) L. 2- or 3-pint.

BIGNONIACEAE.

113. *Oroxylum indicum*, Vent: Mal: *Pathiri*. L. 3-5'; rhachis very stout, terete; Lt. 2-4 pairs, ov. or el., acm., ent., glab., 2 $\frac{1}{2}$ -5". Fl. r. fleshy, 4", lurid purple; Fr. c. w., straight, flat, 1-3' by 2-3 $\frac{1}{2}$ "; seeds 2 $\frac{1}{2}$ " winged all round.
114. *Radermacheria xypocarpa*, K. Schum: (*Stereospermum xylocarpum* L. 1-4', main rhachis angular; Lt. 5-9, el-obg., ac. or ament., glab., 2-3". Fl. h. w. when bare of leaves, white tinged with yellow, fragrant; Fr. h. w., 1-3', slightly curved, woody, covered with hard pustules; seeds winged.

B. Epiphytic Parasites.

LORANTHACEAE.

115. *Loranthus Wallichianus*, Sch: f. Bark pale, L. opp. & alt., cor., el., ob., base ac., glab., $1\frac{1}{2}$ -2 $\frac{1}{4}$ "; pet. $\frac{1}{8}$ - $\frac{3}{8}$ ". Fl. h. w., red, 4-fid, $\frac{1}{5}$ "; Fr. r.
116. *Loranthus scurrula*, Linn.: Bark copiously lenticellate; young parts rusty tom. L. opp., cor., broadly el., ob., base rounded. subac. or cordate, ent., glab. ab. more or less rusty tom. bel., $1\frac{1}{2}$ -3"; pet. $\frac{1}{2}$ - $\frac{1}{2}$ ". Fl. c. w., greenish-yellow. $\frac{1}{2}$ -1". 4-fid.

117. *Loranthus longiflorus*, Desrouss.: Bark grey, smooth. L. usually opp., very variable in shape, ov., el. or lin-obg., ob., midrib prominent, usually red, ent., glab., 3-7"; pet 1/8-1/2", stout. Fl. c w., scarlet, 1-2", 5-fid; Fr. h. w., pink.

Do. var: *falcata*. L. narrowly lin., usually falcate, 4-6" by 3/4-1". Very common on *Albizia amara*.

118. *Loranthus elasticus*, Desrouss.: Branches swollen at joints, dichotomous. L. opp., sessile or nearly so, very thickly cor., ov., el., suborb. or obg-lan., ob., young ones often red, ent., glab., 1 1/2-4". Fl. July, greenish white, 5-fid, 1"; Fr. r. pink. On *Euphorbia antiquorum*.
119. *Viscum monoicum*, Roxb.: Branches terete. L. obliquely ov., or lan., often falcately curved, ac., glab., 1 1/2-5". Fl. May to July, very small, greenish yellow, 3-12 together in the axils; Fr. r. obg., narrowed at both ends.
120. *Viscum orientale*, Willd.: Branches terete, sometimes whorled. L. el. or el-lan., ob., glab., 1 1/4-2". Fl. Jan: to May, very small, greenish yellow, 3-5 together in the axils. Fr. ovoid or subglob.,
121. *Viscum articulatum*, Burm.: Branches flat, jointed, leafless. Fl. c. w., minute, greenish, 1-6 together at the nodes; Fr. May, greenish yellow, glob., 1/6" d.

C. Shrubs & Undershrubs.

I. L. sim.

(a) L. alt.

1. Thorny.

OLACACEAE.

122. *Ximenia americana*, Linn.: Tam: *Shenkarai*. Parasitic on roots of shrubs & trees. Branches often ending in spines. L. cor., el., ob., ent.; glab., 1-2". Fl. March, yellowish-white, scented, Fr. May, orange, edible.

CACTACEAE.

123. *Opuntia Dillenii*, Haw.: *Sapath-kalli*. Very thorny, practically leafless, the stem green, flattened, jointed. Fl. at all seasons, yellow often with pink stripes; Fr. at all seasons, pear-shape, armed with groups of small yellow prickles, red or purple, edible.

SOLANACEAE.

124. *Solanum indicum*, Linn.: Armed with large compressed, sharp, curved thorns. Stem often purple; branches covered with stellate hairs. L. ov., ac., subent., or with a few large triangular-ov., subac. lobes, prickly on both faces, hairy, 2-6". Fl. at all seasons, pale purple; Fr. at all seasons, glob., 1/3 d., dark yellow.

EUPHORBIACEAE.

125. *Fluggia leucopyrus*, Willd.: Tam: *Veppalam*. Branchlets angular, usually ending in sharp spines. L. obv., obcordate or rotundate, ent, glab., 5/8-1". Fl. May-June, dio., minute; Fr. c. w. glob., 1/4" d., white.

2. Not thorny.

(1) L. ent.

CAPPARIDACEAE.

126. *Cadaba indica*, Linn.: L. el-obg., ob., ent., glab., 3/4-1 1/2". Fl. Dec: to July, creamy; Fr. r., cylindrical.

COMPOSITAE.

127. *Notonia grandiflora*, D. C. Tam: *Mosakathuthalai*. L. fleshy, obv., el-lan., or obl., ent., pale glaucous, glab., 2½-7". Fl. Dec: to July, pale yellow, fragrant; Fr. h. w. & r.

EUPHORBIACEAE.

128. *Phyllanthus missionis*, Hook: f. L. el., ac. at both ends, or obv., ob. or apiculate, ent., glab., ½-1½"; st. ov-obg., ob. Fl. May, white; Fr. r.,
129. *Phyllanthus reticulatus*, Poir.: A large straggling, sometimes climbing shrub. L. very variable, obg. or el., sometimes almost rotundate, ob. or ac., base rounded, ac. or subcordate, ent., glab., ½-1½"; st. ov., ac., sometimes bristle-pointed. Fl. Jan: to May, white or pinkish; Fr. h. w. & r., purple.
(ii) L. lobed, ser., cre. or den.

MALVACEAE.

130. *Hibiscus* (*Thespesia*) *Lampas*, Cav.: Tam: *Katuparuthi*. An undershrub. L. 3-lobed, lobes triangular, acm., ent., subglab. ab., with black glandular dots bel., 3-6". Fl. c. w., 3" d., yellow, resembling those of the cotton plant; Fr. h. w.

STERCULEACEAE.

131. *Helicteres Isora*, Linn.: Tam: *Valamburi*. L. bifarious, obg., obv. or roundish, stellately hairy, 3-5". Fl. Sept: to Dec.; red & blue; Fr. h. w., of 5 beaked folioles twisted together in the shape of a screw.

TILIACEAE.

132. *Grewia orientalis*, Linn.: L. el-obg., ac., usually rough with short stellate hairs, 3-nerved at base, 2-3½". Fl. & Fr. at all seasons, petals yellow.

133. *Grewia betuliefolia*, A. Juss.: L. broadly ov., suborb. or obv., glab. or nearly so, 1½" or less. Fl. May to July small, petals white; Fr. June to Sept.
134. *Grewia flavescens*, Juss.: L. ov-obg., ac., stellately hairy, 3-nerved at base, 2-3". Fl. r. yellow., Fr. Dec: to May,
135. *Grewia hirsuta*, Vahl. A common undershrub. L. distichous, ov. or lan., ac., glabrescent or with a few stellate hairs ab., densely villous bel., 2-3". Fl. May to Aug.; white.

EUPHORBIACEAE.

136. *Acalypha fruticosa*, Forst.: A strong smelling undershrub, the young parts more or less covered with yellow glands, L. ov., ac. or subac., cre., glab., glandular bel., 1-3". Fl. h. w.; Fr. h. w.; tom.

- (b) L. opp. or whorled,
1. Thorny.

RHAMNACEAE.

137. *Scutia indica*, Brogn.: Tam: *Churimullu*. A straggling shrub, branches decussate, thorns recurved L., subopp., orb., obv. or el., ob., ent., glab., ¾-1½". April-May; Fr. r.

RUBIACEAE.

138. *Randia dumetorum*, Lam.: Tam: *Karai*. Thorns straight, decussate nearly opp., ½-1¼". usually fascicled on suppressed branchlets obv., ob., wrinkled, ent., more or less pub. ab. & on the nerves bel., 1¼-3¼". Fl. h. w., white; Fr. h. w. & r., glob., ¾-1¼" d.

139. *Canthium parviflorum*, Lam.: Tam: *Madukarai*. Thorns (sometimes absent) opp., sharp, nearly horizontal. L. often fascicled, lvs., obv., or suborb., ob., ent., glab., $\frac{3}{4}$ -1 $\frac{1}{2}$ "; st. shortly triangular with a long subulate point. Fl. h. w., yellowish, Fr. r., yellow, 3/8- $\frac{1}{2}$ " d.

SALVADORACEAE.

140. *Azima tetracantha*, Lam.: Branches bluntly quadrangular, spines usually 4, obtusely quadrangular, very sharp. sometimes 1-7 at a node, up to 1 $\frac{1}{4}$ ". L. el., ac., rigid, strongly mucronate, ent., glab., shining, 1-1 $\frac{3}{4}$ ". Fl. h. w.; Fr. r., glob., white.

VERBENACEAE.

141. *Lantana Camara*, Linn.: Prickles numerous, recurved. L. ov., ac. or subob., cre-ser., rugose, pub., 1 $\frac{1}{2}$ -3". Fl. at all seasons, orange-red; Fr. at all seasons, glob., black.
142. *Gmelina asiatica*, Linn.: L. ov. or el., ob., ent. or irregularly lobulate, glab., with minute round glands bel., $\frac{3}{4}$ -1 $\frac{1}{2}$ ". Fl. & Fr. at all seasons; corolla 1 $\frac{3}{4}$ ", bright yellow; Fr. obovoid, $\frac{3}{4}$ ", yellow.

2. Not thorny.

(i) St. interpetiolar.

RUBIACEAE.

143. *Webera corymbosa*, Willd.: Tam: *Tarenni*. L. cor., obg-lan., ac., ent., glab., shining ab., 3-6". Fl. c. & h. w., white, fragrant; Fr. r., $\frac{1}{4}$ " d., black.
144. *Pavetta indica*, Linn: *Pavattai*. L. el-lan., el-obg. or obv-obg., ob., ac., or acm. ent., glab., 3-6"; st. connate, triangular, ac. Fl. May & June, white, fragrant; corolla tube $\frac{1}{2}$ "; Fr. r., black.

Do. var: *tomentosa*, Hook: f. L. pub. ab., tom. or villous bel.

(ii) St. not interpetiolar.

§ Juice milky.

APOCYNACEAE.

145. *Holarrhena antidysenterica*, Wall: Tam: *Kodai-palai*. L. sessile or subsessile, broadly ov. or el., ob. or obtusely acm., ent., glab. or somewhat pub., 4-8". Fl. Jan: to June, white; Fr. r., of 2 separate cylindrical follicles, 8-15"; seeds with brown hairs at tip.

ASCLEPIADACEAE.

146. *Calotropis gigantea*, R. Br. Tam: *Erakallai*. Young parts with white cottony tom. L. subsessile, thick, fleshy, broadly ov., obg-el. or obv., shortly acm., glab., 2 $\frac{1}{4}$ -6". Fl. & Fr. at all seasons; Fl. waxy, purplish.

§ § Juice watery.

ACANTHACEAE.

147. *Strobilanthes consanguineus*, Clarke. An under-shrub. L. ov., acm., toothed, glab. ab., usually white silky (especially when young) bel. Fl. c. w., white or pale blue, spikes glandular hairy.

VERBENACEAE.

148. *Clerodendron inerme*, Gaertn.: L. el. or obv., ob., ent., glab., $\frac{3}{4}$ -2", with a sharp unpleasant smell. Fl. May to Sept.; white; Fr. seated on the enlarged, veined calyx.
149. *Clerodendron infortunatum*, Gaertn.: Branchlets bluntly quadrangular, clothed with yellow silky pub. L. ov., acm., ent. or den., thinly hairy, 4-10". Fl. Dec: to March, white tinged with

pink; Fr. black, seated on the enlarged pink or red calyx.

II. L. com.

(a) L. 3-fol. or 5-fol.

LEGUMINOSEAE.

150. *Desmodium pulchellum*, Benth.: An undershrub. L. 3-fol. 3-7"; Lt. cor., ov-el., ob. or subac., rugose & glab. ab., finely downy bel., repand, 2-5". Fl. Dec.; white, in the axils of 2-fol. bracts; Fr. Jan:- Feb.; concealed by the bract.
151. *Desmodium laxiflorum*, D. C. An undershrub. L. 3-fol. Lt. ov-el. or broadly lan., ac. or subob., glab. ab., hairy bel., terminal 3-6", lateral 1½-4". Fl. r. to c. w., white or blue; Fr. c. w.
152. *Flemingia congesta*, Roxb: An undershrub. L. 3-fol. Lt. ov-obg., ac., lateral oblique at base, glab. ab., silky bel., base 3-nerved, 4-7". Fl. r., white with pink streaks. Fr. c. w.

VAEBENACEAE.

153. *Vitex Negundo*, Linn.: Tam: *Nochi*. Branchlets quadrangular, whitish with fine tom. L. 3- or 5-fol.; Lt. lan., ac., glab. ab., finely white tom. bel., terminal 2-4", lateral smaller. Fl. Jan: to March, blueish-purple; Fr. r. black.

(b) L. sim. pint.

1. L. paripint.

LEGUMINOSEAE.

154. *Cassia occidentale*, Linn: L. 6-8", rhachis with a sessile gland near base; Lt. 6-10, ov.lan., very ac., ent., glab., 1-4". Fl. & Fr. at all seasons; Fl. yellow; Fr. 4-5".

155. *Cassia auriculata*, Linn.: Tam: *Avarai*, *Avaram*. L. 3-4", rhachis fulvous pub., an erect lin. gland between each pair of Lt.; st. foliaceous, large, reflexed, rotund-reniform, with a long subulate point at base on the side adjoining the pet.; Lt. 16-22, obg-obv., ob., mucronate, glab. or finely downy, ¾-1". Fl. & Fr. at all seasons; corolla yellow up to 2" d.;

2. L. imparipint.

RUTACEAE.

156. *Glycosmis cochinchinensis*, Piers. (rarely 1-fol.) Lt. 3-7, usually 5, obg-lan., ent., glab., 2-8". Fl. c. w.; Fr. c. w. *white*.
157. *Murraya exotica*, Linn.: Lt. 3-7, ov-el., obv. or rhomboid, usually acm. with a notched tip, ent., glab., shining, 1½-3" Fl. Dec: to Aug.; white, fragrant; Fr. r. & c. w. *red*.
158. *Murraya Koenigii*, Spreng. Tam: *Kariveppam*. Lt. 11-25, obliquely ov. or somewhat rhomboid, irregularly cre-den., glab., 1¾-2". Fl. Jan.; whitish; Fr. h. w.

MELIACEAE.

159. *Cipadessa baccifera*, Miq.: Lt. 7-13, opp., el-lan., ac., coarsely ser., glab., 1½-2½". Fl. r. & c. w., Fr. c. w., scarlet.

LEGUMINOSEAE.

160. *Tephrosia purpurea*, Pers.: Tam: *Kolinji*. A small undershrub, much used for green manure. L. 2-4"; Lt. 11-21, obl., ob. or retuse, ent., glab. ab., silky bel., ¾-1½". Fl. r. red; Fr. c. w., lin., curved, 1¼-1¾".

PALMACEAE.

161. *Phoenix humilis*, Royle. Tam: *Icham*. Stem rarely more than 1½' high, covered with the spirally arranged bases of the fallen pet. L. 4-8'; Lt. pliable, fasciculate, quadrifarious, the uppermost sometimes confluent, 10-20" by 1/3-½"; pet. 1" broad at base, furnished with strong spines 2-3". Fl. h. w., yellowish; Fr. r., at first orange then black, edible.

(c) L. 2- or 3-point.

VITACEAE.

162. *Leea sambucina*, Willd.: L. 15-20"; Lt. obg. or el-obg., acm., ser., glab., 3-8". Fl. r. & c. w., white; Fr. c. w., purple-black.

LEGUMINOSAE.

163. *Caesalpinia pulcherrima*, Swartz. Introduced & run wild. L. 4-6"; pin. 6-8 pairs; Lt. 8-12 pairs. Fl. c. w., yellow or red, stamens very long; Fr. c. w., 2-3", obovoid, turgid.
164. *Dichrostachys cineria*, W. & A. Thorny. L. 1½-2½", a small erect gland between each pair of pin.; pin. 8-14 pairs, 3/8-5/8", minute, close set, lin., oblique, subac., pub. Fl. at all seasons in spikes 1-1½", those of the upper half yellow & of the lower red, fading white; Fr. at all seasons, 2-3", flat, twisted up.

D. Bamboos & Tall Grasses.

GRAMINACEAE.

165. *Saccharum spontaneum*, Linn.: A tall grass. Stem solid, smooth, polished. L. rigid, cor., narrowly lin., finely acm., often with a convolute margin, usually glab., 1-2½'. Fl. c. w. in lan., silky hairy panicles 8-24".

166. *Arundo Donax*, Linn.: A tall perennial grass, usually growing near water. Stem fistular. L. tapering from base up, bifarious, drooping, base amplexicaul, smooth, 1-2'. Fl. r., in erect or drooping panicleless 1-2', branches of panicle scaberulous.
167. *Bambusa arundinacea*, Willd.: Tam: *Mungil*. A very large, thorny bamboo. Stem erect or curving, hollow, internodes 1-2½', spines 2 or 3 at the nodes of the branchlets, recurved, up to 1½". Stem sheaths cor., 12-15" by 9-12", ap. rounded. L. lin. or lin-lan., ap. stiff, sharp, glab. or pub. bel., 3-8" by 1"; L. sheath shortly auricled. Fl. Jan: to March, in enormous panicles; Fr. March to May.
168. *Dendrocalamus strictus*, Nees. Tam: *Kal-mungil*. A densely tufted tall bamboo. Stems up to 3" d., with a very small cavity, internodes 1-1½'. Stem sheaths very variable 3-12", back glab. or covered with stiff, golden-brown hairs, ap. rounded. L. rounded at base, gradually narrowed to a short twisted point, rough & often hairy ab., softly hairy bel., margins scabrous, 1-10", short in dry & long in damp localities; L. sheath hairy, shortly auricled. Fl. Jan: to May, in large branching panicles of dense glob. heads; 1" d. & 1½-2" apart; Fr. h. w. & r.
169. *Ochlandra travancorica*, Bedd.: Tam: & Mal: *Odai*. A reed-like gregarious bamboo, up to 20' high; stems dark green, highly polished, smooth, hollow, walls thin, internodes 1-5'. L. broadly obg-lan., acm., ap. setaceous, often scabrous, 6-18" by 2-4"; mouth of sheath with stiff bristles; pet. 1/3-½". Fl. in spicate panicles up to 6'.

E. Climbers.**I. Leafless.****ASCLEPIADACEAE.**

170. *Sarcostemma intermedium*, Dec.: Tam: *Kodikalli*.
Stem green throughout, jointed, resembling the twigs of *Euphorbia Tirucalli*. Fl. Jan.-Feb., white, waxy, fragrant, in terminal & lateral sessile umbels. Fr. r., a torcite follicle, 3-4".

II. L. sim.**(a) L. alt.****(i) Twining.****MENISPERMACEAE.**

171. *Pachygone ovata*, Miers. L. ov-obg., or subtrapezoid, cor., ent., glab., 3-5 nerved at base, 1½-2". Fl. March; Fr. May; seed horse-shoe shaped.

CELASTRACEAE.

172. *Celastrus paniculata*, Willd.: Tam: *Saiyalkai*.
Woody; young branches with pale lenticular warts. L. broadly el., ov. or obv., shortly acm., cre-ser., in the upper half, usually ent. near base, glab., 2½-4". Fl. h. w.; Fr. r.; seeds embedded in a scarlet aril.

RHAMNACEAE.

173. *Zizyphus Oenopia*, Mill.: Large, woody, very thorny; thorns on stem terminating pyramidal woody tubercles. L. distichous, ov-lan., ac., minutely den., base very oblique, usually 3-nerved, glab. or pub. ab., densely rufous silky bel., 1-2½". Fl. r., greenish, with a strong unpleasant smell; Fr. c. w., black.

CONVOLVULACEAE.

174. *Rivea hypocrateriformis*, Choi.: L. orb., ob., base cordate, ent., glab. ab., silky bel., 1½-2½" d. Fl. r. & c. w., white, scented, 2" d.; Fr. c. w.

175. *Argyreia pomacea*, Choi.: L. el-ov., ob., ent., softly hairy, 1-3". Fl. Jan: to May, red, 2" d.; Fr. c. w.

176. *Lettsomia aggregata*, Roxb.: Stems softly white or yellow tom. L. ov., usually ob., glab. ab., white or yellow tom. or woolly bel., ent., 2-4½". Fl. Jan.; pink, in dense capitate cymes; Fr. h. w., red, surrounded by the enlarged sepals.

177. *Lettsomia elliptica*, Wight. L. often closely aggregated on short branchlets, el-lan., ac., ent., glab. ab., more or less hairy bel., 2½-4". Fl. c. w., rose col. with a purple centre; Fr. h. w., orange, surrounded by the enlarged sepals.

178. *Operculina Turpethum*, Manso.: Juice milky. Stems angled & winged, pub. L. ov. obg., subac., more or less pub., 2-4". Fl. March, white; Fr. March-April, glob., the upper portion thin & transparent.

2. Climbing by ten.**VITACEAE.**

179. *Vitis Linnaei*, Wall.: Ten. sim., woody. L. rotund-ov., palmately 3-5 lobed, den., softly glandular pub. & grey bel., 1½-5". Feb: to May; Fr. r.

180. *Vitis tomentosa*, Heyne. Stem reddish or white tom. Ten. forked, woody. L. palmately 3-5 lobed, lobes shallow or very deep, ac., den., floccose with whitish cob-webby wool, up to 13". Fl. May-June, scarlet; Fr. r.

CUCURBITACEAE.

181. *Trichosanthes palmata*, Roxb.: 3-(sometemes 2-) fid. L. as broad as long, variable, more or less deeply 3-5 lobed, usually as far as the middle,

usually ser., glab., often with small scabrous scales ab., & dark circular glands bel., $2\frac{1}{2}$ -5" d. Fl. dio., r., large, white, petals fringed; male flowers with large ov. fringed bracts; Fr. c. w., red, glob., $\frac{1}{2}$ -2" d.

182. *Trichosanthes cucumerina*, Linn.: Ten. 3-(sometimes 2-) fid. orb., reniform or broadly ov., den., more or less deeply 3-7 lobed, lobes broad ac., glab. ab., more or less pub. & scabrid bel., 2-5". Fl. r. & c. w., large, white, petals fringed, male Fl. without bracts; Fr. c. w., ovoid or ellipsoid, 1-3".

LILIACEAE.

183. *Gloriosa superba*, Linn.: Tam: *Kannurelli*. Herbaceous. L. scattered or opp., sometimes ternately whorled, ov-lan., ac., tip prolonged into a ten., ent., glab., 3-6". Fl. c. w., large first green, then yellow, passing through orange to scarlet & crimson; Fr. h. w.

(b) L. opp.

1. Juice watery.

MALPIGHIACEAE.

184. *Hiptage Madablota*, Gaertn: Tam: *Kalari*. Woody. L. cor., el-obg., acm., ent., glab., 4-7". Fl. Feb:-March, fragrant, white with a yellow spot; Fr. Nov., 3-winged.

COMBRETACEAE.

185. *Calycopteris floribunda*, Lam.: Tam: *Tenari-kodi*. Woody. L. ov-lan. or el-obg., ac., or acm., ent., tom., pitted & rusty tom. bel., 3-5". Fl. Jan: to March; Fr. h. w., obg., crowned by the 5 persistent calyx lobes.

186. *Combretum ovalifolium*, Roxb.: Woody. L. el. or el-lan., obtusely acm., ent., glab., 2-4". Fl. Dec: to March, sessile; Fr. h. w. & r., with 4 papery wings.

RUBIACEAE.

187. *Mussaenda frondosa*, Linn.: Mal: *Vellila*. L. often in whorls of 3, broadly el., shortly acm., ent., pub., 3-5". Fl. & Fr. at all seasons; corolla orange-red, one calyx lobe usually very much enlarged, white & leaf-like;

DIOSCOREACEAE.

188. *Dioscorea oppositifolia*, Linn.: L. sometimes alt., cor., very variable, from lan. to el-obg., ov. or suborb., ac. or rounded, ent., margin cartilaginous, glab., 2-5". Fl. r.; Fr. c. w., flattened into 3 apparent wings.

2. Juice milky.

APOCYNACEAE.

189. *Ichnocarpus frutescens*, Ait.: Young branches fulvous tom. L. el-obg., ac. or acm., ent., glab. ab., glab. or slightly pub. bel., $1\frac{3}{4}$ -3". Fl. Aug: to Dec.; small, white, fragrant; Fr. c. w.

ASCLEPIADACEAE.

190. *Hemidesmus indicus*, Br.: Tam: *Nannari*. Herbaceous, slender. L. el-obg. to lin-lan., apiculate, very variable in breadth, broader ones often ob., narrow one ac., ent., glab. & often with white markings ab., pub. bel. Fl. Sept: to Dec.; greenish purple; Fr. h. w.

191. *Cryptolepis Buchanani*, R. & S. L. el-obg. sometimes obg-lan., ap. rounded & retuse, ac. or acm. ac. & apiculate; nerves slender, numerous, nearly at right angles to the midrib, uniting in an

- intramarginal vein, ent., glab., 3-5". Fl. Dec: to May, whitish; Fr. r.
192. *Secamone emetica*, Br.: L. lan., lin-lan. or el., ac., base subac., ent., glab., 1½-3". Fl. July, small, yellow; Fr. r., slender.
193. *Gymnema sylvestre*, R. Br.: Woody. L. ov., el. or ov-lan., ac. or shortly acm., ent., pub. ab., densely pub. bel., 1½-2". Fl. Sept.; small yellow; Fr. c. w.
194. *Leptalimia reticulata*, W. & A. Bark corky, deeply cracked. L. ov., ac., ent., glab. ab., more or less pub. bel., 1½-3". Fl. May, greenish yellow; Fr. r.

III. L. com.

(a) L. alt.

1. L. 3-fol.

LEGUMINOSAE.

195. *Mucuna pruriens*, D. C. Pet. 2½-1½"; terminal Lt. rhomboid-ov., lateral & equilateral & larger, lower side dilated, all subac., mucronate, ent., pub. ab., densely silvery-grey hairy bel., 3-5". Fl. Dec.; purple, petals very unequal, calyx with a few irritating bristles; Fr. Jan-Feb.; turgid, falcately curved at both ends, densely clothed with pale brown or steel grey irritating bristles.
196. *Rhynchosia cyanosperma*, Benth.: Woody, stems & old branches densely clothed with reddish pub. Pet. 1-2½"; Lt. rhomboid-ov., acm., lateral oblique, ent., pub., 2-4½". Fl. c. w., pale yellowish white; Fr. h. w., torulose, densely velvety; seeds 2, subglob., dark blue, shining.
2. L. sim. pint.



LEGUMINOSAE.

196. *Abrus precatorius*, Linn.: Tam: *Kundumuni*. Slender. L. 2-4", Lt. 10-20 pairs, obg., rounded, glab. ab., slightly hairy bel., 3-8", basal ones smaller. Fl. r. & c. w., pink or whitish; Fr. c. w. & h. w., seeds, glob., hard, bright scarlet with a black spot.
197. *Dalbergia volubilis*, Roxb.: Woody; branchlets here & there thickened and twisted into spiral hooks. L. 4-6"; Lt. 11-13, cor., obg. or ov-obg., ob., ent., glab., 1-2", terminal largest. Fl. Jan: to March, small, pale blue; Fr. April to June.
198. *Derris scandens*, Benth.: Tam: *Anaikatti-kodi*. Woody. L. 3-6"; Lt. 9-19, subcor., el-obg. or obv-obg., subac., ent., glab. & shining ab., pub. bel., 1½-2", lowest pair smallest. Fl. May to July, white; Fr. r. & c. w.
3. L. 2-pint.

LEGUMINOSAE.

199. *Caesalpinia Bonducella*, Flem: Very thorny, thorns straight & hooked. L. 1-2'; st. pint.; pin. 12-16, 2-3", with a pair of hooked st. thorns at base; Lt. 16-18, el-obg., ob., mucronate, ent., glab. ab., pub. bel., stipels of short hooked thorns. Fl. r., yellow; Fr. c. w., obg., densely armed all over with long wiry prickles.
200. *Caesalpinia mimosoides*, Lam.: Covered with short, sharp, usually straight prickles & stiff glandular bristles. Young stems red. L. 1-2', thorns on rhachis curved; pin. 10-30 pairs, 2-3"; Lt. sensitive, 20-40, lin-obg., inequilateral, rounded at both ends, glab., ¼-¾", smelling strongly of bugs when crushed. Fl. c. w., yellow

with black glands; Fr. Dec: to March, obg-ob-ovoid, very turgid.

201. *Pterolobium indicum*, A. Rich.: Tam: *Kurumbu*. Very thorny, thorns small hooked. L. 2-4"; pin. 8-16; Lt. 12-16, sessile, obg., ob., sensitive, glab., $\frac{1}{3}$ ". Fl. h. w. to r., white; Fr. r. to c. w., 1 seeded, with a wing $\frac{3}{4}$ -1".
202. *Entada scandens*, Benth: Tam: *Anaitellu*. Very large, woody. Main rhachis of L. usually ending in a 2-fid ten.; pin. 2-3 pairs; Lt. 3-4 pairs, obg. or obv-obg., ob., cor., glab., $1\frac{1}{2}$ -3". Fl. r. yellow or white; Fr. r. to c. w., woody, 1-3' by 3-4", compressed, indented between the seeds; seeds 6-15, orb., compressed.
203. *Acacia Intsia*, Willd.: Tam: *Ingai*. Large, woody, armed with hooked thorns. L. 4-8", rhachis usually with hooked prickles bel., a gland bel. lowest pair of pin. & between the 1-4 uppermost pairs; pin. 5-10, 2-3"; Lt. 20-50, lin-obg., very inequilateral, glab., $\frac{1}{4}$ - $\frac{3}{4}$ ". Fl. r. to c. w., whitish, in terminal paniced glob. heads; Fr. c. & h. w., 4-6", flat.

(b) L. opp.

1. Climbing by ten.

RANUNCULACEAE.

204. *Naravelia zeylanica*, D. C. L. 2-fol, the terminal transformed into a long ten. ending in 3 hooks. Lt. broadly ov., glab. ab., pub. bel., ent. or rarely coarsely den., 3-5". Fl. c. w.; Fr. March.

VITACEAE.

205. *Vitis auriculata*, Roxb.: Ten. leaf-opposed, 2-3 fol. L. 5-fol.; pet. 3-6"; st. large, ear-shaped; Lt. obv.

or subrhomboid, ser., glab. ab., somewhat pub. bel., Fl. h. w. & r.; Fr. r. & c. w.

206. *Vitis pedata*, Vahl. Ten. long, slender, forked, L. 7-11-fol., lateral Lt. pedately arranged. pet. 2-3"; Lt. obg-lan., acm., ser., pub. or glab., 2-5". Fl. r.; Fr. c. w.
2. Ten. absent.

RANUNCULACEAE.

207. *Clematis Gouriana*, Roxb.: L. pint, 2 or 3-pint.; Lt. ov. or obg., ent. or coarsely toothed, glab., 1-5". Fl. c. w.; Fr. March.

RUTACEAE.

208. *Toddalia asiatica*, Lam.: Covered with prickles. L. 3-fol.; Lt. cor., sessile, lan-obg. or obv., ap. notched, ent. or glab., $1\frac{1}{2}$ -3 $\frac{1}{2}$ ". Fl. r. & c. w., small, white; Fr. c. w., glob., orange.

OLACACEAE.

209. *Jasminum auriculatum*, Vahl: Tam: *Katumulli*. L. 3-fol., the two lateral Lt. much smaller than the terminal, sometimes absent, terminal broadly ov. or nearly orb., ac., acm. or rounded, glab. or velvety pub., ent., $\frac{3}{4}$ -1 $\frac{1}{4}$ ". Fl. r., white, fragrant, $\frac{1}{4}$ "; Fr. c. w., black.

C. Fischer.

Four Elephants In One Pit.

On Friday the 24th November at 11 a. m. information was received at Mount Stuart that four elephants had fallen in one pit in Ullandai—6 miles away from Mount Stuart. The Senior Division of the Madras Forest College was camping at Anaipady a place 2 miles away from Mt. Stuart; but unfortunately we received the information only late in the evening when we returned to the camp after a full day's

excursion. So we lost the rare opportunity of witnessing the operation from start to finish, but our Senior Provincial Instructor Mr. E. M. Crothers was kind enough to give us a graphic description of the progress of the events of the day as he had the opportunity to go over to Ullandai soon after the information was received.

9 decoy elephants were marched from Olganirpallam—the present elephant camp—and Annipady within an hour of the receipt of the information, and they were at Ullandai by 3 p. m. The only route to Ullandai is a narrow path with dense forests of bamboo and other huge trees on either side, all the way ascending—sometimes even with gradients of 1 in 1—till we reach within a furlong distance of the pit.

The elephant mahuts and cavadis—mostly Mulcers and other junglemen—were brisk at making ropes out of 'Sterculia fibre' for noosing the neck and hind legs of the elephants as the two 'hemp' ropes they already had were enough only for noosing one animal. There is always a stock of 'Sterculia fibre, at the Range Head Quarters. This is twisted into ropes, in circumference as big as a man's fist, at the pit.

There were four elephants of different sizes in the pit—a mother 6'-10" in height with her calf about a month old, 2'-6" in height, a cow 5'-8" in height and a small tusker, a little less in height than the latter. The heights of the elephants were approximately ascertained by placing a straight bamboo perpendicular to the bottom of the pit; the heights of the elephants noted at the nodes or between by a man on the opposite side. After measuring off the heights a noose that would just fit on to the neck of the mother elephant was made by measuring the neck of a decoy of the same height: and for others, nooses were made based on the fact that the circumference of an elephant's neck would be equal to seven eighths of its height.

After the length of the rope required for noosing the neck is measured off, a peg 6" to 10" long is inserted through the twists of the rope to prevent the noose from going beyond that point and strangling the elephant when it is noosed.

Now came the operation of noosing the neck of the mother elephant. The noose hooked on to bamboo sticks held by men on all sides was dangled over the mouth of the pit. Anything—say a white towel—tied on to the end of a stick—shown towards the animal just through the centre of the dangled noose makes it raise its trunk to catch it when suddenly the noose was let go simultaneously by all those who held it when the word of command 'let go' was given by Mr. E. B. Ramachandra Rao, Extra Assistant Conservator of Forests in charge of Thunacadavu Range, who took a very active part in the operation from start to finish. The noose was then fastened securely to prevent slipping back or being pulled by the elephants' trunk by tying cords tightly round the wooden stop, whilst the neck rope was held tightly by coolies. One man went round the pit holding the end of the cord as others at the pit raised or lowered the peg at the neck noose so that he could get his cord below one end of it and then below the other; the cord every time taken above and below the neck rope when each tie was put on. They then raised the level of the pit by throwing in billets and brushwood, and then a mahut was held firmly on his legs and waist by others at the edge of the pit and he lay himself heels over head into the pit and strengthened the noose again by tying the cord securely behind the noose to prevent it from slipping back. This is the most dangerous part of the operation. When I had to do this operation once I threw logs across the pit so that men could sit or stand upon them and tie cords.

Now, the hind leg—preferably the left leg is always chosen—was to be noosed. A few coolies held the neck rope

in front, had it tied round a tree and dragged the captive to one corner of the pit when she was poked from other sides when it offered a fair opportunity to noose the hind leg. I should think that there is no harm if a decoy holds the neck rope in front and drags the captive to one corner of the pit. The noose dangled was first put in the pit and the captive in its movements to and fro was apt to bring its hind leg inside the noose as it actually did, when all on a sudden at the word of command the noose was pulled up and tightened. This also had to be prevented from slipping. There is no wooden stop in this case but they tie knots with a long hooked bamboo instead of with one's fingers which is a very slow and difficult operation. Thus both the ropes were fastened securely on to the mother elephant.

Similarly the other cow and the little tusker were noosed on their necks and each was tied to corners of the pit.

All this time cold water was being poured copiously on the elephants by coolies, as this has a good invigourating effect.

The young tusker which was about 4'-10" in height became restless and started tugging the rope which had to be released a little in order to prevent it from being strangled; but as soon as the rope was released it got into a position between the smaller cow and a side of the pit. Naturally the latter was not in a mood to be interfered with just then and so she raised her head and pressed the young tusker's head down into the mire till a portion of its trunk and mouth was buried; and not satisfied with this she placed both her forelegs on the neck of the young one and stood up for a couple of minutes with the result that the poor young tusker was choked to death. It was all the work of a couple of minutes. A pitiable sight! None of the onlookers could help it. All the attempts made to save the young tusker were in vain.

In the life and death struggle which the captives were waging in the pit the little calf received kicks and trampling. It was only a stroke of fortune that it escaped death. Her bones were tender and pliable and hence she escaped fractures. Perhaps she may have had a green-stick fracture or two.

Ofcourse it is a very difficult operation when more than one elephant falls in a pit and the authorities are to be congratulated that they successfully took three out of four from the pit.

By this time it was pitch dark and so they could not do anything further. The forester and his men lit fires and guarded the pit till day-break.

The next morning we were taken to the site by our Provincial Instructor, and before we reached the place the smaller cow was out of the pit. So we only saw the mother elephant taken out. The neck rope was fastened round decoy elephants Akbar's and Abdul Rahaman's body. More billets were thrown in. The leg rope was fastened round Lalaminah's body in a similar manner. The elephant after some scrambles got out and there were Akbar and Abdul Rahaman in front and Lalaminah in rear—three capable and intelligent decoys—and soon there was a decoy elephant on its each side.

Then the small calf was the solitary occupant of the pit. Forester Unni, a smart man—I commend him for his work as I had seen his work before on similar occasions—got into the pit with two other men and lifted the calf up. The little thing began to make a hell of a noise that it frightened even the decoys. A small rope was fastened round its hind leg and it was marched separately from its mother. The triumphal procession reached Anaipady by 2 p. m. and the captives were enkraaled.

One decoy took the mother elephant into one compartment and another the other cow into another compartment of the kraal. The neck rope was passed through the bars of the kraal and held by decoys outside it. The decoy that took each one got out and bars were put in position. The nooses were cut with sharp axes or bill hooks; and the captives were free in a space of 300 sq. ft. while only the day previous they were roaming in all mirth and enjoyment in the vast forests of Anamalais utterly regardless of the fate that was impending over them.

But in the excitement the mother won't allow her child to approach her and as it was feared that the calf would receive "damned" kicks as it actually did receive when it was shoved into the kraal, it was put in a small one built temporarily so that there were only the bars of the big kraal as partition between the mother and the child. Before the next day-break the mother knew her child and was patting her with her trunk passed through the bars of the kraal. Then the child was put in with her mother—the poor innocent little thing is all hail and hearty now that she is by her mother.

This calf was trampled by the other two elephants in the pit and the young tusker practically stood upon it. It was so submerged in mire that only its mouth and trunk were visible; yet she survived, and the small tusker about the safe capture of which all were sanguine died.

Mr. H. F. A. Wood, the District Forest Officer kindly permitted the students of the Madras Forest College to name the elephants while in the pit. They named the mother 'Devaki,' child 'Krishna' and the smaller cow 'Parvathi.' The calf's name was first altered to Tippu. Of course Devaki to have a son named 'Tippu' seemed incongruous, but this incongruity was removed by the force of circumstances. The calf was so small that while in the pit, it

could not be made out whether it was a male or a female. When her sex was discovered she was renamed Kalliyani which goes well with Devaki.

On the 30th morning report of another fall at Karian-sholai—a place three miles away from Anaipadi—was received. It was a cow 5' 3" in height. She was taken out, marched to Anaipadi and enkraaled before 5 p. m. She is named 'Seetha.' She received pieces of sugar cane from the hands of the District Forest Officer and Mr. Ramachandra Rao the same evening.

Oh! What a pity! the poor calf Kalliyani died on the morning of the 12th instant. She had a doze of purgative only the previous day.

C. Karunakara Menon.

Editorial Note:—In 1907 (we think) 5 elephants (one large cow and four young animals) fell into one pit near Muthanga in the North Wynaad. All 5 were safely enkraaled. This abnormal fall is reported to have been due to a panic. When the pit-watchers came in the early morning to inspect the pits, they found a herd close by. They shouted and clapped their hands and the alarmed beasts hurried off and in their haste the 5 fell together.

List of contributions to the Gass Forest Museum since May 1916.

Wood specimens of Mappia tomentosa, Spondias mangifera, Wrightia tinctoria.	by A. M. C. Littlewood, Esq.
Do. Randia dumetorum, Stereospermum chelonoides, Acacia ferruginea, Acacia Suma, Eugenia Jambolana.	Do. through M.R.Ry. A. P. Srinivasa Ayyangar, Avl.
Do. Ailanthus excelsa.	H. F. A. Wood, Esq.

Do. Tetrameles nudiflora, Bassia latifolia.	R. Bourne, Esq.
Do. of thirty-four species.	M. R. Ry. Rao Bahadur M. Rama Rao, Avl.
Do. Boswellia serrata.	C. M. Hodgson, Esq.
Fruit and seeds of Cycas circinalis.	H. A. Latham, Esq.
Do. Entada scandens.	H. F. A. Wood, Esq.
Do. Jatropha Curcas, Hydnocarpus Wightiana.	A. M. C. Littlewood, Esq.
Herbarium specimens about 350	M. R. Ry. Rao Bahadur M. Rama Rao, Avl.
Do. 13 of grasses.	G. M. Townshend, Esq.
Do. 20 specimens	M. R. Ry. G. Viswanatham, Avl. Curator.
Do. 2 do.	H. F. Arbuthnot, Esq.
Do. 2 do.	H. A. Latham, Esq.
Do. 3 do.	D. F. O. Kistna.
Do. 6 do.	A. M. C. Littlewood Esq.
Stem of teak showing damage by fire.	F. L. C. Cowley-Brown, Esq.
Two examples of injury by climbers.	Saiyid Abdul Kadir Sahib Bahadur.
Insects boring into sandal.	C. C. Wilson, Esq.
White fire-clay earth and bricks, with descriptive note.	M. R. Ry. K. A. Chennappa, Avl.
Young cobra.	H. C. Bennett, Esq.
Cobra.	M. R. Ry. G. Viswanatham, Aul.
Spider.	Mr. R. David.
Coral snake, scorpion and a number of insects.	E. N. House, Esq.
Bison head.	A. B. Jackson, Esq.
Do.	H. F. A. Wood, Esq.

Abnormal sambur horn.	D. F. O. Kollegal.
13 shikar trophies (on loan).	C. C. Wilson, Esq.
Umbrella of palm leaves.	Secretary, Gokhale Reading Room, Mundur.
Sample of lac incrustations.	D. F. O. Ganjam.
Samples of pencils made of local woods.	Director of Industries.
Two photographs of students bridge-building.	Student C. S. Ramanathan.
6 domestic utensils made of the wood of Wrightia tinctoria & fibre of Trema orientalis.	A. M. C. Littlewood, Esq.

The Principal wishes to express his thanks to the several contributors.

Gazette. Notifications.

October 17, 1916.

Mr. H. F. Arbuthnot, District Forest Officer, Nellore, to be incharge of Guntur, in addition to his present duties during the absence of M. R. Ry., M. Panchapakesa Ayyar Avergal on privilege leave.

October 24, 1916.

The following postings are ordered :—

Mr. J. A. Master, Assistant Conservator of Forests, East Cuddapah district, is posted to the charge of Chitvel Range.

M. R. Ry., V. P. Narayana Menon, Ranger, fourth grade, on relief by Mr. J. A. Master, is transferred from Chitvel range to the charge of Badvel range.

M. R. Ry., A Siddan Pillai Ranger, fifth grade, Pormamilla range, is posted to relieve Ranger P. Gopalasankara of the charge of Badvel range, and to hold charge of that range in addition to his own as a temporary measure until he is relieved by Mr. V. P. Narayana Menon.

M. R. Ry., S. Duraswami Ayyar, Ranger, fifth grade, South Salem division, is granted leave on medical certificate for three months in continuation of three months privilege leave granted to him.

M. R. Ry., N. Swaminatha Ayyar, Ranger, second grade, the Nilgiris is granted privilege leave under article 260 of the Civil Service Regulations for three months from date of relief.

October 31, 1916.

M. R. Ry., D. C. Bhide, Ranger, fourth grade, Nellore range, is reduced to the bottom of fifth grade of Rangers with effect from 21st October 1916.

The six months' combined leave granted to Ranger D. C. Bhide is extended by six months from 11th August 1916.

M. R. Ry., K. Desika Achari, Deputy Ranger, first grade and acting Ranger, sixth grade, Nellore district, will continue to act as Ranger, sixth grade, vice D. C. Bhide.

Mr. E. W. Fernandez, supernumerary Ranger, sixth grade, and sub-protem fifth grade is confirmed as Ranger sixth grade, from 15th September 1916, vice Thambu Nayadu retired.

Mr. E. Kanakiah, Deputy Ranger, second grade and acting Ranger, sixth grade, Bellary, is confirmed as Ranger, sixth grade vice Ranger B. Sanniah resigned.

November 7, 1916.

The following promotions and postings of Forest Offices are ordered :—

1. Mr. Charles D'Arcy McCarthy, on return from leave, to be Conservator of Forests, Western Circle.

2. Mr. Hugh Alison Latham, Deputy Conservator of Forests, to act as Conservator of Forests, third grade and to be in-charge of the Northern Circle during the period of leave granted to Mr. F. L. C. Cowley-Brown or until further orders.

Mr. H. Thammayya, Ranger fifth grade, Gooty Range, Anantapur District, will be considered to have been on privilege leave for one month from 24th September 1916.

The three months' privilege leave granted to Mr. L. R. Narayana Ayyar, Ranger, third grade, in Conservators S. O. No. 132/16 dated 4th October 1916, is cancelled.

November 14, 1916.

Under article 260 of the Civil Service Regulations. Mr. R. B. Cornwell, Extra Assistant Conservator of Forests and Instructor in the Madras Forest College, is granted privilege leave for five weeks with effect from 18th November 1916 with permission to affix the Christmas holidays to the leave.

Mr. J. H. Longrigg, District Forest Officer, Mangalore South, privilege leave for twenty three days from 1st December 1916 with permission to affix the Christmas holidays thereto.

Mr. J. Sadasiva Ayyar, District Forest Officer, Mangalore North, additional charge of Mangalore South during the absence of Mr. J. H. Longrigg.

Mr. J. A. Aranha, Ranger, second grade, is granted privilege leave on medical certificate for twenty three days from or after 28th November 1916.

November 21, 1916.

Mr. G. W. Thompson, District Forest Officer, South Kurnool, is granted privilege leave for two months with effect from 21st November 1916, or later, in lieu of the privilege leave for six weeks already granted to him.

The following postings of Forest Officers are ordered :—

Mr. Thomas Alec Whitehead, District Forest Officer, East Cuddapah to be District Forest Officer Bellary during the absence of Mr. C. Du Pre Thornton on leave or until further orders.

2. M. R. Ry., K. G. Belliappa, Extra Assistant Conservator of Forests, to be District Forest Officer, East Cuddapah vice Mr. Whitehead.

3. Mr. W. C. Hart, Extra Assistant Conservator of Forests, to be Instructor, Coimbatore Forest College, during the absence of Mr. R. B. Cornwell on leave or until further orders.

The posting of Mr. J. A. Aranha, Ranger second grade, Santhavalas range is cancelled.

M. R. Ry. C. Narayanaswami Nayudu, acting Ranger, Mettupalayam range, has been granted privilege leave for one month from date of relief.

November 28, 1916.

Lieutenant Francis Loftus Cowley Brown is granted leave out of India for six months on medical certificate with effect from 5th November 1916 or date of departure.

1. Mr. Muhammad Abdul Hafiz Sahib, Probationary Extra Assistant Conservator of Forests, West Cuddapah, is posted to the charge of Chitvel Range, East Cuddapah district.

2. Mr. J. A. Master Conservator of Forests in charge of Chitvel range, East Cuddapah on relief by No. 1 is transferred to the Bellary district to work under the orders of the District Forest Officer, and to be in charge of Kudligi range.

3. M. R. Ry. T. Subbarayalu Nayudu Ranger, second grade, incharge of Kudligi range, Bellary district, on relief by No. 2 is transferred to the charge of Madanapalle range, Chittoor district.

4. M. R. Ry., V. N. Seshagiri Rao, sub protem, Ranger first grade, incharge of Mamandur range, Chittoor district is appointed Senior Instructor, Vernacular Training School for the 1917 season. To enter upon his duties immediately after the Christmas holidays.

5. Mr. T. T. Ansep, Ranger fifth grade incharge of Chamala range and additional charge of Madanapalli range to relieve No. 4 immediately after the Christmas holidays.

6. Mr. S. M. Razvi Ranger, fifth grade incharge of Palmaner range Chittoor district, is appointed as Junior Instructor of Vernacular Training School for the 1917 session—To join on relief by No. 7.

7. Mr. C. Balayya Nayudu, sub protem Ranger fourth grade is on the expiry of the leave granted to him is posted to the charge of Palmaner range, Chittoor district, vice No. 6.

8. Mr. C. Venkataramana Ayyar, sub protem Ranger first grade, on the expiry of the leave granted to him, is posted to the charge of Kavali range, Nellore district.

9. Mr. M. Subbarayalu Nayudu, Ranger third grade, incharge of Kavali range, on relief by No. 8 is posted to the charge of Nellore range, Nellore District.

10. Mr. B. Chenchurama Nayudu, Ranger fourth grade, incharge of Chandragiri range, Chittoor District to be incharge of Chamala range, in addition to his own and relieve No. 5 before the Christmas holidays.

11. Mr. D. C. Bhide, Ranger fifth grade, on return from leave is posted to the charge of Chittoor range, Chittoor District.

12. Mr. L. Govindaswamy Pillai, Deputy Ranger, second grade and acting Ranger sixth grade incharge of Chittoor range on relief by No. 11 will continue to act as Ranger sixth grade, and is posted to the charge of Chamala range.

December 5, 1916.

Mr. Anthony Calas from fourth grade, sub protem, to fourth grade permanent.

Mr. A. Rama Hebbbar, from fifth grade, permanent, to fourth grade, sub-protiem.

Mr. Alagiriswami Nayudu, from fifth grade, sub-protiem, to fifth grade permanent.

Mr. T. V. Subba Rao Nayudu from sixth grade, permanent to fifth grade, sub-protiem.

December 12, 1916.

Mr. E. Dawson, Ranger, second grade, sub-protiem, is granted extension of leave on Medical certificate for six days from 15th August 1916 to 20th August 1916.

M. R. Ry., C. Balayya Nayudu, Ranger, fourth grade sub-protiem incharge of Nellore range is granted privilege leave on Medical certificate for two months with effect from 9th November 1916.

1. M. R. Ry., A. Venkatanarayan, Ranger, first grade, incharge of Madanapalle range, Chittoor District, is permitted to retire from service with effect from the afternoon of 12th November 1916.

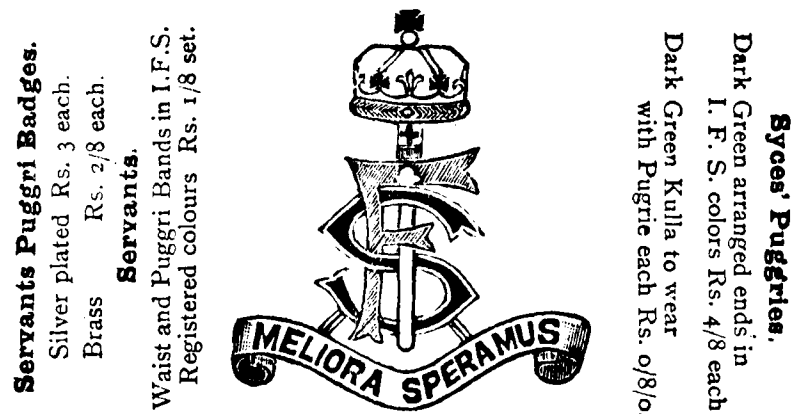
2. Mr. T. T. Ansep, Ranger, fifth grade, incharge of Chalmara range, Chittoor District will be in temporary charge of Madanapalle range vice No. 1 in addition to his own.

Mr. J. A. Master, Assistant Conservator of Forests, on relief of Chitvel range, is posted do duty under the Conservator of Forests, Madras until after his examinations in January 1917 when he will proceed to Bellary district for the charge of Kudligi range.

The grant of twenty days' leave on loss of pay from 24th October 1916 to M. R. Ry. B. Sambamurti Ayyar, Probationary Ranger sixth grade, is sanctioned.

Imperial Forest Service.

MONOGRAM.



Rangers and Deputy Rangers silver plated, English made, best quality whistles, complete with whistle cord each Re. 1.

Plain stars for Rangers and Deputy Rangers per pair Rs. 2.

Khaki or Dark green superfine wool, stockings, heavy weight, noted for the excellence of texture, durability and cheapness, turned down tops per pair Rs. 4/12.

Dark green forage caps with black patent peaks and chin straps and silk linings each Rs. 12. Khaki Helmets each Rs. 15.

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We can make and engrave the names of Forest Department on brass plates as per customers instructions and can submit samples for approval immediately, when called for

Tibet musk best quality	...	per tola	Rs. 36.
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3 yards by 1½ yards for gentlemen	...	each	Rs. 25.

All orders and Communication to be addressed to The Manager,

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Forest Contractors & Military Outfitters,
LUDHIANA (Punjab.)

THE Madras Forest College Journal.

Published Quarterly.

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N, B :-Contributors are requested to send in their contributions typed or written legibly in ink on one side of the paper only.—Editor.

(Editorial).

Forest Department in its relation to Commerce.

Mr. Findlay Shirras, the Director of Statistics to the Government of India in the "Review of Trade of India" for 1915—16 appropriately remarks "The abnormal conditions that have prevailed in trade since the war cloud broke have deepened the growing conviction (1) that the country is far too dependent upon its export of raw products (2) that these should be utilised to a much greater extent for industrial processes within India itself."

India possesses enough raw materials to be quite self-supporting if these products were utilised to manufacture finished articles within her boundaries. The Forest Department has under its control inexhaustible stores of raw products which are now neglected because the trouble of exploiting them is believed to be not worth the candle. Our exploitation is confined only to a few known species, the price of which in the market is sure to give us some profit and we are not to be blamed if we have not gone

further by enquiring into the vast possibilities of these resources. We are handicapped by our want of the means for transport; and as a quasi—commercial department our energies are confined only to the exploitation of such resources as shall give us satisfactory returns to show in the Administration Report for the year.

The Industrial Commission now sitting are recording the opinions of experts among whom experienced Forest Officers are witnesses. In this Presidency, Mr. A. W. Lushington, C. I. E., Retired Conservator of Forests, is placed on special duty to enquire into the commercial exploitation of forest products. We look forward anxiously for the results of this enquiry and we firmly believe that a powerful stimulus will be given to manufacturers using raw products available in this country. We also take this opportunity to wish Mr. Lushington a full measure of success.

In another direction, we are getting into line with other provinces by the appointment of a Special Forest Engineer who has a vast scheme before him of opening out our Forests in various parts by the construction of roads and tramways; and we are sanguine that this should ere long be of material use in placing the many soft-wooded species as well as minor forest produce, tanning barks, dyes etc., in the market to some decided advantage. At present many soft-wooded species are treated as weeds in the Forest, but we look forward to a time when they will attain the position of accessory species, and their removal, where it becomes necessary, will result in entries on both sides of the balance sheet.

To influence the Capitalists of India to launch their capital in any enterprise is a task in which any amount of writings and speeches would produce no palpable effect. It is for us to break the ice. If "The mountain

does not come to Mohamed, Mohamed must go to the mountain," and we, as Mohameds, should show by practical work to the capitalists that what we advocate regarding the vast possibilities of our forests is no idle dream. We request our correspondents who may have valuable information regarding some product or other in which they might have some special interest to freely use the pages of our Journal for discussing the possibilities and probabilities of utilising such products from our forests, so that we in our humble way shall be lending a hand to the solution of the problem of dealing with the commercial aspects of Forest Administration, the full development of which the Madras Government is now contemplating. "The Department" in the words of the authorities themselves "has not hitherto made any organised attempt to collect and publish information as to what kind of timber and other commercial products are available in the Forests, for what purposes they can be used and in what quantities they can be placed in the market."

It is not within our scope to enumerate all the products which are commercially worth exploiting. We must leave the compilation of such a list to abler heads than ours; but we will just mention a few products of special interest.

An important article, the trade in which is affected by the war, is paper. There is a considerable rise in the prices not only of the imported but also of locally produced paper. Before the outbreak of the war inferior German and Austrian writing paper had a large sale in India because of its cheapness. The total consumption of paper in India is estimated at 80,000 tons per annum, of which over 30,000 tons are manufactured in the country. It would indeed have to be an ill-wind that

brought no good to anybody. Even the present gigantic war which has cost the Nations concerned so much loss of life and treasure has been of great advantage to Indian paper mills as it has resulted in curtailing the import of paper and paper-pulp; and Indian mills have been able to raise their prices. There were 11 paper mills working in India at the end of 1915 with an authorised capital of Rs. 49½ lakhs, and the out-put in 1915 amounted to 30,361 tons valued at Rs. 90 lakhs. We congratulate the holders of these gilt-edged shares.

Many of our less popular woods are admirably suited to the manufacture of paper pulp, but we have not sufficient information as to the quantities of each available in our forests. There is an inexhaustible store of bamboos on the Anamalais and elsewhere; and the problem of their extermination is now engaging the attention of Forest Officers. Their extermination is desired in order to further the interests of teak crops. If we could turn them into paper what an advantage could be secured! The absence of water in its proximity is now urged as an impediment in the way of establishing a paper-pulp plant. But cannot the perennial waters of the Anamalai river which is only 13 miles away from the nearest portion of the Ranges, be husbanded, year in and year out, for running a plant if the means of transport are made more efficient? We are glad to note that attempts to do this are now being made. If the European countries of Austria and Germany could capture our markets with the produce of their mills transported across thousands of miles of waters, no child could be convinced if we were to say that *a distance of a few miles, or even a score of miles from a rich bamdoo area, is an impediment for its utilisation on a commercial basis.* Cannot a paper plant be run year in and year out at Feroke which is connected by means

of perennial streams with the Natural Forests of South Malabar, wherefrom bamboos and other soft-wooded species can be incessantly and regularly supplied at a comparatively cheap rate?

Or why could it not be possible to have a Match Factory at or near Feroke, Bombax timber being supplied for the purpose from the South Malabar Forests?

The removal of the competition of Synthetic dyes from Germany has given considerable stimulus to the trade in natural indigo, the total exports having increased from 24,800 cwts. to 41,942 cwts. or 145%, a level which was last seen in 1904—05; and the value of the exports advanced by 131 per cent.

We have no definite information regarding the quantities and qualities of stuff that we can safely place in the market. We have only very scanty ideas. Innumerable tanning barks are available in our forests; but beyond a few stray facts which we have gathered from our text-books we have no practical experience of any tanning processes. We requested information from our readers with the object of answering a query from a Firm interested in tanning materials. It is not that our readers do not wish to give the information, but we fear that no information is available and none will be, till Mr. Lushington has been at work for some years.

“District Forest Officers” we quote from a recent G. O. “were unable to furnish Mr. Tressler with any definite information about the quantities of woods suitable for pencils; and Mr. Couchman said, when he asked Conservators for similar information in regard to the better known woods, to be embodied in his Industrial Manual, he was informed that it was impossible to give any estimates of quantities.”

The Madras Government now being convinced of the need of an Officer to deal with the Commercial aspects of Forest Administration have taken a step in this direction by the appointment of a Special Officer to enquire into such matters.

We firmly believe that early steps should be taken for the dissemination of information relating to the Commercial aspects of Forestry. The Government of India in their endeavour to disseminate matters relating to Trade and Commerce have a weekly journal entitled the "Indian Trade Journal" published by a special branch of the Department of Statistics called the Commercial Intelligence Branch. We wish that the pages of our Journal would be utilised by all concerned to place it in a somewhat similar position and in course of time official recognition might be obtained.

In the absence of a Research Institute, the pages of this Journal might contain the collective experiences of all Forest Officers in the Madras Presidency from which Commercial business houses might obtain information useful to them. Any information regarding utilisation of raw products would be welcome, nothing would be regarded as being too trifling to record. It is just these small scraps of information that would in time be capable of being pieced together to make a compendium of information on that particular subject.

When, however, a Research Institute comes into being, as it must in time, we shall be very glad to place what information we have collected through the medium of correspondents—so lamentably few at present—at the disposal of the Institute which will then be the recognised Bureau of Information.

Forest Officers on Military Duty.

Within the last five months, the Forest Department in Madras has become the poorer by two of its younger officers—Messrs C. C. Wilson, I. F. S. and R. B. Cornwell, P. F. S. having laid down temporarily, we hope, the peaceful profession of Forestry for that of arms. They are now members of the I. A. R. O.

Mr. C. C. Wilson prepared many Working Plans during his tenure of office as Working Plans Officer. Immediately prior to his departure he was engaged in preparing the Working Plan for Mount Stuart Forests in the South Coimbatore Division.

Mr. Cornwell too, prior to his appointment as Provincial Instructor in the Madras Forest College was engaged in preparing Working Plans for the Madura fuel forests as Mr. Wilson's Assistant. A keen sportsman, a good shikari and an erudite instructor—he endeared himself to the students and staff. We parted with him reluctantly.

We wish both these officers distinction in their military careers and a safe return to our midst.

We reproduce below extracts from a letter from Mr. Cornwell which we trust shall be of interest to our readers.

"I arrived at Ambala on Sunday morning and we started work seriously the next morning. We are only 50 at present, but another 200 come in on the 1st February; of these 150 are youngsters coming out from England. We are being worked hard and ought to be in excellent condition when we leave here in the first week of April. We are housed free in barracks, 2 men to a suite of rooms.

It is very a much more interesting life than at the College; and I am sure that the training will do me no end of good. It is very cold at night, and we keep a fire going all night."

We also learn that Mr. J. A. P. D'Cruz (1913-15) has obtained the permission of Government to enlist in the Anglo-Indian army. We admire his patriotism and wish him luck.

A Plea for the Private Student.

Since the opening of the Madras Forest College one private student only has obtained an Honours certificate, all the others who have entered the college have invariably done very poorly.

Many boys present themselves for admission as private students who would not have been given a post of a Deputy Ranger. The idea seems to be that because they or their parents or their guardians are prepared to defray all expenses, they are entitled to risk failure. Many private students have not had a sufficiently good general education to do well in this college. It would be well for parents and guardians to know that unless a boy has a Matriculation certificate (1st Division) he will not benefit by the education given at the Forest College. It will be just so much waste of valuable time attending the course. That private students have not troubled to qualify themselves for the post is a pity. They *can secure* an advantage over Government Students after the college course as matters now stand.

Let us take young men of the same age, say 21, and assume that one of them enters the college as a private student, whilst the other obtains a post of Deputy Ranger with the object of being deputed to the college sometime

later. It is impossible or nearly so to be deputed to the college the year in which the appointment of Deputy Ranger was secured. It will take from 2 to 3 years to gain admission to the college. Assume it takes just 2 years. In that time the man who entered as a private student has completed his course; and if his previous education has been sufficiently good, that combined with diligence should have helped him to an Honours Certificate.

The man with an Honours certificate is appointed Ranger on Rs. 80, whilst the other man is just about to enter the college on a stipend of Rs. 50.

I do not desire to overdraw the picture. Let us suppose the private student secured the Higher Standard certificate instead of an Honours certificate. Even then he is better off. He will have obtained a Ranger's post on Rs. 50 at least and within the 2 years the Deputy Ranger is at the College there is every likelihood of the Ranger on Rs. 50 having been promoted to Rs. 60 or even 80.

Let us consider these two young men from another point of view. The one who entered the Forest Department as a Deputy Ranger at the age of 21 is 23 when he joins the college. We will suppose he obtains a Higher Standard certificate at the end of the course, so that by the time he is a Ranger on Rs. 50 he is 25. The Private student would be a Ranger on Rs. 50 at the age of 23.

Will the 2 years spent at the college by a Government student count towards qualifying service for retirement? This is doubtful. The chances are that these 2 years will not count as service in which case the private student has as much service as his Deputy Ranger friend when the latter obtains his certificate,

though in all probability he will be in a higher grade. There is no doubt that properly qualified private students have an advantage over Government students.

In the near future, it is likely that private students will be expected to pay Rs. 1800 by way of tuition fees.

The existing advantages of a private student will need improvement in order to keep pace with the outlay. I would suggest that when private students are expected to pay Rs. 1800 for their course, that the following rules might be adopted with advantage.

1. Private students obtaining the Honours Certificate to be appointed Rangers on Rs. 100.

2. Private students obtaining the Higher Standard to be appointed Rangers on Rs. 60.

This would place the advantage entirely with sufficiently educated private students and it should certainly stimulate them to do their best during their course. Those men who are not sufficiently educated would be driven away by the fees. This would be as it should. The Forest College was never intended to be Refuge for Sinners—I mean those who have sinned against the use of time in their school days.

The proposal made above would be of great advantage to the Department. It is likely to attract the best talent obtainable in this Presidency. Keen competition will result and in future the spectacle will not often be seen of one man carrying off all or nearly all the medals and prizes offered.

There would be no necessity to appoint Deputy Rangers with the object of deputing them to the College. A sufficient number of qualified Rangers (Private Students) would be available annually. Admission to the

College would be regulated by the number of prospective vacancies of which the Principal could be informed in advance of the time when candidates for admission are selected. If it is found at any time that a sufficient number of candidates have not presented themselves, in the following year the requisite number may be made up by offering stipends to qualified men who may not have the means of entering as Private Students.

Then again if the majority of the students happen to be private students, the fees would amount to a respectable sum annually which could be devoted towards the cost of Original Research work which might then be begun.

If prospective private students are inclined to complain against the rule of paying for tuition, I would point them to the agitation of the Indian Press which claims for Indians the treatment accorded to Europeans. In Europe such education is not given free. By being asked for fees and being given some distinct advantage for it, the treatment is exactly that given to all European students in a European country.

If the suggestions made above should catch the eyes of the Powers that be and are given a trial, I am sanguine that nothing but good results will be obtained.

Old Ranger.

Spike in Sandal.

From the fact that the disease can be transmitted by contact, it appears to me that there must be some toxic substance (perhaps of a virulent chemical nature) or bacilli in the sap of an infected tree which when imbibed by a healthy tree produces the disease either by directly reaching on some of the valuable constituents of the sap

and neutralising them, so that the nutrition of the tree is greatly impaired, or some bacilli which directly attack the enzymes and destroy them so that the tree cannot convert its starch into glucose.

Now, this poison may be hereditary or may be dormant in the plant for some time and exhibits its presence at a stage when through some causes the tree becomes weak and enfeebled or even at earlier periods of its life. Just as in the case of the human body also, certain hereditary diseases make their appearance when the system becomes weak and exhausted; or again the poison may be present in the soil or below a certain depth or be subsequently introduced into it through the agency of other plants so that when the rootlets of a healthy tree penetrate that particular layer, the poison finds its way into the tree through its root system and does all the mischief.

In the light of the above, therefore, I beg to detail a few experiments that may be tried to locate the poison.

1. Small chips of sapwood from an infected tree should be soaked in some fresh water for a few hours (as little water as possible being used so as not to dilute the sap too much) or better still pressed between the jaws of a nut-cracker or a small pair of tongs, the solution stirred and then injected into a healthy tree through a small hole bored downwards into the stem with a small gimlet or other boring tool. The mouth of the hole should be closed with a small wooden plug or other hard substance, and the result watched. If this fails, chips of heartwood may be tried and also pieces of tender rootlets.

2. A small quantity of soil taken from above the rootlets of an infected tree about 1 or 1½ ft. below the surface should be mixed with some fresh water (as little

water as possible being used), the mixture allowed to settle and the clean liquid at the top injected into a healthy tree, as in the first case the hole closed and the result watched.

If any of the experiments should produce the disease, then equal proportions of the solution injected and of a solution of chips and soil from a healthy tree may be analysed and it can be found out what constituent is excessive in one and deficient in the other or what new substance exists in one which is absent in the other. The solutions may also be microscopically examined in regard to the bacilli they contain.

Kanigiri, }
14—12—16.)

E. W. Fernandez,
Forest Range Officer,
Kanigiri.

Infusions made from leaves of affected trees injected into healthy ones does not communicate the disease. This has been tried by Dr. Coleman. He has succeeded in imparting the disease to a healthy sandal tree by grafting operations. As there are few subjects of greater importance or interest to Forest Officers in Southern India than that of "Spike" disease in Sandal we commend the suggestions made by our correspondent to those of our readers who have facilities for giving them a trial.

Editor.

Exploitation of Nux Vomica products.

Among the products exported from the Madras District to the United States in the first half of the current year (1916) Nux vomica ranked seventh, following skins, coconut oil, pepper, coir yarn, indigo and sandal-wood, and amounted to 2,666,118 pounds valued at Rs. 4,02,291.

Nux vomica is shipped either in the form of seeds or of "pickings," the latter being shells or husks washed from the seeds.

Nux vomica seeds and "pickings" are obtained from the plumlike (?) fruit of the trees (*Strychnos Nux vomica*, Linn.). The fruit is collected and the seeds washed out and dried in the sun, or the seeds are simply gathered from the ground, but in the latter case they have little commercial value. The best seeds are known in the trade as fine, bold and fresh. Their appearance should be "bright," that is, clean and silvery.

In the Forests of Nellore, where the tree is common, the seeds are washed out by a forest tribe, the Yanadis, and a good price is obtained for them.

The current quotation for Nux vomica in Madras at the end of June was 1 anna 3 pies per pound. Nux vomica is packed in robbins or bags usually of 164 pounds when exported, the shipping ton being 14 to 16 cwts. net.

(*Oil Paint and Drug Reporter* extracted from "The Tropical Agriculturist").

Strychnos Nux vomica (Tamil *Yettimaram*, Telugu *Mushti*, Malayalam *Kanjiram*, Uriya *Kora*) is common throughout the Presidency. In many places it is very abundant—and it would seem that the trade might well be very considerably extended. In most localities the seeds are not collected at all. There is some danger, however, of glutting the market. It is precisely for this reason that the Forest Department requires an Information Bureau that would arrange for the distribution of forest products and prevent collection of material in excess of the demand.

It is to be noted that the average price for the last quarter of 1916 had risen from 2 annas 7 pies to 3 annas per pound, in Madras.

Record showing the growth of palmyra trees.

Month and year.	No. 1 tree.		No. 2 tree.		No. 3 tree.		Remarks.
	No. of leaves put forth.	Height of tree.	No. of leaves put forth.	Height of tree.	No. of leaves put forth.	Height of tree.	
1916.		F. In.		F. In.		F. In.	
January ...	1 Leaf.	2-4	1 Leaf.	1-10	1 Leaf.	0-6	
February.	1 do.	"	1 do.	"	1 do.	"	
March ...	No leaf.	"	2 Leaves	"	1 do.	"	
April ...	1 Leaf.	"	2 do.	"	2 Leaves	"	
May ...	1 do.	"	1 do.	"	1 Leaf.	"	
June ...	1 do.	"	1 do.	"	1 do.	"	
July ...	1 do.	"	2 do.	"	1 do.	"	
August ...	1 do.	"	2 do.	"	1 do.	"	
September.	2 do.	"	2 do.	"	1 do.	"	
October ...	2 do.	"	1 do.	"	1 do.	"	
November.	1 do.	"	1 do.	"	1 do.	"	
December.	1 do.	2-10	1 do.	2-4	No leaf	1-0	
Totals ...	13	Incre- ment. 0-6	17	Incre- ment. 0-6	12	Incre- ment. 0-6	

21-1-17. H. J. Mc Laughlin,
District Forest Officer,
Kistna.

Descriptive list of trees etc : for the Walaiyar and Bolampatti Camps.

I regret that the following errors crept into the above list published in the last issue.

Toddalia and **Vitis** were included under plants with opposite leaves, actually the leaves are alternate. The three species concerned should be rearranged as follows:

Toddalia asiatica, (No. 208) under E. Climbers, III. Leaves compound, (a) Leaves alternate, 1. Leaves trifoliate and should come first in that class under **Rutaceæ** before No. 195.

Vitis auriculata, (205) and **V. pedata**, (206) under E. Climbers, III. Leaves compound, (a) Leaves alternate, and find place at the end of that category under **Vitaceæ** 4. Leaves digitate or pedate after No. 203.

The following species of trees were omitted:

A. I. (a). 1. (ii).

Urticaceæ.

Artocarpus hirsuta, Lam. Tam: *Tellaikori-mara*,
After No. 10.

A. I. (b). 2. (ii).

Rhizophoraceæ.

Carallia integerrima, DC. Tam: *Panchai-maram*,
Before No. 66.

Oleaceæ.

Olea dioica, Roxb. After No. 67.

A. II. (a). 3. (i).

Leguminosæ.

Hardwickia binata, Roxb. Tam: *Acha*. Only at
Walaiyar. After No. 84.

C. Fischer.

**Athletics at the Madras Forest College from
December 1916 to February 1917.**

Athletics suffered a wee bit during these three months, since both the classes were out of head quarters the whole time and separated from each other for about

2 months. However, we made capital out of the situation having, whenever possible, some practice in football, the game for the term.

The Senior Division Students had a six-a-side football tournament in the camp at Walayar. The beaten teams had the pleasure of standing a treat to the winners—the team captained by Student C. S. Nanjappa—Mr. C. B. Dawson making a good contribution.

Two other very interesting games were played here—one between the Young and the Old, as it was called, and the other between the Brahmins and the Non-Brahmins. The first in which the Young found much more persistent opposition than they expected in their old opponents ended in a draw to the tune of 1 all. In the second game the Non-Brahmins defeated the Brahmins by 5 goals to nil.

The annual six-a-side tournament was held at Sadivayal in the month of February when both Divisions were camping there. The teams captained by Junior Students P. K. Parameswaran Pillai and J. Venugopal respectively, having scored equal points at the expiry of the normal period, had to settle their claim to the prize. An exciting and excellent game was played; and after a 20 minutes' keen contest Parameswaran Pillai's team won the day by 3 goals to 2 and received the well-merited cups kindly awarded by our Vice-President, Mr. H. C. Bennett. It must, however, be said in justice to the losers of the day that every man was in his best form and that the captain, Venugopal displayed considerable skill with the ball. There was held on the last evening of the tournament a social gathering to which the Principal and Mr. Dawson liberally subscribed. A merry half-hour was spent, some of the students contributing to the general enjoyment

with their skill in music, recitation &c. To quote the words of our Principal, the Chairman of the evening, there was an exposition of latent intellect in several unsuspected quarters.

The students of the Senior Division had some practice in sprinting at Anaipadi in December. A race was run up to the Top-slip Depôt and back. The winners were K. S. Raghavachar, T. Balaram and K. Thiruvengkatachari. A general feeling of disappointment was caused by student C. S. Nanjappa being disabled to run within a few minutes of the start.

The Annual Marathon Race was run along the usual cross-country course (6 m. 5 fur. 100 ft.) on the morning of the 17th February starting at 7 o'clock. Senior Student C. S. Nanjappa, last year's winner, won the first prize breaking the record by 4 minutes. The other prize-winners mentioned in order were T. Balaram, U. K. Timmaya, K. Thiruvengkatachari and P. K. Parameswaran Pillai, of whom the first and the third belong to the Senior Division and the other two to the Junior.

"A Trip along the Kumradhari."

I beg to report that starting from Kokkada on the evening of 7th under verbal orders of District Forest Officer I reached Shirady and early on the morning of 8th a raft was constructed and we started from Udane at 3.18. P. M. down the Gundia River. There was barely sufficient water in the river and the raft scratched against the surface of several rocks on the way to Hosamata, where the Uppinangady-Kulkunda Road crosses the Gundia Hole, where we reached at about 6.28. P. M. and where we halted for the night. The Potail of Hosamata an old Brahmin in whose house I halted for the night

gave me a short history of the early floating of timber that way and warned of the dangers in the river as far as he knew. The timber used to be floated only in the hot season and that with great difficulty and delay. There was heavy rain on the night of the 8th and early in the morning of the 9th the water in the river had risen by more than a yard. After 10. A. M. after finishing our food, as the men refused to start earlier, we started on our raft. There was nothing particularly noteworthy from Hosamata to the confluence of the two rivers Kumaradhari and Gundia Hole, but about 200 yards below this point there was a waterfall, water falling obliquely for a depth of $2\frac{1}{2}$ ' or 3 feet. It is said that here when the water is low, water falls from a height of 12 feet or more.

I was keeping a watch in front of me on the raft and noting down the locality where rocks etc., are found and the exact time at which we reached that particular locality etc., in detail in a Note Book.

Coming down from the confluence of the Gundia and Kumaradhari rivers we passed the first waterfall, several rocks and one more waterfall, the locality of which none of us now remember and consequently I am unable to report as the Note Book was subsequently lost as will be reported latter. Passing down from there and passing several rocks we came to what is known as "Kudrathaya Mandi water fall" which is the biggest and most fear inspiring. I am a good swimmer and am not at all afraid of being lost in water but when I remember Kudrathaya Mandi and the way we came down along there, my very hair stands on end. Its proximity was known to us on account of the roaring it made and which could be heard at a distance of more than two miles. Several people who were on the banks of the river and of whom we asked the names of places wondered and asked us why we were

bent on going into the very jaws of death. However we reached the waterfall which is not one waterfall but a series of them. The first waterfall I think must be from a height of about 8 to 10 feet. Our raft with us went down with the current.

Where the water falls there are waves formed which go from about 6' to 8' high. We and our raft went down into the water I do not know for what depth and rose to the surface. In another 5 seconds we were in another waterfall of the same dimensions in which also we repeated the same process. Abdulla, the other Moplah with us, lost all hope of reaching home but we encouraged him and made him hang on to the raft. There was no guiding the raft here. The raft went merrily on its way down waterfall after waterfall and we rather than counting the number of them and noting the positions of rocks etc., had to be in real earnest with the care of very lives. After 10 to 15 minutes of this journey in the waterfalls we came to its end and breathed more freely. The creepers with which the aft of our frail craft was tied, having broken in the "Arbi" we alighted on an island in mid-stream and repaired the raft and I took notes of the Arbi. We pushed off again in a quarter of an hour, and passed to more Arbises of much lesser importance and we reached Katara waterfall near the Narimogar reserve at about 6-30. P. M. We were intending to push on to Uppinangady which is only at a distance of a mile or a little more, before nightfall but unfortunately the fore part of the raft struck on a rock and its aft was pushed on by the current to another. It was in mid river with fast running currents about us and we tried our very best to disentangle our raft but all to no avail. As it was getting dark, we left our raft and all our samans on the raft as we could not swim with our samans to the shore through that fast running current, a distance of about 100 or 120 yards.

Swimming, we got to the shore and walked to Uppinangady—a distance of 4 miles by land. The next day viz., the 10th we went back and brought what remained of the raft and our samans by river to Uppinangady. When the raft struck against the rock we were thrown into the water and there unfortunately I lost the precious Note Book in which I had taken detailed notes about the navigability of the river.

We lost a good deal of samans together but I have made good the loss sustained by Abdulla and paid for his lost articles at 50% of their price.

The river is not practicable for floating timber, but a few logs if necessary can be floated down by extraordinarily courageous men at great risk to themselves and the timber, at the time of flood. This river cannot be made easily navigable unless several thousands of rupees are spent in blasting rocks at these "Arbis."

I have reported about this at tiresome length but owing to the loss of my Note Book I am unable to submit in detail the observations and notes I took on the way, for both of which I beg that the District Forest Officer may be pleased to excuse me.

The above is copy of a report from Mr. E. Ramapuram, Range Officer, Uppinangady; to the District Forest Officer, Mangalore South.

Note :—Arbis are waterfalls.

The Mystery of the Blue Gum and Malaria.

During the later decades of the nineteenth century it was a common practice to plant Blue Gum or Eucalyptus trees in districts infected by malarial fever. It was held that the essential oil produced by the leaves combatted the harmful vapors rising from the swamps, laden with the

poison of disease. The discovery that the malarial germ is introduced into the blood by a mosquito has settled once and for all the origin of the disease.

Yet it is only within the last few months that a somewhat mysterious point has been fully settled. The theory that the Eucalyptus trees neutralised the poison vapors is nonsense, yet the fact remains that where Blue Gums were freely planted, there was always a notable decline in the amount of malaria. For instance, in a certain district near Algiers the planting out of thousands of Eucalyptus trees completely transformed the conditions. Malarial fever of a peculiarly virulent type had formerly been a constant feature, but, within 12 months of the planting of the Blue Gums the disease entirely disappeared, and is now unknown.

What is the explanation of this circumstance? It has been demonstrated that, of nearly all trees, the Eucalyptus absorbs the greatest amount of water. Two seedlings—a Blue Gum and a Plum were placed with their roots in water and the height of the water was carefully marked. The plants were kept in a warm atmosphere and examined at the end of 24 hours. The little Eucalyptus has disposed of 4 times the water that the Plum had been able to take up. Seeing that Blue Gums increase in height with great rapidity often growing many inches a day in a hot position, the amount of moisture taken up increases on a greatly progressive scale. And this is just what brings about the downfall of the malarial mosquito. To complete its life cycle it is necessary that this insect should pass its larval stage in pools of water. With the coming of the Eucalypti these pools and indeed all marshy places disappear; the breeding spots of the mosquitos are gone and in time the insects vanish altogether. The district is then free from

malarial trouble simply because the carriers of the disease are not able to keep going.

The suggestion carried in the foregoing paragraphs might well be used in districts infested with malarial mosquitos, provided the climate is suited to the Blue Gums or Eucalyptus trees. (American Scientist).

The dangerous tin can.

The expert malaria investigators of the United States Public Health Service have found that discarded tin cans containing rain water are breeding places for the mosquito which is the sole agent in spreading malaria. Tin cans should not be left about the yard of the home or factory; for they may lead to sickness and even death. But if cans cannot be disposed of and must be kept in the premises, each can should be punched with one or more holes in its bottom so that it will not hold water. (American Scientist).

Indian Industries Commission.

Evidence by Forest Officers.

Mr. P. M. Lushington, Conservator of Forests, S. Circle, in his written evidence stated:—

“There is little doubt that the most successful efforts of the Forest Department to promote industrial enterprise have been by means of plantations not only of indigenous, but also of introduced trees. The teak plantations of Nilambur are well known, but have been insufficiently considered from an industrial point of view. They were started with a view to supply local requirements in teak; but owing to close planting and rich soils, the wood produced is not so suitable for building or furniture making as for the special purpose of ship-building. The wood commands a high price in the market; but the wood almost all goes to the Persian Gulf, where it is used in the

construction of *fallamars*. There is at present a very considerable area planted; and private individuals, seeing the profits made by Government, have started their own plantations in the same locality. Formerly Bombay traders from the various parts used to attend the sales; but latterly these have been absent; and it is certainly a matter for enquiry as to why these merchants are absent.

"Another large industry which was started by the department is the production of casuarina plantations, more especially in Guntur, Nellore, Chingleput, South Arcot, and Trichinopoly. Another example of a successful introduction is seen in the Nilgiri eucalyptus plantations. Another industry which was introduced by the department was the growing of the cashew nut in the South Arcot in soils unsuited to other cultivation. I wish to issue a note of warning against the too rigid adherence to the policy inaugurated on the advice of Mr. Beadon Bryant that further plantations should not be made. I am aware that when he made his suggestion we were inclined to spend too much on artificial reproduction; but, as some of our greatest successes have been due to plantations, I wish to point to the danger of this policy being carried to an extreme.

"Another most important industry is the production of sandalwood oil. The production of sandal has been very much neglected; and its protection has been sadly deficient. For this we require especially trained Working Plans Officers. Mysore is even more largely interested in this tree than we are and are introducing factories for the distillation of oil. Our outturn is not at present sufficient to justify a factory of our own; but I consider we should work our oil in conjunction with them and save large quantities of export. A further industry that requires a great deal of working up is the bamboo industry. In order to put this matter on a satisfactory basis we require a local Research Officer. Not only would such an Officer be able to provide us with proper rules for working; but probably he would be able to organise the working of bamboo for paper in such Districts as Malabar, Coimbatore, and Kurnool, where there is a plethora of the *Bambusa Arundinacea*.

"Another large industry which I consider has been greatly neglected by the Madras Government is the production of tanning material.

"The chief tanning material is the bark of *Cassia Auriculata* (Tamil *Avaram*, Telugu *Tangedu*); and it is in connection with this

that a change of policy is needed. This *Cassia* is a first class tan; but incidentally, because it belongs to the Leguminosæ it is one of the many trees and shrubs that can be used for green manure. This has been fatal to the growth of the shrub, because Government has recognised the ryots' claim to it and at the same time recognised that large contracts are given for this tan. This half-hearted policy has been ruinous to the shrub. In order to develop the possibilities of this industry, we require a Research Chemist and a Research Economist.

"Two other Forest industries are pencil and match-making. Both industries, together with the pulp industry, are now being taken up by the Director of Industries in Madras, but there is no real head of the Forest Department in Madras and the Director of Industries is not a business man. He is completely out of touch with what is going on in the Forests; and we are ignorant of what is going on in connection with these industries.

"I have now outlined the chief well-known Forest industries, but in my opinion they hardly touch the fringe of Forest Industrial Commerce. The Madras Forests are a large store-house of raw material, stocked with hundreds of kinds of woods, tans, dyes, gums, fibres, and other material, which is practically unknown, and in this respect the Forests are hardly worked at all. Timber extraction is confined to a few well-known species; and the bulk of the wood is taken out for fuel, but quite two-thirds of almost every Forest remains untouched.

"We are completely out of touch with the Scientific and Technical Department of the Imperial Institute, which I believe to be entirely due to our want of a Research Department in Madras. Our most crying need then is for a Local Research Department similar to that of Dehra Dun; and we have been asking for this for some years now. But properly to develop our Forest resources we require a Forest Director of Industries as apart from the Agricultural Director. The Forest Director should not be a Forest Officer, but a trained Commercialist who should work in conjunction with the Head of the Forest Department and the Research Officers. It should be his business to find out what are the chief requirements of the commercial world and to organise an industrial survey of all principal Forests where these materials are to be found. He should also encourage Industrial Exhibitions which are of great value educationally.

"But above all we want to encourage local industrial enterprise, of which there is but little in Madras. This can in my opinion best be done by pioneer factories. The Mysore Government have set a good example in this respect and have established a sandalwood oil factory which, I understand, is likely to prove a success. Other pioneer factories for pulping, pencils, and matches should be under the charge of the Director of Industries and run by commercial men and later on we should have fibre and floss factories and possibly many others.

"The duty of Government in this matter is chiefly educational, and I am of opinion that none of these factories should be permanent but should be handed over to private companies as soon as companies can be found sufficiently trustworthy to take charge of them."

Mr. H. B. Bryant, Conservator of Forests, Central Circle, in his written evidence stated :—

"To commence with I must give it as my considered opinion that no Forest research work of any value is possible under the existing conditions of the Forest Department in the Madras Presidency. The Department is so seriously undermanned that it is quite impossible for any of its officers to engage in serious research work without utterly neglecting the ordinary duties which are expected of them. Assuming that the Department will be placed in a thoroughly organized condition with regard to the establishment required for carrying out the ordinary duties expected of it, the next necessity is the establishment of a properly equipped local Forest Research Institute. Incidentally I may mention that the proposal was put forward to build such an Institute in connection with the Madras Forest College recently constructed, but this was vetoed by the Government. Such an institute is essential if any real progress is to be made in Forest research with a view to convert into economic use many products of the Forests which are now lying latent therein.

"To expect the average Forest Officer with the multifarious duties which are already imposed upon him to be able to dive into research work with any hopeful results is to expect an impossibility. The Department is undermanned and overworked all down the line, and whatever little organization it has possessed or now even possesses, it has years ago outgrown and it is literally at the present moment, and has been for some years past, kept in a constant state of struggling inefficiency which, before long, if nothing is done to avert it, will land

it in a very unhappy state of inanition. For the improvement of economic industry in this country Forest research is imperative; and for the proper conduct of Forest research, a thoroughly good and efficiently trained organization in Forest administration is absolutely essential. Further in my view the Government would be well advised if they made up their mind to forego all surplus revenue made by the Forest Department in this Presidency for a period of the next 20 years; and instead of taking it out of the Forests and utilising it for other purposes, as they are now doing, they should spend it on the proper maintenance, working, opening out and development of the Forests themselves. From the point of view of sound Forest policy and from the present degraded and undeveloped state of many of the Forests themselves the Government is quite unjustified in taking so much revenue from the Forests and putting so little back therein.

"The surplus revenue derived from the Forests might well go to form two funds, viz:—

- (1) The Forest Capital Reserve Fund.
- (2) The Forest Economic and Industrial Development Fund.

"No. 1 fund would be used to finance capital work such as expensive ghaut roads, trunk roads, tramways, buildings, saw mills, ropeways and the like, for the purpose of working the Forests and transporting Forest produce from localities which are at present inaccessible; and No. 2 fund would be utilised to finance the operations in connection with the establishment of Forest Research Institutes and the pioneering of new industries in connection with products derived from the Forests themselves.

"Deficiencies in Forest transport are very numerous indeed. There is not a single district in the Circle, of which I at present hold charge, wherein Forest transport has as yet been properly facilitated by the construction of roads in order to make the Forests accessible for the purposes of developing them. Sometimes the argument is used that it is not the business of the Forest Department to make roads, but that this work should be left to the Local Fund Department or Public Works Department rather than that the roads the Forest Department requires should be constructed by itself, for its own use, and such being the case, many a Forest Officer has had to be content to sit down and inspect his Forests through a telescope in the absence of any communications to and through them which would

not only enable him to thoroughly inspect the Forests, but also to work them and transport Forest produce from them. The spirit of proper enterprise has undoubtedly been lacking in this respect on the part of the "powers-that-be." There must be more intelligent sympathy with the real objects and aims of Forest conservancy in this country on the part of Government, and a little less sympathy towards the ignorant susceptibilities of the peasant population. Forest conservancy can never really hope to be popular in any country, still less in a country like India, where the education of the people is so backward; and that most fallacious pose that the Revenue Officer of the country is the saviour and protector of the ryot against the oppression of the Forest Officer must be altogether swept away and a harmonious working together of both Officers must be insisted upon. The Forest Officer, if only the truth were realised, is a far more real friend of the inhabitant of this country than the Revenue Officer can ever be. I do not expect this fact to be recognised, but in my opinion it is a fact nevertheless."

Mr. C. D. McCarthy, Conservator of Forests, Western circle, stated.

"From the point of view of extraction, the establishment of the Forest Department is built for the exploitation of such major forest products *only* as timber, fuel, bamboos and so forth. The department exercises practically no control over the collection of other production. For example its connection with barks, fruits, gums, honey and wax is limited to selling the right of collection; and we are ignorant even of the quantities collected under these leases. We are undermanned even for the scope of our present work; nor do our current re-organisation proposals go beyond dealing with it. And although we attempt to reply to enquiries concerning the commercial exploitation of products which are not in the regular line of collection, it must be admitted that the results are seldom of any use. The fact is that our staff is not formed for this purpose. It is trained and concentrative on the protection, improvement and exploitation of the forests; and it is waste of time and training to use it otherwise.

"I will take two enquiries as typical of what we are frequently asked to do for commercial firms. The first might be:—"Please inform us in what localities the fruit of *Schleichera trijuga* is obtainable in commercial quantities; and give us an estimate of the cost of collection and delivery at the nearest railway line." The next

would be:—"Can you supply soft wood suitable for tea boxes, if so in what quantities and at what rates? The wood must be supplied in the form of planks or squares."

"In both cases the department is able to do little more than specify the localities in which the raw product is obtainable. As regards the first we have no collecting agency. We should either have to organise one amongst the forest tribes who collect similar products for the minor forest produce contractors, or else go to these contractors for quotations. One need hardly say that the information provided in this way is not likely to be of any assistance to enquirers. In the second case it is obvious that the wood supplied must be seasoned (in this instance, by immersion), and that it must also be sawn up. Now this department only supplies fresh cut timber to the dealers. We have no seasoning depôts of any sort and we have no sawing machinery. Nor would it be reasonable to expect us to set them up to meet such demands.

"I must repeat however, that it is not the function of the department as it stands to meet such demands; nor do I recommend that it should be utilized in that way. We cannot become the collecting agents for individuals; nor can we take the place of the retail dealer or the sawmill to supply this and that consumer.

"Proposals have been sent up for the addition of a local research staff to the Forest Department in Madras. In my opinion, when it is formed, its work should be confined entirely to professional forest subjects. Owing to the employment hitherto of the existing staff in holding enormous divisional charges there has been little professional knowledge collected even upon such essentials of our work as the rate of growth and regeneration of any of our principal timber species with the result that the all-important point of the proper felling rotation in timber and even in fuel forests, is largely a matter of guess work. There is an immense amount of professional work awaiting this branch in half a dozen other directions; and I am totally averse to any proposals to utilize this staff when we get it, upon such refinements as investigations into dyes, resins and tans, whilst the very spade-work of the profession is yet to do. This should be the duty of a totally different establishment and requires attainments and training which the education of a Forest Officer does not supply. In my opinion also it would not be advisable to attach a commercial or scientific officer to the Forest Research staff. I understand that some such

proposal has been made with the object of establishing a closer touch between the Forest Department and that of Industries as well as with the outside commercial world. Every one of course is in favour of furthering this connection; but I think officers of these attainments would be far more usefully employed in the department of Industries and that closer relations with the Department of Industries would be best attained by a system of conferences between the heads of the two departments.

"On the subject of Forest Transport we appear to have reached the stage when we must begin to employ mechanical means and improve and utilise our resources of water transport. We have about reached the limit of what native labour and cartage can do for us. Of late the calls upon the latter by mercantile and industrial development have very considerably increased; also it is not possible to establish a paying transport service with large Government establishments of bullocks and cartmen for the exploitation of the forests in remote and unhealthy localities. The trouble in making a start with mechanical transport here, in South India, is that there is absolutely no reliable agency or advice to assist us in these matters. Unfortunately also the few attempts that have been made have been, as far as my knowledge goes, without exception, failures, and it is difficult, therefore, to get a hearing for such proposals. The cause of these failures seem to be that in the absence of independent professional opinion we have been obliged to go direct to the makers not only for the material, but for advice of what material we wanted. And the result has been either that the mechanism supplied was not suitable for the work or that it was too big and expensive for its job. In this presidency we have lately been given a Forest Engineer who is doing useful work in the alignment and the construction of export roads into the more remote and inaccessible hill tracts and forests; but it is too much to expect the special knowledge required for providing light railways in hill forests from one and the same officer. What seems to be required is that a 'specialist' qualified to advise on such subjects as light forest railways and tramways, sawmills and engines should be available. The Forest Department in this presidency would not in itself be able to keep such an officer fully employed. But full work for a man might be provided if other departments such as the Agricultural and Industries could find any use for such services. Failing that, we might have one for the whole Forest Department in India.

"As regards waterways there is an enormous development of transport available in the river system of the West Coast. For a short period of the year these rivers are already utilized for rafting or boating for forest and agricultural purposes. But owing to the fall of water after the rains the floating comes to a stop from January to June. This is frequently owing to a diffusion of the dry weather supply amongst a number of channels in the river bed. If the available water could be concentrated into one of these, the floating and rafting period would be considerably extended, whilst if an efficient system of submersible locks could be devised, they might very frequently continue all the year round. Here again we appear to be up against the same thing."

Mr. C. E. C. Fischer, Principal, Madras Forest College stated:—

"A much more detailed and precise knowledge of the distribution of commercially useful Forest trees and plants than is at present available is very necessary.

"There is already a forest museum at Coimbatore which should be further developed and partly re-arranged with a view to affording the fullest commercial and industrial information. The catalogue of museum should be readily available to all interested in forest products.

"There is urgent need for the creation of a research branch to the Madras Forest Service on the lines similar to those of the Forest Research Institute at Dehra Dun. The research officers could be attached most conveniently to the Madras Forest College at Coimbatore, where there is already a well found and developing forest museum and a large laboratory.

"The research officers I would recommend are:—

1. A forest economist.
2. A silviculturist.
3. A botanist (ecological).
4. A zoologist (mainly entomologist).
5. A chemist.
6. A commercial expert in charge of an information bureau.

"The existing research institute at Dehra Dun cannot cope with the demands of the whole of India; and if the interests of the Madras Presidency in this respect are not to be shelved for an indefinite period, a local research institute is imperative."

"The first three officers suggested in the last paragraph should be trained Foresters, as a knowledge of silviculture and experience of forest conditions is essential. These three posts must be provided for, therefore, by an increase in the cadre of the Forest Service.

"The zoologist and the Chemist should, I consider, be recruited by the direct appointment of experts in those sciences.

"The commercial expert should be primarily a business man with experience of business methods and requirements. He should maintain a close touch with the markets and with industrial concerns interested in the raw products of the forest.

"He would serve as intermediary between the research officers proper, especially the economist, and the manufacturers or consumers. It would be his province not only to make the results obtained by the research officers available to the business and industrial world, but to indicate to the former the direction in which further research is desirable and the form in which information is to be prepared.

"The whole institute must be under the President ship of a Forest Officer of experience, who will be in a position to co-ordinate and direct the efforts of all the specialists.

"The catalogues, and the periodical lists of additions, of all libraries from which books of reference may be borrowed should be furnished to all research institutes, and may also be made available to industrial concerns where possible.

"The forests require to be opened up by roads and modern means of mechanical transport.

"This has already been done in a few instances, e. g. the teak plantations of Nilambur. It would be possible, no doubt, to create other successful plantations; but they are apt to be very expensive and require additional establishment. Their justification lies in assured demand at remunerative prices. Plantations in selected localities of *Bombax malabaricum* for tea-boxes and packing cases might prove successful.

"The question of the deficiencies in forest transport has already met with official recognition; the slow progress is due to shortage of officers and the lack of funds. A more generous expenditure on well considered schemes would undoubtedly prove remunerative in a very short time. In addition I would recommend that suitable officers

should be encouraged to study what is being done in the direction in other parts of the world, either by being specially deputed or by financial assistance when on leave.

"This recommendation applies not only to the study of methods of transport but to all other branches of forest work.

"The loan of Government experts should be given to the full extent that circumstances permit. It would depend on the particular circumstances of the case whether the firms or companies should be called upon to pay for this expert assistance. For instance in the case of a new company starting a new industry the assistance might be given gratuitously, whereas a well established firm requiring advice could justifiably be called upon to contribute actual expenses and, in certain cases, an expert fee in addition.

"The procedure here again would depend on the circumstances of the particular case. Ordinarily Government should be at liberty to publish for the general good the results obtained by its experts. But this should not involve a betrayal of any trade secrets to the sole possession of which the firm concerned is genuinely entitled. I would have each case decided on its own merits.

"If Government supplies the raw material on favourable terms, e. g. wood or bamboo for wood pulp, there should be some official control or supervision to ensure that the business is being properly run. Otherwise there is the danger that the concession might be used merely to secure a monopoly, or else that the venture may turn out a failure through inefficient management, when it might have been a perfectly sound proposition if well directed.

"As far as industries dependent on the forests are concerned, and especially from the forest point of view, the organisation is practically non-existent. The most important work of the Forest Service is of a highly technical nature and a technically trained officer at the head is a very necessary step towards a better state of affairs. I understand that the necessity for a Chief Conservator for the Madras Presidency has been admitted, but that the actual creation of the post has been deferred owing to the war or for some other reason. I am of opinion that the post should be created forthwith. It is impossible for a layman to arrive at a correct view of technical questions. No untrained officer would be allowed to decide technical points in engineering; and there is no reason why forestry should be put on any other footing.

"The difficulty has been a want of knowledge as to where the particular scientific work required is to be found. If one is faced with the probability of having to address a number of libraries, possibly without success in the end, one is apt to do without.

"I have no technical knowledge of hydro-electric installations and cannot of course appreciate all the difficulties; but it seems to me that there are immense possibilities in this direction. There are numerous places in the hills of this Presidency where water could be used for developing power. I believe that there is no insuperable difficulty in conveying electric power over considerable distances; indeed this is already being done. If several large power stations were to be erected at suitable points, most of the industrial centres could be supplied. At present a very large quantity of wood fuel is consumed for industrial purposes; this results in high prices and even in shortage of fuel. I believe that this is actually the case in Madura. Electric power would set free, therefore, a large quantity of wood fuel for domestic purposes; and the price would fall automatically in consequence.

"The stems of the cotton plant, and possibly of some other crops, which form waste material at present, are very suitable for paper-making. Probably a considerable number of the woods for which at present no use can be found would be suitable for wood pulp."

**Key for the identification of the trees
and important shrubs and climbers to be met
with in and near the Madras Forest College
camps at Anaipadi and Setumadi in the South
Coimbatore Forest Division.**

As the descriptive list published in the last issue of this journal gave a very incomplete key, I have endeavoured to make the key a special feature of the present list, so as to enable the user to trace every plant included down to its specific rank.

Users are warned that there are great variations in most Indian plants and they should, therefore, be sure to obtain mature leaves and to examine a number of

specimens so as to arrive at a trustworthy impression of the normal and average shape and size of the parts; the key should not be used with a single leaf.

In order to make the key as complete as possible certain variable species have had to be entered more than once, at different places. As the key has been greatly enlarged, considerations of space have demanded that the descriptive portion should be almost entirely omitted.

A tract of evergreen forest (*Kariansholai*) falls within the area covered by the present list; and it is certain that a number of species occurring there have been omitted; only such plants as I have myself noted in the localities are included. Those species which have been seen by me only in the evergreen forest are distinguished by the letters E. F. placed after them.

Species that find place more than once in the list have been numbered once only and the information is entered once only, for the second and subsequent entries the user is referred back to the original entry by the serial number.

The numbers in brackets after headings in the key itself show the number in the list of the last species included in that class. For instance, under A trees after "1. L. alt." will be found the figure 68 in brackets. This signifies that the last species under the class with alternate leaves is No. 68 and that the class with opposite leaves begins with No. 69.

When the specific name adopted is not the same as that given in the "Flora of British India" the latter is entered within brackets.

I shall be very glad if any user of the key will write and let me know of any difficulty met with in its use or make suggestions for improvement.

The following abbreviations are employed :

ab.	=above	Lt.	=leaflet-s.
ac.	=acute	mar.	=margin
acm.	=acuminate	ner.	=nerves, nerved
alt.	=alternate	ob.	=obtuse
ap.	=apex	obg.	=oblong
ba.	=base	obv.	=obovate
bel.	=below	opp.	=opposite
cart.	=cartilaginous	orb.	=orbicular
cau.	=caudate	ov.	=ovate
com.	=compound	par.	=parallel
cor.	=coriaceous	pel.	=pellucid
cord.	=cordate	Pet.	=petiole-d
cre.	=crenate	Pin.	=pinna-e
c. w.	=cold weather	pint.	=pinnate
den.	=dentate	pr.	=pairs
dis.	=distichous	pub.	=pubescent
el.	=elliptic	pun.	=punctate
ent.	=entire	r.	=rains
Fl.	=flowers	Rch.	=rhachis
fol.	=foliate	rou.	=round-ed
Fr.	=fruit	Sc.	=scale
g. d.	=gland-dotted	sca.	=scabrous
gl.	=gland, glandular	ses.	=sessile
gla.	=glabrous	ser.	=serrate
ha.	=hairs, hairy	sim.	=simple.
h. w.	=hot weather	St.	=stipule, stipular
L.	=leaf, leaves	stel.	=stellate
lan.	=lanceolate	Tam.	=Tamil
lat.	=lateral	Ten.	=tendril
lo.	=lobed	tom.	=tomentum, tomentose

A. Trees. (125).

I. L. sim. or 1-fol (84).

I. L. alt. (68).

(i) Juice milky (15).

& Thorny.

(a) L. large persistent.

1. Euphorbia Nivulia Ham. (Euphorbiaceæ) Tam: *Vellai-kalli*. Fl. c. w.; Fr. r.

(aa) L. very small, falling early.

(b) Joints of stem straight.

2. Euphorbia antiquorm Linn. (Euphorbiaceæ) Tam: *Thiruga-kalli*. Fl. c. w.; Fr. h. w.

(bb) Joints of stem spirally twisted.

3. Euphorbia tortilis Rottl. (Euphorbiaceæ) Tam: *Thiruga-kalli*. Fl. c. w.; Fr. h. w.

&&. Not thorny (15).

(a) L. very small, falling early.

4. Euphorbia Tirucalli Linn. (Euphorbiaceæ) Tam: *Pachchan-kalli*. Fl. c. w. Fr. h. w.

(aa) L. obvious, persistent.

(b) L. hispid or sca.

(c) L. under 4" long, not 3-5 ner. at ba.

5. Streblus asper Lour. (Urticaceæ) Fl. Feb.; Fr. h. w.

(cc) L. over 4" long, 3-5 ner. at ba.

6. Ficus hispida Linn. f. (Urticaceæ) Fl. Feb:—May; Fr. April-June.

(bb) L. not hispid or sca. (15).

(c) Aerial roots present. (10).

(d) L. rusty-grey tom. bel. when mature.

7. Ficus tomentosa Roxb. (Urticaceæ) Tam: *Ton-ichchi*. Fl. May-June; Fr. r.

- (dd) L. gla. bel. when mature.
 (e) L. pel.-pun.
8. *Ficus Arnotiana* Miq. (Urticaceæ) Fl. c. w.; Fr. h. w.
- (ee) L. not pel.-pun.
 (f) Lat. ner. 5-8 pr.
9. *Ficus bengalensis* Linn. (Urticaceæ) Tam : *Ala*. Fl. May; Fr. May-June.
- (ff) Lat. ner. 10-13 pr.
10. *Ficus mysorensis* Heyne. (Urticaceæ).
- (cc) Aerial roots absent. (15).
 (d) Ap. of L. cau. acm.
11. *Ficus religiosa* Linn. (Urticaceæ) Tam : *Arasu*. Fl. Dec.; Fr. h. w.
- (dd) Ap. of L. not cau. acm.
 (e) L. glossy ab.
 (f) Ner. very numerous, close.
12. *Ficus Benamina* Linn. (Urticaceæ) Fl. May-June; Fr. r.
- (ff) Ner. 7-8 pr., not close.
13. *Artocarpus integrifolia* Linn. (Urticaceæ) Tam : *Panasa*. Fl. May-July; Fr. c. w.
- (ee) L. not glossy ab.
 (f) L. 3-ner. at ba., lat. veins 4-6 pr.
14. *Ficus glomerata* Roxb. (Urticaceæ) Tam : *Athi*. Fl. and Fr. c. w.
- (ff) L. not 3-ner. at ba., lat. veins 10-14 pr.
15. *Bassia latifolia* Roxb. (Sapotaceæ) Tam : *Iluppai*. Fl. h. w.; Fr. r.

- (ii) Juice watery (68).
 & Thorny (21).
 (a) L. g. d.
16. *Atalantia monophylla* Corr. (Rutaceæ) Tam : *Elumichai*. Fl. h. w.; Fr. r.
- (aa) L. not g. d.
 (b) L. white or yellow. tom. bel.
17. *Zizyphus xylopyra* Willd. (Rhamnaceæ) Tam : *Mulkottai*. Fl. r.; Fr. c. w.
- (bb) L. not white or yellow tom. bel.
 (c) Ner. conspicuously prominent & straight.
18. *Bridelia retusa* Spreng. (Euphorbiaceæ) Tam : *Mulluvengai*. Fl. r.; Fr. c. w.
- (cc) Ner. not conspicuously prominent & straight.
 (d) L. not much longer than broad.
19. *Capparis grandis* Linn. (Capparidaceæ) Fl. h. w.; Fr. r.
- (dd) L. at least twice as long as broad.
 (e) Branches spinous, L. 3-ner. at ba.
20. *Alangium Lamarckii* Thw. (Cornaceæ) Tam : *Alinji*. Fl. Dec:-Feb.; Fr. h. w.
- (ee) Trunk thorny, L. not 3-ner. at ba.
21. *Diospyros montana* Roxb (Ebenaceæ) Tam : *Vakkanai*. Fl. h. w.; Fr. r.
- &&. Not thorny (68).
 (a) L. peltate.
 (b) L. g. d. bel.
22. *Macaranga tomentosa* Wight. (Euphorbiaceæ).
- (bb) L. not g. d. bel.
23. *Pterospermum Heyneanum* Wall. (Sterculiaceæ) E. F.

- (aa) L. not peltate (68).
- (b) L. not lo. (63).
- (c) L. cre. or ser. (38).
- (d) L. white, grey or ferruginous
pub. or tom. bel. (27).
- (e) L. sca. with white discs ab.
- 24. *Cordia fulvosa* Wight. (Boraginaceæ) Tam : *Naravuli*.
Fl. r. & c. w.; Fr. h. w. & r.
- (ee) L. not sca. ab.
- (f) Tom. stel.
- (g) L. membranous, Pet. 4-6".
- 25. *Givotia rottleriformis* Griff. (Euphorbiaceæ) Tam :
Vellaibuthalai. Fl. h. w., when leafless; Fr. c. w.
- (gg) L. hard, Pet. 1-1½".
- 26. *Cordia Wallichii* G. Don (Boraginaceæ) Fl. h. w.; Fr. r.
- (ff) Tom. not stel.
- (g) Ap. of L. rou.
- Zizyphus xylopyra* Willd. (Rhamnaceæ) see No. 17.
- (gg) Ap. of L. ac.
- 27. *Trema orientalis* Bl. (Urticaceæ) Fl. c. w.; Fr. h. w.
- (dd) L. not white, grey or ferru-
ginous bel. (38).
- (e) L. gla. (35).
- (f) L. over 12", ner. numerous par.
- 28. *Dillenia pentagyna* Roxb. (Dilleniaceæ) Tam : *Nai-tek*,
Ponnai. Fl. h. w. when leafless; Fr. r.
- (ff) L. under 12", ner. not conspicu-
ously par. (35).
- (g) L. 3-ner. at ba.
- (h) L. el., ob., serratures not sharp.
- 29. *Zizyphus trinervia* Roxb. (Rhamnaceæ) Tam :
Karakattan. Fl. May-June; Fr. r.

- (hh) L. lan., acm., serratures sharp.
- 30. *Grewia disperma* Rottl. (*G. laevigata* Vahl. Tiliaceæ)
Fl. r.; Fr. c. w.
- (gg) L. not 3-ner. at ba.
- (h) L. obv., ses. or sub-ses.
- 31. *Careya arborea* Roxb. (Myrtaceæ) Fl. Feb.; Fr.
h. w.
- (hh) L. not obv., Pet.
- (j) Bark very smooth, greenish-white.
- 32. *Terminalia Arjuna* Bedd. (Combretaceæ) Tam : *Vellai-*
marudu. Fl. h. w.; Fr. c. w.
- (jj) Bark not conspicuously smooth, dark.
- (k) Twigs gla.
- (l) L. pel. pun.
- 33. *Casearia graveolens* Dalz. (Samydaceæ) Tam : *Kallali-*
maram. Fl. h. w.; Fr. r
- (ll) L. not pel. pun.
- 34. *Eleodendron glaucum* Pers. (Celastraceæ) Tam : *Arali*.
Fl. & Fr. c. w.
- (kk) Twigs brown pub.
- 35. *Hydnocarpus Wightiana* Bl. (Bixaceæ) Tam : *Vetti-*
mara. E. F. Fl. h. w.; Fr. c. w.
- (ee) L. ha.
- (f) L. 6-ner. at ba.
- 36. *Grewia tilicefolia* Vahl. (Tiliaceæ) Tam : *Tadasal*.
Fl. March-July; new leaves April-May; Fr. r.
- (ff) L. not 6-ner. at ba.
- (g) L. orb., dotted with stel. ha. ab.
- 37. *Erioloena quinquelocularis* Wight. (Sterculiaceæ) Tam :
Malamtuthi. Fl. r.; Fr. c. w.

- (gg) L. broadly ov.; gla. ab.
38. *Tetrameles nudiflora* Br. (Datiscaceæ) Tam: *Chini*.
E. F.
- (cc) L. ent. (63).
(d) L. with Sc. bel.
(e) L. 3-ner. at ba.
(f) Sc. silvery.
39. *Croton malabaricus* Bedd. (Euphorbiaceæ) E. F.
- (ff) Sc. scarlet.
40. *Mallotus philippinensis* Muell.-Arg. (Euphorbiaceæ)
Fl. c. w.; Fr. h. w.
- (ee) L. not 3-ner. at ba.
41. *Cullenia excelsa* Wight. (Malvaceæ) Tam: *Karanai*.
E. F. Fl. Feb:-April; Fr. Nov:-Jan:.
- (dd) L. without Sc. bel. (63).
(e) L. pub. or tom. at least bel. (48).
(f) Ner. prominent & straight.
Bridelia retusa Spreng. see No. 18.
- (ff) Ner. not conspicuously straight.
(g) L. cor. & hard (46).
(h) L. ashy or buff bel.
(j) Tom. not stel., mar. of L. cart.
42. *Semecarpus Anacardium* Linn. f. (Anacardiaceæ)
Tam: *Sheru*. Fl. r.; Fr. c. w.
- (jj) Tom. stel., mar. of L. not cart.
Cordia Wallichii G. Don see No. 26.
- (hh) L. neither ashy or buff bel.
(j) L. without gl.
(k) Young parts silky.
43. *Buchanania latifolia* Roxb. (Anacardiaceæ) Tam:
Morai-maram, *Manisheru*. Fl. r.; Fr. c. w.

- (kk) Young parts grey or tawny tom.
44. *Diospyros melanoxylon* Roxb. (Ebenaceæ) Fl. h. w.;
Fr. c. w.
- (jj) L. with 2 gl. bel. close to ap. of pet.
(k) L. ob. at ap., bark deeply cracked,
resembling crocodile hide.
45. *Terminalia tomentosa* W. & A. (Combretaceæ) Tam:
Karamarudu. Fl. June-July; Fr. c. w.; new leaves
in March.
- (kk) L. ac. at ap., bark not resembling
crocodile hide.
46. *Terminalia paniculata* Roth. (Combretaceæ) Tam:
Pillamarudu. Fl. r.; Fr. c. w. & on to h. w.
- (gg) L. not cor. & hard.
(h) L. 3-ner. at ba.
Alangium Lamarckii Thw. see No. 20.
- (hh) L. not 3-ner. at ba.
(j) L. broad el. or orb.
47. *Antidesma Ghæsembilla* Gaertn. (Euphorbiaceæ) Tam:
Pulian-chedi. Fl. h. w.; Fr. r.
- (jj) L. lan.
48. *Unona pannosa* Dalz. (Anonaceæ) E. F. Fl. h. w.
- (ee) L. gla.
(f) L. under 1" long, close set.
49. *Phyllanthus Emblica* Linn. (Euphorbiaceæ) Tam:
Nelli. Fl. h. w.; Fr. r. & c. w.
- (ff) L. over 1" long, not close
set. (63).
(g) Bark very smooth.
(h) L. 3-ner. at ba.
50. *Gyrocarpus americanus* Jacq. (Combretaceæ) Tam:
Thanaku. Fl. Feb.; Fr. June; new L. May-June.

- (hh) L. not 3-ner. at ba.
 (j) Bark greenish-white, veins pel.
Terminalia Arjuna W. & A. see No. 32.
- (jj) Bark white or yellow with lighter patches, veins not pel.
51. *Anogeissus latifolia* Wall. (Combretaceæ) Tam: *Vekkali*. Fl. Sept:-Oct; Fr. c. w.; new L. May.
- (gg) Bark not conspicuously smooth. (63).
- (h) Bark deeply cracked, resembling crocodile hide.
Terminalia tomentosa W. & A. see No. 45.
- (hh) Bark not resembling crocodile hide. (63).
- (j) Mar. of L. pel.
52. *Terminalia belerica* Roxb. (Combretaceæ) Tam: *Thani*. Fl. March-Sept; Fr. c. w.
- (jj) Mar. of L. not pel. (63).
- (k) L. pel. pun.
53. *Achroynchia laurifolia* Bl. (Rutaceæ). E. F. Fl. r.
- (kk) L. not pel. pun. (63).
- (l) L. narrow, smelling of turpentine.
54. *Mangifera indica* Linn. (Anacardiaceæ) Tam: *Ma-maram*. Fl. Jan; Fr. May.
- (ll) L. not narrow, not smelling of turpentine. (63).
- (m) L. dis.
- (n) Bark dark brown, cracked, St. not scarious.
55. *Cleistanthus collinus* Benth. (Euphorbiaceæ) Tam: *Oduvai*. Fl. Feb; Fr. June.

- (nn) Bark light coloured, not cracked, St. scarious.
56. *Holoptelia integrifolia* Planch. (Urticaceæ) Tam: *Aya*. Fl. Oct:-Nov; Fr. Feb.
- (mm) L. not dis. (63).
- (n) Young shoots & branchlets gla. (61).
- (p) Lat. ner. par.
- (q) Bark of branchlets pale brown.
57. *Shorea Talura* Roxb. (Dipterocarpaceæ) Fl. Feb:-March; Fr. May-June.
- (qq) Bark of branchlets reddish-brown.
58. *Hopea parviflora* Bedd. (Dipterocarpaceæ) Fl. Feb:-March; Fr. May-June.
- (pp) Lat. ner. not par.
- (q) Tree of evergreen forest.
59. *Dimorphocalyx Lawianus* Hook. f. (Euphorbiaceæ) E. F. Fl. h. w.; Fr. r.
- (qq) Trees of deciduous forest.
- (r) L. distinctly Pet.
60. *Elaeodendron glaucum* Pers. (Celastraceæ) Tam: *Arali*. Fl. & Fr. c. w.,
- (rr) L. subses.
61. *Antidesma diandrum* Roth. (Euphorbiaceæ) Tam: *Katu-puli*. Fl. r.; Fr. c. w.,
- (nn) Young shoots & branchlets not gla.
- (p) L. very little longer than broad.
Capparis grandis Linn. see No. 19.
- (pp) L. at least twice as long as broad.
- (q) Trees of evergreen forest.
- (r) Shoots brown pub.
Hydnocarpus Wightiana Bl. see No. 35.

- (rr) Shoots velvety.
62. *Antidesma Menasu* Miq. (Euphorbiaceæ) Fl. April-May; Fr. May-June.
- (qq) Trees of deciduous forest.
- (r) Shoots rufous tom.
63. *Polyalthia cerasoides* Hook. f. (Anonaceæ) Tam: *Nullilai*. Fl. May-June; Fr. r.
- (rr) Shoots not rufous tom.
- Diospyros montana* Roxb. see No. 21.
- (bb) L. lo. (68).
- (c) L. 2-lo.
- (d) L. lo. $\frac{1}{2}$ way down.
64. *Bauhinia racemosa* Lam. (Leguminosæ) Tam: *Atti*. Fl. h. w.; Fr. c. w.
- (dd) L. lo. $\frac{1}{2}$ way down.
65. *Bauhinia malabarica* Roxb. (Leguminosæ) Tam: *Atti*. Fl. r.; Fr. c. w.
- (cc) L. with more than 2 lo.
- (d) L. 3-ner. at ba.
- Gyrocarpus americanus* Jacq. see No. 50.
- (dd) L. with more than 3 ner. at ba.
- (e) L. ashy tom. bel.
66. *Cochlospermum gossypium* DC. (Bixaceæ) Tam: *Kudraipuduku-mara*, *Katiolaga*. Fl. Dec:-May, when leafless; Fr. h. w. & r.
- (ee) L. velvety bel., not ashy.
- (f) Mar. of lo. of L. ent.
67. *Sterculia urens* Roxb. (Sterculiaceæ) Tam: *Shen-thanaku*. Fl. c. w.; leafless Dec:-Feb.; Fr. h. w.
- (ff) Mar. of lo. of L. den. or lobulate.
68. *Sterculia villosa* Roxb. (Sterculiaceæ) Tam: *Vakkai-mara*. Fl. c. w.; Fr. h. w.

2. L. opp. or whorled. (84).
- (i) St. interpetiolar. (73).
- &. Thorny.
69. *Randia uliginosa* Dc. (Rubiaceæ) Tam: *Malainochi*. Fl. r.; Fr. c. w.
- &&. Not thorny.
- (a) L. gla.
- (b) L. shining, St. connate, green.
70. *Morinda citrifolia* Linn. (Rubiaceæ) Tam: *Sayai-maram*, Fl. h. w. & r.; Fr. c. w.
- (bb) L. not shining, St. not connate, red:
71. *Stephegyne parvifolia* Korth. (Rubiaceæ) Tam: *Nir-kadambai*, Fl. May-June; Fr. r.
- (aa) L. pub. at least bel.
- (b) L. orb., ba. cord.
72. *Adina cordifolia* Hook. f. (Rubiaceæ) Tam: *Manja-kadambai*. Fl. Oct:-Nov:
- (bb) L. ov., narrowed into the Pet.
73. *Hymenodyction excelsum* Wall. (Rubiaceæ) Tam: *Perunjoli*. Fl. r.; Fr. c. w.
- (ii) St. not interpetiolar. (84).
- &. L. ha. (77).
- (a) Juice milky.
- Ficus hispida* Linn. see No. 6.
- (aa) Juice watery.
- (b) L. over 12" long.
74. *Tectona grandis* Linn. (Verbenaceæ) Tam: *Teku*. Fl. July-Aug.; Fr. Dec:-Jan.; leafless March-April.
- (bb) L. not more than 10" long.
- (c) Bark smooth, white or pinkish, peeling in thin strips.

75. *Lagerstroemia lanceolata* Wall. (Lythraceæ) Tam: *Ventek*. Fl. r.; Fr. cw.

(cc) Bark not conspicuously smooth or light coloured, not peeling in strips.

(d) L. gl. at insertion of Pet.

76. *Gmelina arborea* Linn. (Verbenaceæ) Tam: *Kumili*. Fl. h. w.; Fr. April-June.

(dd) L. nct gl. at insertion of Pet.

77. *Premna tomentosa* Wild. (Verbenaceæ) Tam: *Kolkattaiteku*. Fl. h. w.; Fr. r.

&& L. gla. (84).

(a) L. pel. pun.

(b) Ner. uniting in an intramarginal vein.

78. *Eugenia Jambolana* Lam. (Myrtaceæ) Tam: *Nagamaram*. Fl. h. w.; Fr. r.

(bb) Ner not united by an intramarginal vein.

Achronychia laurifolia Bl. see No. 53.

(aa) L. not pel. pun. (84).

(b) Juice milky.

(c) L. whorled, main ner. numerous, par.

79. *Alstonia scholaris* R. Br. (Apocynaceæ).

(cc) L. opp., main ner. 6-12 pr., not par.

80. *Wrightia tinctoria* R. Br. (Apocynaceæ) Tam: *Palai*. Fl. June; Fr. c. w.

(bb) Juice watery. (84).

(c) L. apparently 3-5 ner. at ba.

(d) Bark grey, not cracked, L. distinctly Pet.

81. *Strychnos nux-vomica* Linn. (Loganiaceæ) Tam: *Etti-maram*. Fl. March-April Fr. May-July.

(dd) Bark black, cracked, scaly, L. nearly ses.

82. *Strychnos potatorum* Linn. f. (Loganiaceæ) Tam: *Teta-maram*. Fl. & Fr. May-June.

(cc) L. not apparently 3-5 ner. at ba.

(d) Tree of evergreen forest, Ner. of L.

close, numerous.

83. *Mesua ferrea* Linn. (Guttiferæ) Tam: *Suruli*. Fl. April-May; Fr. Oct-Dec:

(dd) Trees of deciduous forest, Ner. of L. neither close nor numerous.

(e) L. somewhat fleshy, tasting of mustard.

84. *Salvadora persica* Linn. (Salvadoraceæ) Tam: *Kunni*. Fl. Feb:-March: Fr. March-April.

(ee) L. cor. stiff, not tasting of mustard. *Elaeodendron glaucum* Pers. see No. 60.

II. L. com. (125).

1. L. alt. (120).

(i) L. digitate.

& Lt. petioluled, Fl. scarlet.

85. *Bombax malabaricum* DC. (Malvaceæ) Tam: *Olaga*, *Yeluvai*. Fl. h. w. when leafless; Fr. June-July.

&& Lt. sessile, Fl. white.

86. *Bombax insigne* Wall. (Malvaceæ) Tam: *Kal-yeluvai*. Fl. Oct:-Jan: when leafless; Fr. May.

(ii) L. 3-fol. (90).

& Thorny, Lt. under 2" long.

87. *Rhus mysorensis* Heyne (Anacardiaceæ) Tam: *Mulluvadathi*. Fl. h. w.; Fr. r.

&&. Not thorny, Lt. over 2"
long.

(a) Lt. silky bel.

88. *Butea frondosa* Roxb. (Leguminosæ) Tam: *Porasu*.
Fl. March with new leaves; Fr. r.

(aa) Lt. gla. bel.

(b) Lt. ent.

89. *Crataeva religiosa* Forst. (Capparidaceæ) Tam: *Mavali*.
Fl. h. w.; Fr. r.

(bb) Lt. cre.

90. *Bischoffia javanica* Bl. (Euphorbiaceæ) E. F.

(iii) L. pint. (110).
&. Thorny.

(a) Lt. 16 or more Pet. &
Rch. terete.

91. *Zanthoxylum Rhetsa* DC. (Rutaceæ) E. F.

(aa) Lt. not more than 9, Pet.
& Rch. flat or winged.

(b) Pet. & Rch. jointed, L. smell-
ing of limes.

92. *Limonia crenulata* Roxb. (L. acidissima Linn.
Rutaceæ) Tam: *Billuva-mara*. Fl. h. w.; Fr. r.

(bb) Pet. & Rch. not jointed, L.
smelling of aniseed.

93. *Feronia Elephantum* Corr. (Rutaceæ) Tam: *Villan-
maram*. Fl. h. w.; Fr. r.

&&. Not thorny. (110).

(a) L. g. d.

94. *Chloroxylon Swietenia* DC. (Rutaceæ) Tam: *Porasan*.
Fl. Jan:-Feb.; Fr. h. w.

(aa) L. not g. d. (110).

(b) Mar. of Lt. not ent.

(c) Petiolules very short.

(d) Lt. ov.-lan., cre.

95. *Garuga pinnata* Roxb.

(dd) L. falcate-lan., ser.

96. *Azadirachta indica* A. Juss. (Melia *Azadirachta* Linn.
Meliaceæ) Tam: *Veppam*. Fl. h. w.; Fr. r.

(cc) Petiolules distinct, $\frac{3}{4}$ -2" long.

97. *Ailanthus excelsa* Roxb. (Simarubaceæ) Tam: *Pi-
maram*. Fl. c. w.; Fr. h. w.

(bb) Mar. of Lt. ent. (110).

(c) L. paripint. (102).

(d) Lt. 20 or more.

98. *Tamarindus indica* Linn. (Leguminosæ) Tam: *Puli*.
Fl. April-June; Fr. Jan:-March.

(dd) Lt. fewer than 20.

(e) Lt. pub. bel.

99. *Sapindus laurifolius* Vahl. (Sapindaceæ) Tam: *Puchi-
kottai*. Fl. Dec.; Fr. h. w. & r.

(ee) Lt. gla.

(f) Lat. Lt. alt.

100. *Harpullia imbricata* Thw. (Sapindaceæ) E. F. Tam:
Uchal. Fl. c. w.; Fr. h. w.

(ff) Lat. Lt. opp.

(g) Lt. 4-8 pr., equal, ac.

101. *Cassia Fistula* Linn. (Leguminosæ) Tam: *Konnai*.
Fl. h. w.; leafless March-April; Fr. Sept:-March.

(gg) Lt. 3 pr., smaller at ba. of L. than at ap.,
ob.

102. *Schleichera trijuga* Willd. (Sapindaceæ) Tam: *Puvam*.
Fl. March; Fr. May.

- (cc) L. imparipint. (110).
 (d) Main ner. numerous, close prominent:
 (e) Lt. aem, main ner. united by a strong intramarginal one.
103. *Spondias mangifera* Willd. (Anacardiaceæ) E. F.
 (ee) Lt. ob., main ner. not united.
104. *Pterocarpus Marsupium* Roxb. (Leguminosæ) Tam: *Vengai*. Fl. r.; Fr. c. w.
 (dd) Main ner. not numerous, close or prominent. (110).
 (e) Lt. puberulous bel.
105. *Dalbergia lanceolaria* Linn. f. (Leguminosæ) Tam: *Pachchalan*. Fl. r.; Fr. c. w.
 (ee) Lt. gla. bel. (110).
 (f) Lat. Lt. opp.
 (g) L. crowded at end of branches, Lt. 7-11, petiolules under $\frac{1}{4}$ ".
106. *Odina Wodier* Roxb. (Anacardiaceæ) Tam: *Udiya*. Fl. May; new L. May June; Fr. r.
 (gg) L. not crowded at end of branches, L. 5-9, generally 5, petiolules $\frac{1}{4}$ " or more.
107. *Pongamia glabra* Vent. (Leguminosæ) Tam: *Pungam*. Fl. c. w.; Fr. r.
 (ff) Lat. Lt. alt.
 (g) Lt. not more than 1" long.
108. *Dalbergia paniculata* Roxb. (Leguminosæ) Tam: *Pachchalan*. Fl. May-June; Fr. c. w.
 (gg) Lt. more than 1" long.
 (h) Lt. ob. or emarginate, end one largest.
109. *Dalbergia latifolia* Roxb. (Leguminosæ) Tam: *Iti*. Fl. r.; new L. May; Fr. c. w.

- (hh) Lt. tapering to both ends, all more or less equal.
110. *Dalbergia sissoides* Grah. (Leguminosæ) Tam: *Iti*. Fl. r.; Fr. c. w.
 (iv) L. 2-or 3-pint. (120).
 &. Thorny. (114).
 (a) Bark light-coloured.
 (b) Bark yellowish, Lt. less than 30 pr., ob.
111. *Acacia leucophloea* Willd. (Leguminosæ) Tam: *Velvelam*. Fl. r.; Fr. c. w.
 (bb) Bark white or light brown, peeling in thin papery flakes, Lt. more than 30 pr., ac.
112. *Acacia Suma* Buch-Ham. (Leguminosæ) Tam: *Odula*. Fl. r.; Fr. c. w.
 (aa) Bark dark-coloured.
 (b) Thorns straight, Fl. in heads, pod moniliform.
113. *Acacia arabica* Willd. (Leguminosæ) Tam: *Karuvellam*. Fl. r.; Fr. c. w.
 (bb) Thorns hooked, Fl. in spikes, pod straight.
114. *Acacia ferruginea* DC. (Leguminosæ) Tam: *Parambai*. Fl. r.; Fr. c. w.
 &&. Not Thorny. (120).
 (a) Rach. & rachides of L. articulated.
115. *Moringa pterygosperma* Gaertn. (Moringaceæ) Tam: *Muringai*. Fl. c. w., Fr. h. w.

- (aa) Rach. & rhachides of L. not articulated.
- (b) L. without gl.
116. *Melia dubia* Cav. (Meliaceæ) Tam: *Malai-rembu*. Fl. c. w.; Fr. r. & c. w.
- (bb) L. with gl. on Rach. (120).
- (c) Pet. without gl.
117. *Xylia dolabriformis* Benth. (Leguminosæ) Tam: *Iral*. Fl. July; leafless March; Fr. c. w.
- (cc) Pet. furnished with a gl.
- (d) Pin. 6 or more pr., Lt. less than $\frac{1}{4}$ " broad.
118. *Albizzia amara* Boiv. (Leguminosæ) Tam: *Unjal*. Fl. Dec:-Feb.; Fr. Oct:-Dec:.
- (dd) Pin. 4 pr. or less, Lt. over $\frac{1}{4}$ " broad.
- (e) Lt. 5-9 pr., over 1" long.
119. *Albizzia Lebbek* Benth. (Leguminosæ) Tam: *Vaghai*. Fl. h. w.; Fr. c. w.
- (ee) Lt. 10-20 pr., under 1" long.
120. *Albizzia odoratissima* Benth. (Leguminosæ) Tam: *Siru-raghai*. Fl. h. w.; Fr. c. w.
2. L. opp. (125).
- (i) L. 3-or 5-fol.
121. *Vitex altissima* Linn. (Verbenaceæ) Tam: *Mailadi*. Fl. May; Fr. r.
- Do. var: *alata* Pet. with a broad wing, wider at ba.
- (ii) L. 1-pint.
- &. Lt. cau.-acm., main ner. 8-10. pr.
122. *Stereospermum chelonoides* DC. (Bignoniaceæ) Tam: *Pathiri*. Fl. April-June; Fr. Nov:-Dec:-

- &&. Lt. not cau.-acm., main ner. 4-6 pr.
123. *Dolichandrone crispa* Seem. (Bignoniaceæ) Tam: *Chaklati-pathri*. Fl. c. w.; Fr. h. w.
- (iii) L. 2-or 3-pint.
- &. L. usually 2-pint., Lt. lan., Fl. white Fr. long, cylindric, with hard warts.
124. *Stereospermum xylocarpum* Benth. & Hook. f. (Bignoniaceæ) Tam: *Vedangkurunai*. Fl. April-May; Fr. c. w. & h. w.
- &&. L. usually 3-pint., Fl. dark-purple, Fr. long, flat, broad, smooth.
125. *Oroxylum indicum* Vent. (Bignoniaceæ) Tam: *Valaingi*.
- B. Shrubs & undershrubs (163),**
- I. L. sim. (149).
1. L. alt. (140).
- (i) Thorny. (129).
- &. L. very small, stem flattened, green.
126. *Opuntia Dillenii* Haw. (Cactaceæ) Tam: *Sapathkalli*. Fl. & Fr. whole year.
- &&. L. large, stem not flattened.
- (a) L. gla.
- (b) Spines bearing L., L. tapering to Pet.
127. *Gymnosporia montana* Benth. (Celastraceæ) Fl. Dec:; Fr. h. w.

- (bb) Spines not bearing L., L. rou.
at ba.
128. *Ximenia americana* Linn. (Olacaceæ) Tam: *Shembulinchan*. Fl. c. w.; Fr. r.
- (aa) L. stel. ha.
129. *Solanum indicum* Linn. Fl. & Fr. Sept:-Dec:.
- (ii) Not thorny (140).
& Juice milky.
130. *Excaecaria robusta* Hook. f. (Euphorbiaceæ) E. F.
Tam: *Sholai-shevu*. Fl. May-June; Fr. r.
- && Juice watery (140).
- (a) L. g. d.
131. *Embelia tsjeriam*-Cottam DC. (Myrsinaceæ) Fl. r.;
Fr. c. w.
- (aa) L. not g. d. (140).
- (b) L. ent.
- (c) L. under 2" long, no gl. on mid-
rib.
132. *Phyllanthus reticulatus* Poir. (Euphorbiaceæ) Fl. r.;
Fr. c. w.
- (cc) L. over 2" long, a gl. on midrib
bel.
133. *Hibiscus Lampas* Cav. (Thespesia Lampas D. & G.
Malvaceæ) Fl. r. & c. w.; Fr. c. w. & h. w.
- (bb) L. not ent. (140).
- (c) L. lo.
- (d) L. palmately lo.
- (e) L. 3-lo., tom. bel., a gl. on midrib
bel.
- Hibiscus Lampas* Cav. see No. 133.

- (ee) L. 5-7 lo., gla., no gl. on midrib.
134. *Jatropha curcas* Linn. (Euphorbiaceæ) Tam: *Katukottai*. Fl. May-June; Fr. c. w.
- (dd) L. lo. only near the ap.
135. *Grewia aspera* Roxb. (*G. abutifolia* Mast. Tiliaceæ)
Fl. r. & c. w.; Fr. c. w. & h. w.
- (cc) L. not lo. (140).
- (d) L. dis.
- (c) L. densely villous bel., 4-ner.
at ba.
136. *Grewia hirsuta* Vahl. (Tiliaceæ) Fl. r.; Fr. c. w.
- (ee) L. dotted with stel. ha. bel., 7-
ner. at ba.
137. *Helicteres Isora* Linn. (Sterculiaceæ) Tam: *Valamburi*. Fl. r. & c. w.; Fr. h. w.
- (dd) L. not dis. (140).
- (e) L. under 2" long, gla. or nearly so.
138. *Grewia betuliaefolia* A. Juss. (*G. populifolia* Vahl.
Tiliaceæ). Fl. Nov:-July; Fr. r.
- (ee) L. over 2" long, distinctly ha. or
tom.
- (f) L. 3-ner. at ba., gla. bel.
139. *Grewia orientalis* Linn. (*G. columnaris* Sm. Tiliaceæ)
Tam: *Sullai*. Fl. Jan:-Sept.; Fr. r. & c. w.
- (ff) L. 5-ner. at ba., not gla. bel.
- (g) L. sca. ab., stel. ha. bel.
- Grewia aspera* Roxb. see No 135.
- (gg) L. velvety ab., grey tom. bel.
140. *Grewia rotundifolia* Juss. (*G. orbiculata* Rottl.
Tiliaceæ) Tam: *Kuppumani-thalai*. Fl. Dec:-July;
Fr. r.

2. L. opp. or whorled
(149).
- (i) Thorny.
&. Thorns straight, $\frac{1}{2}$ - $1\frac{1}{2}$ " long.
141. *Randia dumetorum* Lam. (Rubiaceæ) Tam: *Karai*.
Fl. May-Nov.; Fr. Nov:-Dec:
- &&. Thorns recurved, under
 $\frac{1}{2}$ " long.
142. *Lantana Camara* Linn. (Verbenaceæ) Fl. & Fr. r.
& c. w.
- (ii) Not thorny (149).
&. St. interpetiolar.
- (a) L. gla.
143. *Pavetta indica* Linn. (Rubiaceæ) Tam: *Pavattai*.
Fl. h. w.; Fr. r.
- (aa) L. tom.
- Pavetta indica* Linn. var: *tomentosa* Hook. f. Fl.
h. w.; Fr. r.
- &&. St. not interpetiolar. (149)
- (a) Juice milky.
- (b) Shrub of evergreen forest, Pet.
 $\frac{1}{4}$ " long.
- Excaecaria robusta* Hook. f. see No. 130.
- (bb) Shrubs of deciduous forest,
L. ses. or sub-ses.
- (c) L. white cottony or wooly pub.
144. *Calotropis gigantea* R. Br. (Asclepiadaceæ) Tam:
Erakalli. Fl. & Fr. throughout the year.
- (cc) L. not white pub.
145. *Holarrhæna antidysenterica* Wall. (Apocynaceæ) Fl.
April-July; Fr. Sept:-Oct:.

- (aa) Juice watery.
- (b) Shrubs of evergreen forest.
- (c) L. gla.
146. *Strobilanthes barbatus* Nees. (Acanthaceæ) E. F. Fl.
& Fr. r. & c. w.
- (cc) L. ha.
147. *Strobilanthes Heyneanus* Nees. (Acanthaceæ) E. F.
Fl. & Fr. r. & c. w.
- (bb) Shrubs of deciduous forest.
- (c) Small shrub, L. sharply ser.
148. *Clerodendron serratum* Spreng. (Verbenaceæ) Fl. r.
& c. w.; Fr. c. w.
- (cc) Large (subscandent) shrub, L. ent.
or nearly so.
149. *Premna Wightiana* Schauer. (Verbenaceæ) Fl. July.
- II. L. com. (163).
1. L. 3-fol. (154).
- (i) Large shrub, Lt. ser.
150. *Allophilus Cobbe* Bl. (Sapindaceæ) Tam: *Perrakudi-*
kai. Fl. & Fr. r. & c. w.
- (ii) Under shrub, Lt. ent.
(154).
- &. Lat. Lt. under 1" long.
151. *Desmodium gyrans* DC. (Leguminosæ) Fl. & Fr.
Aug:-Feb:.
- &&. Lat. Lt. over 1" long.
- (a) Branchlets triquetrous.
152. *Desmodium Cephalotes* Wall. (Leguminosæ) Fl.
Oct:-Dec:; Fr. Dec:-Feb:.
- (aa) Branchlets terete or slightly
angled.

- (b) Pet. under $\frac{3}{4}$ " long, Lt. cor.; bracts, com., concealing the inflorescence.
153. *Desmodium pulchellum* Benth. (Leguminosæ) Fl. Dec:-Jan: Fr. Jan:-March.
- (bb) Pet. 1" long or more, Lt. membranous, bracts sim., not concealing the flowers.
154. *Desmodium laxiflorum* DC. (Leguminosæ) Fl. & Fr. r. & c. w.
2. L. once pint. (160).
- (i) L. paripint.
- &. Stem stout, single, crowned by the L., L. 3-9 feet long, Lt. linear, 10-12".
155. *Cycas circinalis* Linn. (Cycadaceæ) Tam: *Pai-ithu*. Fl. h. w.; Fr. r. & c.
- &&. Stem branched, L. under 2 feet long, Lt. under 6".
- (a) Lt. linear-obg., under 1" long.
156. *Sesbania aculeata* Poir. (Leguminosæ) Tam: *Daincha*. Fl. c. w.; Fr. h. w.
- (aa) Lt. ov. or ov.-lan., over 1' long.
157. *Cipadessa baccifera* Miq. (C. fruticosa Bl. Meliaceæ) Fl. h. w. & r.; Fr. r. & c. w.
- (ii) L. imparipint.
- &. Lt. g. d.
158. *Murraya Koenigii* Spreng. (Rutaceæ) Tam: *Kari-veppam*. Fl. c. w.; Fr. h. w.
- &&. Lt. not g. d.

- (a) Lt. ent., under $1\frac{1}{2}$ " long, whole plant seldom over 2' high.
159. *Tephrosia purpurea* Pers. (Leguminosæ) Tam: *Kolinji* Fl. & Fr. all the year.
- (aa) Lt. ser., over $1\frac{1}{2}$ " long, plant usually over 4' high.
- (b) Small shrub, hardly woody, Lt. 5-7, not g. d.
160. *Leea aspera* Edgew. (Vitaceæ) Fl. r. & c. w.; Fr. c. w.
- (bb) Large woody shrub, Lt. 9-13, g. d.
- Cipadessa baccifera* Miq. see No. 157.
3. L. 2-or 3-pint.
- (i) Thorny, Lt. minute, ses.
161. *Dichrostachys cinerea* W. & A. (Leguminosæ) Tam: *Vadathalai*. Fl. r.; Fr. c. w.
- (ii) Not thorny, Lt. large, not ses.
- &. Lt. gla. bel.
162. *Leea sambucina* Willd. (Vitaceæ) Fl. April-July; Fr. c. w.
- &&. Lt. pub. or bristly bel.
- (a) Lt. gla. ab., bristly bel., ner. 12-18 per.
- Leea aspera* Edgew. see No. 160.
- (aa) Lt. bristly ab. & bel., ner. 7-12 pr.
163. *Leea setuligera* C. B. Clarke (Vitaceæ) Fl. r. & c. w.; Fr. c. w.
- C. Bamboos.
- I. Thorny.
164. *Bambusa arundinacea* Willd. (Graminaceæ) Tam: *Mullu-mungil*. Fl. Feb:-March; Fr. March-May.

II. Not thorny.

1. L. under 2" wide,
culm-walls thick.

165. *Dendrocalamus strictus* Nees (Graminaceæ) Tam: *Kal-mungil*. Fl. Feb:-March; Fr. March-May.

2. L. 2" or more wide,
culm-walls thin.

166. *Ochlandra travancorica* Bedd. (Graminaceæ) Tam: *Odai*.

D. Climbers (207)

I. L. sim. (195).

1. L. alt. (187).

(i) Plants with Ten. (172).

&. Ap. of L. ending in a Ten.

167. *Gloriosa superba* Linn. (Liliaceæ) Tam: *Kannuvelli*.
Fl. r. & c. w.

&&. L. not ending in a Ten.
(187).

- (a) L. not lo., branchlets 5-6
angled.

168. *Vitis discolor* Dalz. (Vitaceæ) Fl. r.-Oct.; Fr. c. w.

- (aa) L. more or less palmately lo.,
branchlets terete.

- (b) Ten. sim., L. gl. pub. bel.

169. *Vitis Linnaei* Wall. (Vitaceæ) Fl. r.; Fr. c. w.

- (bb) Ten. divided, L. not gl.-pub. bel.

- (c) Stems covered with dense, easily
detachable, white or reddish tom.

170. *Vitis tomentosa* Heyne (Vitaceæ) Fl. May-June;
Fr. r.

(ec) Stems without dense tom.

- (d) L. subsca. with small Sc. ab. & on
ner. bel; male racemes with large
bracts.

171. *Trichosanthes palmata* Roxb. (Cucurbitaceæ) Fl.
Sept:-Jan;; Fr. h. w.

- (dd) L. gla. ab., pub. or sca. bel., male
racemes without bracts.

172. *Trichosanthes cucumerina* Linn. (Cucurbitaceæ) Fl.
Aug:-Dec;; Fr. c. w.

(ii) Ten. absent. (187).

&. Many hooked branchlets,
L. oblan.

173. *Ancistrocladus Heyneanus* Wall. (Ancistrocladaceæ)
E. F. Fl. h. w.

&&. No hooked branchlets,
L. not oblan. (187).

(a) Thorny (178).

- (b) L. minute, spinous, with
axillary cladodes.

174. *Asparagus racemosus* Willd (Liliaceæ) Fl. h. w.;
Fr. r.

- (bb) L. over 1" long, no cladodes.

- (c) L. ent.

- (d) Thorns St.

175. *Capparis horrida* Linn. f. (Capparidaceæ) Fl. c. w.;
Fr. h. w.

- (dd) Thorns not St.

176. *Cansjera Rheedii* Gmel. (Olacaceæ) Fl. r.; Fr. c. w.

- (cc) L. minutely denticulate.

- (d) L. dis., stem covered with woody
thorny bosses.

177. *Zizyphus Oenoplia* Thuill. (Rhamnaceæ) Tam: *Shingai*. Fl. r. & c. w.; Fr. Feb:-April.
(dd) L. not dis., stem without woody thorny bosses.
178. *Zizyphus rugosa* Willd. (Rhamnaceæ) Tam: *Kottai-maram*. Fl. h. w.; Fr. r.
(aa) Not thorny. (187).
(b) Stems angled & winged.
179. *Operculina Turpethum* S. Manso. (Ipomaea *Turpethum* Br. (Convolvulaceæ) Fl. c. w.; Fr. h. w.
(bb) Stems terete (187).
(c) L. gla. bel.
(d) L. cre.
180. *Celastrus paniculata* Willd. (Celastraceæ) Tam: *Manja-kodi*. Fl. h. w. Fr. r.
(dd) L. ent.
(e) Mar. of L. cart.
181. *Dioscorea oppositifolia* Linn. (Dioscoreaceæ) Fl. Oct:-Nov.:.
(ee) Mar. of L. not cart.
(f) L. glaucous, not pel. pun., ob.
182. *Maerua ovalifolia* Camb. (Capparidaceæ) Fl. Feb.; Fr. h. w.
(ff) L. shining, minutely pel. pun., acm.
Cansjhera Rheedii Gmel. see No. 176.
(cc) L. not gla. bel (187).
(d) L. hispid with appressed ha. ab.,
183. *Argyreia sericea* Dalz. (Convolvulaceæ) Fl. r.; Fr. o. w.
(dd) L. gla. or nearly so ab.
(e) Secondary ner. of L. par., at right angles to main ner.

184. *Bridelia stipularis* Bl. Fl. c. w.; Fr. h. w.
(ee) Secondary ner. of L. not par., not at right angles to main ner.
(f) L. orb., cord.
185. *Rivea hypocrateriformis* Chois. (Convolvulaceæ) Fl. Nov:-Jan.; Fr. Jan:-Feb.:.
(ff) L. not orb. or cord.
(g) L. white or yellow woolly or tom. bel. main ner. prominent bel.
186. *Lettsomia aggreata* Roxb. (Convolvulaceæ) Fl. Sept:-Dec.:.
(gg) L. ha. bel., main ner. slender.
187. *Lettsomia elliptica* Wight (Convolvulaceæ) Fl. Oct:-Dec:-
2. L. opp. (195).
(i) Juice watery (191).
&. Mar. of L. cart.
Dioscorea oppositifolia Linn. see No. 181.
&&. Mar. of L. not cart.
(a) L. not cord. at ba.
(b) L. tom. ab. rusty tom. & pitted. bel.
188. *Calycopteris floribunda* Lam. (Combretaceæ) Fl. Feb.; Fr. h. w.
(bb) L. gla. or nearly so, not pitted bel.
(c) L. el. or el-lan., main ner. 4-6 pr.
189. *Combretum ovalifolium* Roxb. (Combretaceæ) Fl. Feb:-March; Fr. May-June.

- (cc) L. ov-lan., ner. 7 pr.
190. *Jasminum trichotomum* Heyne (Oleaceæ) Fl. r.; Fr. r. & c. w.
- (aa) L. cord. at ba.
191. *Dioscorea bulbifera* Linn. (Dioscoreaceæ) Tam: *Pannu-kalangu*. Fl. c. w.
- (ii) Juice milky. (195).
& Young parts fulvous tom.
192. *Ichnocarpus frutescens* Ait. (Apocynaceæ) Fl. Dec:-April; Fr. r.
&& Young parts not fulvous tom.
- (a) L. pub. ab. & bel.
193. *Gymnema sylvestre* R. Br. (Asclepiadaceæ) Fl. Aug:-Dec.; Fr. Dec:-Jan.
(aa) L. gla. ab.
(b) Slender twiner, small subulate St. gl. present.
194. *Hemidesmus indicus* R. Br. (Asclepiadaceæ) Tam: *Nannari*. Fl. r. & c. w. Fr. c. w.
(bb) Woody twiner, no St. gl.
195. *Secamone elliptica* R. Br. (Asclepiadaceæ) Fl. r.; Fr. c. w.
- II. L. com. (207).
i. L. 3-fol. (200)
(i) Large climber, no thorns or prickles.
196. *Spatholobus Roxburghii* Benth. (Leguminosæ) Fl. r.; Fr. c. w.
(ii) Thorny or stems prickly, at least near the ba.

- & Lt. tom. ab., softly white tom. bel.
197. *Diocorea tomentosa* Heyne (Dioscoriaceæ) Tam: *Shaval-Kalangu*. Fl. Oct:.
- && Lt. gla. ab.
(a) Lt. ses, g. d.
198. *Toddalea aculeata* Lam. (Rutaceæ) Fl. & Fr. throughout the year.
(aa) Lt. petiolulate, not g. d.
(b) Pet. 4-8" long, prickly, Lt. 3.
199. *Dioscorea daemona* Roxb. (Dioscoreaceæ) Fl. July.
(bb) Pet. 1-1½" long, not prickly, Lt. usually 5.
200. *Dioscorea pentaphylla* Linn. (Dioscoriaceæ) Fl. Oct:.
2. L. once pint.
(i) Lt. alt.
201. *Dalbergia volubilis* Roxb. (Leguminosæ) Fl. March; Fr. April-May.
(ii) Lt. opp.
202. *Derris scandens* Benth. (Leguminosæ) Fl. Nov:; Fr. Jan:.
3. L. pedate, Ten. present.
203. *Vitis tenuifolia* W. & A. (Vitaceæ) Fl. r.
4. L. 2-pint., thorny.
(i) Pet. & Rch. furnished with gl. & Lt. 40-50 pr., ½" broad.
204. *Acacia pennata* Willd. (Leguminosæ) Tam: *Ingai*. Fl. r. & c. w.; Fr. c. w.
&& Lt. 10-25 pr. ⅓-¼" broad.
205. *Acacia Intsia* Willd. (Leguminosæ) Tam: *Ingai*. Fl. r. & c. w.; Fr. c. w.

- (ii) Pet. & Reb. without gl.
&. Young parts with stiff bristles
from gl. br., L. 1-2 feet long.
206. *Cæsalpinia mimosoides* Lam. (Leguminosæ) Tam:
Nariporandi-mulla. Fl. Nov:-Jan; Fr. Dec:-April.
- &&. Young parts not bristly, L.
under 9" long.
207. *Pterolobium indicum* A. Rich. (Leguminosæ) Tam:
Narimorandi. Fl. May-July; Fr. c. w.
C. Fischer.

**Contributions to the Gass Forest Museum,
from January to March, 1917.**

No.	Particulars.	Contributor.
1	Gum of <i>Euphorbia antiquorum</i>	A. M. C. Littlewood, Esq. D. F. O. Central Coim- batore, through R. O. Mettupalaiyam.
2	One large coil of cane	J. H. Longrigg, Esq., D. F. O., Mangalore.
3	Three bags of the liber of <i>Antiaris</i> <i>toxicaria</i>	Do.
4	126 botanical specimens	P. F. Fyson, Esq.
5	140 do. do.	C. E. C. Fischer, Esq.
6	12 different specimens of haustoria of <i>Ximenia Americana</i>	P. M. Lushington, Esq.
7	Abnormally developed Sandal inflorescence	Do.
8	Portion of a sandal free, distorted by a creeper	E. C. M. Mascarenhas, Esq., D. F. O. Salem.
9	4 specimens of fungi	C. E. C. Fischer, Esq.
10	A wasp hive	H. F. A. Wood, Esq.
11	6 photographs showing experi- ments in concentrated regene- ration at Mt. Stuart	Do.
12	One small dish and some fancy articles of clay	A. B. Myers, Esq.

Gazette Notifications.

December 19, 1916.

M. R. Ry., K. Gajaraja Mudaliyar, Extra Assistant Conservator of Forests, working under the District Forest Officer, Nellore, is posted to Western Circle to work under the District Forest Officer, Coimbatore South.

M. R. Ry., C. Shanker Singh B. A., (Honours) is appointed as Ranger, sixth grade, on probation for six months and is posted to East Cuddapah to work under the orders of the District Forest Officer from 1st November 1916.

M. R. Ry., T. Subbarayulu Nayudu, Ranger, second grade in charge of Kudligi Range, Bellary District will hand over charge to Harpanahalli Range Officer and proceed at once to take charge of Madanapalli Range, Chittoor District.

M. R. Ry., C. Rama Rao, Ranger sub-protem, fourth grade, incharge of Harpanahalli Range, Bellary District will relieve No. 1 at once and hold charge of Kudligi Range, in addition to his own until relief by Mr. J. A. Marter, Assistant Conservator of Forests.

M. R. Ry., K. V. Subba Rao, Ranger, third grade, Upper Gadavari, is granted leave on Medical Certificate for three months with effect from 26th October 1916.

M. R. Ry., A. P. Singaravelu Mudaliyar, Ranger second grade, sub-protem, South Malabar is granted combined leave up to 24th August 1917 inclusive (privilege leave for three months and furlough for the remaining period) with effect from date of relief preparatory to his retirement.

January 2, 1917.

Mr. R. B. Cornwell, Extra Assistant Conservator of Forests, on return from leave, to South Malabar to work under the District Forest Officer.

Mr. J. H. Longrigg, District Forest Officer, Mangalore South, is granted privilege leave for twenty two days from 1st December 1916 with permission to affix the Christmas holidays thereto.

M. R. Ry. M. Subroil Nayudu, Ranger, third grade, Kavali Range, Nellore district is posted to the charge of Nellore Range in addition to his own until he is relieved of the former charge by M. R. Ry. O. Venkataramana Ayyar, Ranger, First grade, Sub-protem, on return from leave.

Mr. Abdul Hussain Kirmani Sahib, Ranger, Vizagapatam District, is granted privilege leave for fifteen days in continuation of Christmas holidays.

M. R. Ry. R. Veeraswami Nayudu, Ranger, Fourth grade, Ganjam is transferred to Upper Godavari for the charge of Nugur Range, Deputy Ranger Behara Bhagirathi will relieve him.

M. R. Ry. A. K. Kandan, Ranger, fifth grade, is appointed as Instructor of the Vernacular Training School to be opened in the North Vellore division on 1st February 1917.

T. V. Govinda Rao, Acting Ranger, Sixth grade, is appointed as Assistant Instructor.

Mr. J. A. Aranha, Ranger, Second grade, North Salem Division, is granted extension of privilege leave on Medical certificate for two months from 26th November 1916 in continuation of the leave granted to him.

M. R. Ry. S. Doraiswami Ayyar, Ranger, fifth grade, is on return from leave posted temporarily to the charge of Anchetti Range, North Salem Division, until relieved by Ranger Mr. Aranha. The former on relief at Anchetti is posted to the Ambur Range of the North Vellore Division.

January 9, 1917.

M. R. Ry., K. R. Venkataramana Ayyar Avargal, Extra Assistant Conservator of Forests and sub-protam, Extra Deputy Conservator of Forests, to be permanent Extra Deputy Conservator of Forests, vice M. R. Ry., Rao Sahib M. Rama Rao Avargal retired.

January 23, 1917.

The privilege leave for five weeks granted to Mr. R. B. Cornwell, Extra Assistant Conservator of Forests, is extended by thirteen days with effect from 23rd December 1916.

M. R. Ry., K. R. Venkataramana Ayyar Avargal, District Forest Officer, South Vellore, to be also Deputy Collector in North Arcot District.

Forest Rangers Messrs. L. S. Janes and E. V. Padmanabha Pillai are confirmed as Extra Assistant Conservators of Forests with effect from 8th December 1915, the date on which they were appointed as Extra Assistant Conservators on probation.

Consequent on the retirement of fourth grade Ranger M. R. Ry., P. V. Alagiriswami Nayudu, the following promotions are made in the class of Rangers with effect from 2nd December 1916:—

M. R. Ry., N. Sundaresa Ayyar, from the fourth grade sub-protam, to fourth grade permanent.

M. R. Ry., K. Karunakaran Nambiyar, from the fifth grade, permanent, to fourth grade sub-protam.

M. R. Ry., N. Vijiarangam, from fifth grade sub-protam to fifth grade permanent.

Mr. W. S. Fernandez, Ranger, fourth grade is granted leave without allowance for two months with effect from date of relief by Ranger Mr. K. P. Benjamin.

The following confirmations are ordered;—

K. S. Ramiah, Ranger, Sixth grade, on probation, South Coimbatore to be Ranger, Sixth grade permanent with effect from 1st August 1916.

K. C. Joseph, Ranger, Sixth grade, on probation, South Mangalore, to be Ranger, Sixth grade permanent, with effect from 1st August 1916.

January 30, 1917.

The privilege leave for two months granted to Mr. G. W. Thompson, District Forest Officer, South Kurnool, is extended by fourteen days with effect from 6th February 1917.

M. R. Ry. A. Hanumantha Rao, Ranger, First grade, to be Extra Assistant Conservator of Forests on probation for one year.

Mr. A. B. Meyers, Extra Deputy Conservator of Forests, working under the Conservator of Forests, Western Circle, to the Central Circle, to work under the District Forest Officer, Nellore.

The resignation tendered by M. R. Ry. C. Sanker Singh, Probationary Ranger, Sixth Grade, East Cuddapah District, is accepted with effect from 4th January 1917.

Mr. D. A. Stracey, Extra Assistant Conservator of Forests, is transferred from the Direction office to Kurnool West to work under the orders of the District Forest officer till 15th April 1917 after which he will return to Waltair.

Ranger Mr. Abdul Hussain Kermani Sahib is posted to Upper Godavari for the charge of Nugur range.

M. R. Ry. N. Swaminatha Ayyar, Ranger, Second Grade, is granted leave on medical certificate for four months from 20th January 1917 in continuation of the privilege leave for three months granted to him.

February 6, 1917.

Mr. W. A. Mekkeri Sahib, Ranger, fourth grade, is on return from leave, transferred from Cuddalore range, South Arcot District, to Pappireddipatti range, South Salem Division.

M. R. Ry., K. Rangasayi Nayudu, Ranger, fourth grade, on relief by No. 1 will hold charge of Chitteri range, South Salem Division.

Mr. G. C. Robinson, Assistant Conservator of Forests, is attached to the Office of the Conservator of Forests, Western Circle, for training from 29th instant.

The posting of M. R. Ry., N. Swaminatha Ayyar, Ranger, second grade, to Mettupalayam range, Central Coimbatore, is cancelled.

Antony Culas, Ranger, fourth grade, Mangalore North, is transferred to Mettupalayam range, Central Coimbatore.

February 13, 1917.

M. R. Ry. E. B. Ramachandra Rao, Extra Assistant Conservator of forests on probation, to be District Forest Officer, Kistna, with effect from 19th February vice Mr. H. J. Mc. Laughlin permitted to retire.

M. R. Ry., Hanumantha Rao, Ranger, first grade, and Probationary Extra Assistant Conservator of Forests is posted on relief to Chittoor District to work under the orders of the District Forest Officer until further orders.

M. R. Ry., C. M. Kunhiraman Nair, Ranger, fourth grade, Madakasira range, is transferred to Rajampet range, East Cuddapah District.

Mr. D. C. Bhide, Ranger, fifth grade, is posted to Madakesira range, Anantapur District.

In supercession of the order posting Ranger Mir Abdul Hussain Kirmani Sahib to Nangur Range, he is posted to Kurnool East for the charge of the Gudem Range.

M. R. Ry., Ramaswami Ayyar, Ranger, first grade, Kurnool East is granted privilege leave for three months with effect from date of relief:

February 20, 1917.

M. R. Ry., Viraswami Nayudu, Ranger, fourth grade, is granted leave on Medical Certificate for six months with effect from date of relief. Deputy Ranger Behra Bhagirathi will hold charge of Berhampur range, vice Ranger Viraswami Nayudu.

V. C. Appadurai, Deputy Ranger, third grade, Kollegal, to act as Ranger, sixth grade, and to be in charge of Erode range, Central Coimbatore Division.

P. Sankunni Menon, Deputy Ranger, third grade, North Malabar, to act as Ranger, sixth grade and to be incharge of Mangalore range, Mangalore North Division.

February 27, 1917.

Syed Munaver and Mr. C. H. Ashe, Probationary Rangers, sixth grade are confirmed in their appointments with effect from 1st January 1917.

March 6, 1917.

M. R. Ry. A Hanumantha Rao, Probationary Extra Assistant Conservator of Forests will remain in East Cuddapah district as Assistant to the District Forest Officer until he takes charge of South Cuddapah Division on 8th April 1917.

M. R. Ry. L. Govindaswami Pillay, Deputy Ranger, Second Grade and Acting ranger, Sixth grade incharge of Chittoor range, Chittoor district, will on return of M. R. Ry. D. C. Bhide, Ranger, Fifth grade, continue to act as Ranger, Sixth grade vice M. R. Ry. N. Seshagiri Rao, Ranger, First grade, sub-protiem appointed as Senior Instructor, Vernacular Training School.

K. Desika Achari, Deputy Ranger, first grade on return from leave, is appointed as Acting Ranger, Sixth grade vice Ranger S. M. Razvi Sahib appointed as Assistant Instructor, Vernacular Training School, and is posted to the charge of Kalyandrug range, Anantapur district.

M. R. Ry., K. R. Krishna Ayyar, Ranger, Dourthpade in charge of Kalyandrug range, on relief by No. 1 is posted to the charge of Vonipenta range (new) North Cuddapah district (new).

M. R. Ry. S. Chinnadorai Pillai, Ranger, third grade incharge of Vonipenta range (old Prodathur range) on relief by No. (2) is posted to the charge of Balapalle range (new) South Cuddapah district (new).

M. R. Ry., M. Krishna Ayyar, Deputy Ranger, first grade and Acting Ranger, sixth grade, is posted to the charge of Vempalli range (new) West Cudduapah District (new).

The combined privilege leave on medical certificate for nine months granted to Ranger, C. Venkatanarayanayya is extended by three months.

Mr. J. A. Aranha, Ranger, second grade, North Salem Division, is granted combined leave for six months i. e., privilege leave for three months from 27th October 1916 and leave on medical certificate for three months in continuation thereof.

Mr. Nicholas, Ranger, fifth grade, is posted for duty under Working Plans Officer, South Coimbatore.

M. R. Ry., M. R. Sundram Ayyar, on relief by Ranger, Nicholas, to the charge of Thanucadavu range, South Coimbatore.

March 13, 1917.

The Board grants leave for one month to Mr. D. T. Barry District Forest Officer, Tinnevely cum Ramnad, from 11th April 1917 with permission to prefix the Easter holidays to his leave.

We beg to acknowledge with thanks the receipt of subscription from the following gentlemen as noted below.

Any omission may kindly be brought to the notice of the Manager.

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J. Ramalingam	... 3 0 0
S. M. Sreenivasagam Pillay	... 3 0 0
B. Gulam Dastigir	... 3 0 0
L. A Krishna Ayyar	... 3 0 0
D. Dhananjaya Rao	... 3 0 0

	Rs.	a.	p.
V. P. Ramana Rao	...	3	0 0
K. Thruvenkatachari	...	3	0 0
N. Subramania Ayyar	...	3	0 0
C. S. Nanjappa	...	3	0 0
V. Mahadeva Ayyar	...	3	0 0
T. Paramasivan Pillay	...	3	0 0

Students of the Junior Division.

C. Sreenivasa Rao	...	3	0 0
S. G. Venketaramanan	...	3	0 0
J. A. Stephen	...	2	0 0
Syed Yahia.	...	1	0 0
C. M. Bartholomeze	...	1	0 0
A. B. Fenn	...	1	0 0
J. Venugopal Naiudu	...	1	0 0
Mohamed Habibulla Sahib Bahadur	...	6	0 0
M. R. Ry., K. Gajaraja Mudaliar	...	6	0 0
D. L. Sathi, Esquire	...	6	0 0
M. Chandy "	...	6	0 0

THE
Madras Forest College Journal.

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N. B.:-Contributors are requested to send in their contributions typed or written legibly in ink on one side of the paper only.—Editor.

Editorial Notes.

The information that Mr. Fischer, I. F. S., Principal, Madras Forest College was handing over charge to Mr. Cowley-Brown, I. F. S., the former Principal, the next day at Coimbatore was officially announced to us on the afternoon of the 19th May in our Coonoor Camp. Mr. Cowley-Brown was the first Principal of the Madras Forest College and in 1915 handed it over to the capable hands of Mr. Fischer. Since the preliminary difficulties with which every difficult problem is beset in the beginning were all tided over, we had time to sit and think how we could make ourselves useful in other ways to the Madras Forest Department at large. With this idea we started the Forest College Journal, and though hardly a year has passed, we have been assured from other quarters that we are making ourselves useful.

Mr. Fischer has taken a paternal interest in us. He was a Principal—in the real sense of the word to us—in the College, a playmate in the play ground and a guardian outside; and Mrs. Fischer has spared no pains to make any function in connection with the College a success. During

spare hours, she with her husband used to visit the College compound for the pruning of trees which are left to the care of gardeners who avail themselves of the opportunity to sleep when the College is out in camp and cows who availed themselves of the opportunity of the gardeners' sleeping hours to feed themselves fat on the growth in the College compound.

As President of the Committee of Management of this Journal, our vocabulary is too short to describe how much we are indebted to Mr. Fischer.

We wish both Mr. and Mrs. Fischer long life and prosperity.

Farewell entertainment to Mr. Fischer.

Coonoor 19th May :—The information that Mr. Fischer was leaving our camp the next morning was received only at 5 P. M. To bid him farewell there was barely an hour and a half. It was half past six; was it a magician's wand or an Alladin's lamp that was responsible for the farewell arrangements made in the lecture tent? No. It was neither the magician's wand nor Alladin's lamp; but it was only the combined effort and sincerity of the Senior Division Students that organised a gathering simple but to the heart's content of both the guests and the hosts. We missed our Juniors as they were camping in Ootacamund.

Messrs. Dawson and Crothers, Instructors with the Senior Division were also present.

Mrs. Fischer and the Principal were received by students P. K. Karunakara Menon and C. Karunakara Menon at the door of the lecture tent and taken to their seats; and they were garlanded by students C. S. Nanjappa and Gulam Dastagir. Student D. E. Lewin read out a short speech in which he dwelt upon the many good qualities of head and heart of the out-going Principal. He was followed by

student N. T. Tampi who expatiated upon them in fuller detail and drew attention to the interest which Mrs. Fischer was taking in the growth in the College compound.

Light refreshments were then served. The Principal's concluding speech was a masterly advice to the students to be thoroughly honest in their career and to express their opinions independently without caring for favour or frown.

The gathering dispersed with three cheers to the Principal and three cheers to Mrs. Fischer.

Welcome Address to Mr. Cowley Brown.

Coimbatore 26th May 1917 :—The Students and Staff of the Madras Forest College assembled at the College this morning to welcome Mr. F. L. C. Cowley Brown on his return to the College. The students in their smart uniform formed a guard of honour as Mr. Cowley Brown arrived at the College at 8-30 A. M.

The students thereafter assembled in "Beddome" Hall where the Principal was garlanded as he took his seat and an address of welcome was read by a student of the Senior Division followed by an extempore speech by another Senior student.

Mr. C. B. Dawson gave a short speech in which he briefly and generously surveyed Mr. Cowley Brown's work for the College during the time he was here before.

The Principal in thanking the students "opened out his heart to them as they had discovered theirs to him" and thereby sowed the seeds of "mutual sympathy, the essential to discipline." He brought home to the mind of every student the fact that discipline is the key-note of success and that therefore discipline must be the watch-word of every student and alumnus of this Institution.

The late Mr. H. F. Arbuthnot.

It was with the greatest regret that we learnt of the very sudden death of Mr. H. F. Arbuthnot I. F. S. while he was on short leave at Kodaikanal at the end of May, at the early age of 44. Mr. Arbuthnot was taking part in a tennis tournament up to two days before his death and his untimely end from appendicitis came as a great and very unexpected shock to all his friends.

Mr. Arbuthnot was educated at the Merchant Taylor's School in London and after a short period of preparation at Wrenn and Gurney's coaching institution passed 9th in the competitive examination for the Imperial Indian Forest Service in July 1892, taking first place in Botany.

He passed out of Coopers' Hill in 1895 and was posted to the Madras Presidency, arriving at the Presidency town at the end of that year. He served first in the Coimbatore District and later in a number of other Districts as Assistant, D. F. O. and on Working Plans duty.

Mr. Arbuthnot gained a name as a hard and zealous worker who never spared himself in the pursuance of his duty. He drew encomiums on himself very recently for his devoted work in the Nellore District, where his energy and sympathy went a long way to popularising and extending the "Kancha" system.

We desire to tender our heartfelt sympathy to Mrs. Arbuthnot and her three children.

Killing trees with arsenic.

In continuation of the note under the above heading on page 55 of No. 2 of the Journal the following notes are interesting. None of the *Acacia arabica* trees poisoned nor the girdled "controls" on the College estate have died. They lost their foliage in March earlier than the majority of the trees in the compound, but not earlier than some. The one striking feature is that all the seven trees had thrown out from the trunk below the ring two or more shoots by 29th March, showing that the ringing has had some effect. They are being kept under further observation, and more trees were similarly treated in April to ascertain the effect of poisoning during the hot weather.

C. Fischer.

Annual rings in *Dalbergia latifolia*, Roxb.

Some doubt has been expressed as to whether the rings in the above named species are truly annual. The question is not decisively settled by a reference to the authoritative works available since some seem to be in no doubt of the validity of the rings and others, e. g. Bourdillon's "Forest trees of Travancore," state that there are "No distinct annual rings."

In many cases the rings are distinct enough but whether they are truly annual is another matter. We shall be grateful for authentic and precise information from any of our readers who may be in possession of such facts, not mere expressions of opinion. It is clear that rings must be counted on sections from trees of known age.

C. Fischer.

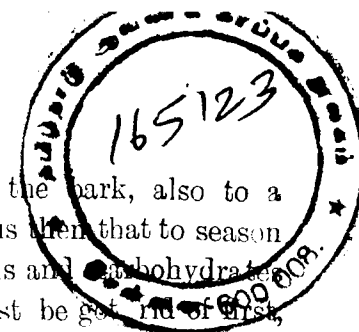
Seasoning, etc.

(Extracts from Sir. W. Schlich's Manual of Forestry and comments thereon prepared by Mr. A. W. Lushington, C. I. E.)

"All wood, after being properly seasoned, used in places which are nearly or completely dry is very durable, for *moisture is necessary for the development of decay*; this is seen from the condition of wood in the interior of buildings, carvings, furniture, etc., which remain unimpaired for centuries; and if we exclude the danger of attacks by insects, even woods, like beech and birch, not otherwise considered durable, are extremely durable when kept in dry places."

"Half dried wood cannot be durable."

"The substances found in wood other than woody tissue are (1) water 35-55%, (2) starch and other carbohydrates, (3) Proteins, (4) Tannin and colouring material, (5) Resin (including turpentine), (6) Mineral ash. The protein substances, rich in Nitrogen, are chiefly found in the young unligified wood and especially in the cambium: they readily decompose and have hitherto been considered as the chief accelerators of decay and rot in the wood. The tissues richest in starch are most exposed to attacks of fungi and wood destroying insects." [N. B. Starch under the action of any acid (and vegetable acids are always present) becomes by degrees more easily under action of heat and pressure (the bark presses and the sun heats) convertible into sugars which ferment; and the fermentation process in itself is such that some of the material becomes converted into fungus-A.W.L.] "Resin in moderate quantities makes wood elastic, strong, heavier, less permeable to water, less liable to insect attack, less liable to fungus; excess makes wood brittle. Tannin and colouring matter



and mineral ash are found chiefly in the bark, also to a lesser extent in the wood." It is obvious then that to season woods, in the proper sense, the proteins and carbohydrates are essentially the products that must be got rid of first, and the water after it; the proteins and carbohydrates are either in solution in the sap, or held in suspension therein and capable of being carried away with the sap. It is further obvious that so long as the logs or timber are replete with sap, this carrying away would be far easier than if the juicy portion were allowed to dry up wholly or in part; further the parts richest in proteins and in carbohydrates are the cambium layers, (the slimy layers between the bark and the wood) or the layers closely juxtaposed thereto; wherefore it is further obvious that if the bark is removed immediately the tree is felled, the removal of these ingredients would be still further facilitated by soaking the logs at once in water or by steaming them.

If the trees are felled and are allowed to remain without further treatment for a protracted period with the bark on them, the fact of their being in a confined space without free access of air rapidly makes the protein decompose and causes the carbohydrates to ferment; and once this process begins, and fungi are allowed to form, it is a very difficult business to get rid of these new elements. It is often supposed that logs felled, and left so (with their bark on) in the forest for a protracted period are seasoning"; but very much the reverse is the case; they are putrifying; for fungus, which leads to rot and decay, is setting in, and insects which seek the saccharine matters are setting up their ravages. Even were it not so, the hygroscopicity of sugar is well known; and if this is not got rid of, wood with these ingredients in it must always be more hygroscopic and subject to warping, shrinking, cracking and absorption of moisture than wood without these ingredients

The only true way of seasoning then, subject to the modifications noted below, is to rid the trees of their bark immediately they are felled, and to soak them in water, or steam them, until all the proteins and carbohydrates are washed or steamed out; and then allow them to dry out the moisture (and expel the heat if steamed) very slowly at first, more and more rapidly as the moisture (or heat) vanishes, always out of the rays of the sun and out of the rain.

Seeing that the sapwood is the portion next after the cambium, which contains these ingredients, if the material is to be kept in the log or beam, it is best to get rid of that sapwood by squaring the logs; and this should be done immediately after the barking; and immediately after the squaring, the logs should be submerged in water. But seeing again, that the evaporation of moisture "is proportional to the extent of the woody surface exposed"; (and the same applies equally to the washing out of the carbohydrates and proteins)—thus "barked wood dries more rapidly than unbarked wood, splitwood than unsplit wood (thus split Scotch Pine dries up 12 times faster than unsplit Scotch Pine), planks expose more surface to the air than other forms of converted timber, and they dry most readily,"—it is obvious that unless it is absolutely necessary to keep the wood in bulk in the log or beam, converted timber is far the easier to season (in the modes above shown) than unconverted timber; half barks than squared logs, quarter than half barks, scantlings than quarter barks, planks than scantlings, battens and staves than planks.

Sawnwood dries more rapidly than splitwood of the same dimensions, but splitwood warps less, cracks less, retains its elasticity far more because all the fibres are intact and merely separated instead of being sawn through and because the splitting is mostly radial instead of

tangential, whilst with sawing it is usually the other way about.

"Straight and long fibres render a wood 'fissile' (readily capable of being split), and this is the case with most conifers and all rapidly growing woods. A wavy or twisted, unhomogeneous condition of the fibres, owing to knots, wounds, bent fibres or dormant buds, implies considerable power of resisting fission.....Elasticity always increases fissibility for the more elastic a wood, the faster the splitting precedes the wedge, and the wider the cleft opened in the wood. Wood splits best when either quite green or when quite dry; half dried wood is the least fissile. This is due, when the wood is green, to the flexibility of fibres, and when the wood is dry to their elasticity."

"The saw never splits, but tears and cuts the fibres asunder, and sometimes separates them from one another with a plane-like action."

In fissibility, "the wood is not merely affected by the actual contact of the wedge, for the fibres separate from one another *in front of* the wedge, in the direction of the fibres.

It is usually easier to split wood radially than tangentially, because the coherence between the fibres and medullary rays radially is less than the coherence between the annual woody zones, but in the case of conifers, poplars, willows, birches, lindens, hazel etc., the medullary rays are very small but very narrow and do not bind the zones together and with them tangential splitting is easier than radial splitting." "In brittle woods a splitting action breaks the fibres, in flexible woods the fibres yield before the wedge without transmitting the shock any further."

"Wood shrinks unequally in different directions, and so the wood becomes distorted when it warps, and cracks and crevices appear in round wood. As shrinkage is greatest tangentially cracks are chiefly radial, and this being also the earliest direction in which wood splits, this fact intensifies the tendency to crack radially; split and quartered beams crack much less than round, still less scantlings and planks, least of all veneer which is therefore preferred as fine as possible. Wood shrinks least along grain and in negligible quantities, up to 5 per cent radially, and up to 10 per cent tangentially; wherefore to *reduce warping and cracking* to a minimum, logs should be sawn (as well as split) as far as may be radially," (not as in India a series of cuts parallel through the greatest thickness of the log, known as "the beam, or plank," then two at right angles to the best beam, one from each of the barks cut off, then more or less alternately parallel to the "best beam" and to the 2nd best beams; in no case, if this is done, is a scantling or plank truly tangential as are the outer planks of the Indian method of sawing. The Indian tangential planks may be broader but can never be a fraction as good).

Note:—Cloven (i. e. split) timber is almost always used for staves for casks (spirit casks, slack barrels and barrels for dry goods) and barrel hoops (where iron is not used), spokes and felloes of wheels, rungs of ladders, shingles for roofing, laths, hurdles, park-palings, oars and rudders, billiard cues, sieve-frames, cheese moulds, measures for fruit and dry goods, venetian blinds, boxes generally, matches and match boxes, pencils, band-boxes, trenail wood, for musical instruments especially violins, and piano sounding boards, glaziers' wood (window frames and door panels sometimes sawn but split wood the better as it warps less), and any thin wood where warping and cracking must be carefully guarded against.

The "Kapila" powder trade in the South Yellore Forest Division, North Arcot District.

The merits of the "Kapila" powder as an excellent dye for silk and wool, have long been recognised, though it does not appear that this valuable minor forest produce has obtained its deserved place in the trade of the Madras Presidency. This powder is obtained from the glandular pubescence covering the outside of the ripe fruits of *Mallotus philippinensis*.

It seems not improbable that the outside markets are not aware of the volume of trade that is possible in this item of minor forest produce in the Presidency, and the object of these notes is therefore to show the extent to which this dye could be supplied annually from this district and to invite similar information from other districts, so that an impetus might be given to the development of trade of this dye.

Distribution and area. This small evergreen tree—*Mallotus philippinensis*—, is generally found in all the hill reserves of this district above 2000 feet altitude, and is at its best on the unreserved lands and patta fields on the Javadi and Yelagiri plateaus, more particularly in the Polur and Santavasal Ranges. It is very sparsely distributed in the reserves where it is found chiefly alongside ravines. The trees growing on patta lands and in the neighbourhood of villages are carefully preserved and their branches are periodically clipped by the Malayalee residents on the plateau, and on account of the abundance of light and the stimulus to the growth and development of branches they receive in such exposed situations, the crop of fruits from such trees is always greater than that from others, away in the forest areas where the trees don't receive any special treatment. The aggregate area of reserved forest, unreserved

lands and patta fields over which the tree is found irregularly distributed may be put down roughly as about 150 square miles, of which the patta lands contain by far the largest number of trees.

Season for collection of the Kapila powder. The tree flowers between July and November and is in fruit between December and March or even sometimes till April.

The valuable product of the tree is the crimson powder which covers the ripe fruits and which is used for dyeing silk to which it gives a bright orange color. Very great care is required (in which the Malayalees are adepts) in ascertaining the exact time when the ripe fruits have to be harvested for their powder. On the one hand immature fruits either will not give up their powder easily or if they do the resulting powder has a greenish tint which detracts from the value of the article, while on the other hand if the fruits are not harvested at the right time, the powder will disappear being blown away by wind. The brilliant and shiny nature of the fruit is often an indication of the arrival of the time for harvesting the crop and at this period a slight touch of the fruits will leave the stain of the powder on the hand.

The season for the collection of the powder lasts from February to April.

Method of collection. The slender branches bearing the ripe fruits are plucked off the trees and collected in clean baskets. The fruits are then carefully separated singly and placed on a clean cloth which is improvised into a bag in which they are vigorously shaken and pressed after being dried for sometime. In this process much of the powder is cast off into the bag and the fruits are thereafter dried for some time when the same process is repeated to extract all the remaining powder that may stick on to the fruits.

The powder thus obtained will contain some broken twigs etc., which are picked out and the powder—where fine quality is aimed at is pressed through a white clean and finely porous cloth until the very fine powder for the market is obtained.

The whole process is a laborious one and a basketful of fruits very often does not give even 1 lb of powder. On this account, the cost of collection is often prohibitive and unless the trees are at hand and have a luxuriant crop of fruits such as those on patta lands the collection of fruits from ill grown forest trees some distance away from the Malayalee villages, does not pay.

The seeds of the ripe fruits, after the powder is extracted from the latter, are often thrown alongside ridges of patta fields where they germinate and the plants are thereafter taken care of by the Malayalees. It is on this account we see a large number of these trees alongside the patta fields at Patrakad and other places on the plateau.

The cost of collection. The cost of collection of the powder including delivery at the nearest railway station varies from Rs. 10 to Rs. 11 per maund of 25 lbs.

Selling rate and chief local markets. Until about 6 months ago, the powder was selling from Rs. 16 to even Rs. 20 per maund delivered at the minor forest produce contractors' depots. The price appears to have since gone down, the current market rate being reported to be somewhere in the neighbourhood of Rs. 15 per maund, on account of which the contractors in this division are holding up their stock. This decline in prices is attributed by contractors to the mineral dyes of the same color now being offered in the market at cheaper rates.

The powder is consumed at Conjeevaram and Kumbakonam where silk cloths on a large scale are manufactured.

These merchants would appear to prefer Kapila powder for dying silk where quality is the chief consideration, to mineral dyes of the same color though the latter sells cheaper and it is therefore not unlikely that the normal prices for kapila powder would soon be restored.

Quality and quantity of Kapila powder annually available in the district with a statement of present stock.

The annual out-put of this powder from the South Vellore division does not appear to have ever exceeded about 700 maunds, though under favourable circumstances, it might increase up to about 1000 maunds easily. It is often said that adulteration has killed the market for vegetable dyes, but so far at least as kapila powder is concerned, the Malayalees are far too innocent to practise that deception. The material required to adulterate the powder with, is fine and well colored brick dust whose color the kapila powder resembles and no burnt bricks are available anywhere on the Javadis. It is always the middleman, if any, who practises the trick and as long as good and reasonable prices are offered and inferior substitutes of mineral dyes which are equally deceptive are not favored, I do not think that there will be any reason for doubting the quality of the Kapila powder.

On this date, a quantity of about 400 manuds of good Kapila powder is in stock with the minor forest produce contractors in this division and this is all last year's stock held up for want of good prices. The Cyclone during November last has greatly interfered with the normal out-put of the powder during the current year and it does not therefore appear likely that more than about 400 maunds will be collected during the year. There is considerable scope for increasing the annual out-put if only a steady demand arises for the Kapila dye, as at present a lot of this powder is

allowed to run to waste in forest areas at some distance away from villages which at present, it does not pay the Malayalees to collect.

The produce is available, on application by purchasers, from the following Contractors :—

1. Mr. Parasurama Mudaliar,
Minor forest produce contractor, Kaniambadi.
2. Khan Sahib Bangi Abdul Razack Sahib Bahadur,
Ambur.

Vellore, }
4—4—1917. }

K. R. Venkataramana Ayyar,
District Forest officer,
South Vellore.

Editorial note: *Mallotus phillipinensis*, Muell-Arg. occurs in all the districts of the Madras Presidency in greater or lesser abundance from elevations of about 300 to 5000 feet. The dye powder, derived from its fruit was collected to a greater extent in the past, before the competition of aniline dyes, than in the present. It was a regular source of forest revenue in the Ganjam District, for instance up to about 1898 and became fitful thereafter. Samples were sent to Germany in 1899 or 1900, but the prospect of trade in the face of synthetic dyes was declared to be unpromising.

One of the chief dangers to the revival of the use of *Kapila* or *Kamala* dye lies in the possibility of adulteration. This may be either fraudulent as indicated in the note above, or through carelessness by insufficient sifting or cleaning. In either case this leads to dissatisfaction owing to the unreliable results in the hands of the dyer and the stigma of a bad name in the market.

Editor.

Loranthus.

Loranthus as a destructive pest has nowhere else in the Madras Presidency proved so fatal to a tree of value as in Coonoor, and to a less extent in Ootacamund. Widely distributed it may be found growing where there is moisture for the seed to germinate and a rough bark for the seed to adhere. Such conditions being common, *Loranthus* is often met with; but whereas in less moist localities it does not easily kill a tree, but only the branch growing above the infected part, and often not even that, in Coonoor a few branches of *Loranthus* cause a disproportionate effect on large *Acacia melanoxylon* trees which are rapidly destroyed, so that plantations of this once promising species are no longer profitable. Hence abundant vitality of growth and exceptional fertility of soil are no protection against *Loranthus*. On the contrary it is these two factors combined with exceptional moisture that account for the speed with which *Acacia melanoxylon* succumbs. The injury that kills the branch is not merely local. The flow of sap in the cells becomes stagnant, and this cell destruction spreads through the stem down the trunk, as may be seen by the discoloration. The more the moisture in the wood, the greater the destruction; and to this the probably reduced transpiration by phyllodes may contribute. In Coonoor the mists, the cloudy days, the heavy rainfall, all combine to give *Loranthus* exceptional sway. When the air is dry, the soil of moderate fertility and the tree with no superfluity of sap, the effect of *Loranthus* is local, and it then requires many points of attack to make a tree stag-headed.

With the effect of *Loranthus* we may compare the action of a foreign substance in the human body which unless extracted sets up poisoning. We want in silviculture

the medical term mortification. Ordinarily a tree suffering from external injury forms a callus and occludes the affected part. The injury is thus localised. Again when rot starts in the centre of an old tree, as for example the internal and central injury that causes old *Hardwickia binata* trees to be so often hollow, an injury probably due to the habit this species has of dying back for many years before it finally shoots up with a gnarled and irregularly grown basal stem, since the injury does not affect the growing and most active cells, the tree lives to old age, and need show no signs of stagheadedness. *Loranthus*, on the other hand, affects the growing cells, occlusion is not possible, unless the *Loranthus* is cut off, the host tree is powerless, and its death rapid.

With this understanding that the fatal effects of *Loranthus* are due to excess and not to exhaustion remedial lines can be indicated. *Acacia melanoxylon* should not be grown crowded, or combined with *Acacia dealbata*, or on low lying ground. The favourable conditions are found in Marlimund Reserve where it grows on a slope with good drainage sparsely mixed with bluegum. The latter with its well known absorptive power should greatly mitigate the effect of *Loranthus* on its victim. But enough has been put forward to show that the exceptional factors of locality in and around Coonoor coupled with the moist luxuriance of *Acacia melanoxylon* probably place it beyond any remedial or preventive measures.

C. B. Dawson.

The Thekkadi leased forest.

Situated in the Thunacadavu Range on the Anamalais forming one compact block covering an area of 2694 square miles is the Thekkadi leased forest. This forest is too well known to require any introduction at our hands. In the

sixties this was one of the suppliers of teak to the Bombay dock-yards.

The owner of this forest is the Nambidi of Kollengode and for a time teak trees were extracted from this on a stamp fee of Rs. 5 per teak tree felled. The Government's possession of this forest was unsettled until 1887 when a satisfactory arrangement was come to between the Government of Madras and the Nambidi of Kollengode by which it was agreed to pay a fixed annual rental to the Nambidi and to renew the lease at the will of the British Government.

Of course the problem of undertaking cultural operations on any scale was not thought of prior to this, for it was only a wild-goose chase to spend money for such purposes in a forest the possession of which was unsettled. The extraction of valuable timber species unaccompanied by any cultural operations resulted in the decrease of valuable species and the increase of undersirable ones and the monopolisation of a considerable part of the area by bamboos and lantana. Here is the forester confronted with a very difficult problem, for one of his best forests that has a uniformly fertile soil, at least throughout 80% of the area, if not the whole, sufficiently deep and retaining moisture throughout the year is with its capital encroached upon. That it is an excellent teak producing area was attested to by the magnificent teak timber that it supplied to the Bombay dock-yards; and stately trees that are now seen scattered here and there make this assurance doubly sure; one of the teak trees felled now gave a girth of 23' and a height of 135'; and the age of this by counting the annual rings was estimated to be 601.

The present aim is to make it normal forest with a good proportion of teak and the aim of the Working Plan Officer, if we understood rightly is centred on this.

The Thekkadi leased forest comprises nearly 15000 acres. The existing growth testifies to the fact that it is very far from being a normal forest, for there is a conspicuous absence of poles though the presence of seedlings is not far from encouraging. We understood that 50% of the area is to be enumerated and by now 2500 acres would have been completely enumerated; but the results are not available as the reconnaissance report is still behind the curtain. Ours is therefore only a broad outline and we trust that we will not be far from right if we say that in this forest saplings do not reach the pole stage in the same proportion as seedlings reach the sapling stage. The spread of bamboos and lantana was only after the area was brought under fire protection prior to which it is stated that this has been the scene of annual depredations by fire from the forests of Cochin and those of the Nambidi of Kollengode. Are we to give up fire protection for minimising the spreading of bamboos which monopolise a great part of the area to the exclusion of timber species or are we to adhere to it are questions which will be answered in the course of this article.

In spite of the attempts to keep fire from outside, the area inside has not been free from it because minor produce contractors often resort to their favourite game of setting fire to forests for facilitating the collection of minor produce and extensive areas are burnt annually by their mischief. The unhealthiness of the Range does not permit the Range establishment to remain on the hills during the fire season when they retreat to Sethumadai, at the foot of the hills and so control is slackened; and we presume that in the interests of this valuable forest the paltry revenue derived from minor produce should be sacrificed.

Rigid fire-protection, intense regeneration operations, intense regeneration fellings, eradication of bamboos and lantana, and placing the realisation of revenue from the

extraction of valuable timber species in subsidiary importance for the present, are what are required to bring up this forest to a normal condition.

Rigid fire protection.—In our last article on 'Fire as a stimulant' we advocated it only in the early stages, but when once the regeneration is established and the seedlings are between 3" and 4" in girth we repeat again that fire is detrimental to their interests which is illustrated by the concrete examples we have in compartments No. XX and XXIII of the Thekkadi Working Circle, where in a considerable part of the area seedlings and saplings were very numerous five years ago and these five years have not worked a bit to show any progress, for there was a fire in the area in 1914. A great number of seedlings and saplings show signs of having repeatedly died back on account of fire.

Intense regeneration operations :—That teak is a great light demander is known to every silviculturist; and in a forest in which our aim is to get a good proportion of teak in transforming it into a normal forest, unimpeded overhead light should always be kept on, but a fertile soil with plenty of rainfall, under this condition invites weeds, bamboos and lantana which are awfully uncomfortable for teak in its early stages.

Herein comes the question of weedings and cleanings which have to be carried on till teak is free from danger; then again thinnings have to be resorted to for which no hard and fast rules are to be laid down but left to the discretion of the local officer.

Regeneration in blanks has to be resorted to by artificial means such as dibbling, and if broad cast sowing is found successful this had better be adopted; in poor localities planting has to be adopted. Resorting to planting as in

Nilambur is out of question here, for means of transport here are not even one tenth as easy as in Nilambur and therefore more costly. But teak has a great future before it and there might come a time when the State will have to repent that they did not make the best use of a natural teak growing area to its best advantage however great may be the expenditure that has to be incurred on it. Of course there is Nilambur now, but is that enough when one more Kaiser is to be produced by a freak of Nature to blacken the pages of history, to send down so many huge and magnificent ships to the bottomless depths of the ocean?

That, by clean fellings and exterminating bamboos by burning them, regeneration of teak and rosewood will be obtained is illustrated by the magnificent reproduction in $5\frac{1}{2}$ acres in the slopes below Mt. Stuart Bungalow. Teak seeds were dibbled 6' by 6' in February and March last so that they got the benefit of alternate heat and moisture which is so essential to successful germination and gave the seedlings a start of the weeds in some cases, but here four weedings were carried out before this date. In open places the regeneration is simply marvellous but under the shade of a few trees left, it again tells us "I am a light demander and I can't stand drip."

There is a magnificent growth of teak poles in the area cleared round Thekkadi Bungalow about seven years ago. This had to be fire protected out of necessity but unfortunately the poles do not seem to have grown unimpeded, for weeds have invaded them; *Cæsalpinia* is now spreading itself rapidly in the area and lantana has just begun to establish itself. There was only an attempt made in 1913 to set them free. If we have to get our teak out of harm's reach when once it is established, protection, weedings and cleanings have to be done and in the later stages thinnings.

Lantana is a pest and unless it is removed root and branch, starved out and killed there is every likelihood of its propagating itself again for we have seen it is sarmentose. There is a scheme for the eradication of lantana laid out for the Mount Stuart Working Circle under which the area is to be divided into workable blocks of 13. Lantana has to be uprooted in the first block in the first year, during the second year when the second block is worked for the first time, the first block will be gone over again, during the third year when the third block is worked for the first time, the second block will be gone over a second time and the first block the third time; thus to completely get rid of lantana in fifteen years. It will be interesting to note here how lantana was uprooted by Mr. C. C. Wilson in a part of the Lantana area to arrive at the average cost of removing lantana in one acre. Levers consisting of stout Thadasi poles and small chains were utilised and it bodily uprooted even the biggest bush. The cost as ascertained is Rs. 16-2-0 per acre. We doubt even if this would be successful for lantana is very easy of propagation; and even in this area cleared a few months ago we saw it growing again. We would even go to the extent of growing some crop that shall occupy space to the exclusion of weeds after the first time lantana is uprooted. The cost of this will be less than that of going over one acre a second time the second year. We saw guinea grass in one of the Teak plantations in Mt. Stuart which kept out other weeds. Though we do not recommend the same as it has been found to choke the seedlings yet we would go in for some growth that is easy of propagation, that enriches the soil and at the same time keeps out weeds. This may be done in the early stage till the teak is out of danger.

Then again the eradication of bamboos is another important problem which entails enormous expenditure and

here are carried out experiments to find out methods of erradicating bamboos. (1) Clear fell bamboos and leave them where they are which of course is detrimental to the interests of regeneration. (2) Clear fell bamboos and remove them out of the area which of course is out of the pale of practical politics in so extensive a bamboo area like this. (3) Clear fell bamboos and burn them. The last of these has been found to be less expensive and this seems to be the best method for dealing with bamboos.

Mr. Troup in his very interesting note on some European Sylvicultural Systems, with suggestions for improvement in Indian Forest management discusses the value of concentration thus—"The true selection system is quite inapplicable to the large forest areas which have to be dealt with in India, since the amount of close attention which requires to be devoted to each acre in the effort to attain normality would be quite impracticable under Indian conditions. Seek what arguments we may, everything points to concentration rather than to diffusion of work as the ground work of successful forest management in India. Concentration implies more efficient and more economical work on natural and artificial regeneration with subsequent tending operations, more economical and thorough exploitation under a definite scheme of roads or other export works, the possibility of fire in effecting regeneration, the conduct of special fire protective measures in definite areas where protection is most urgently required, a more economical use of the staff and better supervision over it, a more workable arrangement as regards closure to grazing, and what is of great importance in the mixed forests of India, special facilities for regulating the proportion of valuable species to what is economically and sylviculturally desirable."

The future of the Thekkadi leased forest is summed up in the above for concentrated working is what is required

here. The forest covering 15,000 acres may conveniently be divided into 3 block of 5,000 acres each, and each block 50 coupes of 100 acres each. Thus we will regenerate the first block within the first 50 years when we will be carrying on the extraction of mature trees in the other two blocks. When in the first coupe of the first block—which is of course the one already worked under selection fellings—we carry on clear fellings and regeneration operations the first coupe in the 2nd and 3rd blocks will have their selection fellings. Thus there will be operations in three different parts of the forest, the total area in one year amounting to 300 acres. During the second rotation the second block will be treated as the first block when this will have its remunerative thinnings and the third block selection fellings. During the third period the third block will be treated as the 2nd block during the second period or the first block during the first period; and 1st and 2nd will have their remunerative thinnings.

Then shall it be possible for us to promote regeneration by fire and successfully regenerate the area by adopting even to costly measures as planting where regeneration is badly wanting, carry on our weeding and cleaning operations until we establish our principal species and then thinnings to improve our trees of the future. The advance growth of valuable species need not be touched but only improved by necessary thinnings. This concentrated working will help us to get rid of bamboos and lantana till teak is past danger; and no matter what may, if lantana which has everything in its favour for its propagation grows up again, for in raising a crop where teak is to have the major proportion, lantana may protect the soil against the direct rays of the sun, enrich the soil by the fall of its leaves, retain moisture in the surface soil.

Who has tried to answer whether it may not prove a blessing where it is now a curse?

Since writing the above we understood that the revolution would be roughly about 150 years. Before undertaking operations on any scale it is justifiable to consider the financial aspect. We will put down the initial expenditure to be on the safe side—we will leave a wide margin—to be Rs. 70 per acre; and this sum in the course of 150 years at 4% compound interest would be about Rs. 25,000. This figure will threaten us at the outset, but at the same time should we not calculate the revenue realised from the extraction of produce at the start of the operation in each coupe and calculate compound interest on it at the same rate for a hundred and fifty years? The balance will of course be realised from the intermediate thinnings in the interest of our crop of the future.

The existing tram line improved by feeder lines will serve as means of transport for the extraction of timber from the Thekkadi Leased Forest.

The present District Forest Officer is carrying out experiments on different lines to see under what conditions he could get the best regeneration of Teak and Rosewood in this forest; and these have been dealt with in the April number of the Indian Forester by Mr. M. R. Sundaram Ayyar, Extra Assistant Conservator in charge of Thunacadvu Range.

C. Karunakara Menon.

15-5-1917.

Podu and Tongya Cultivation and natural Regeneration.

Podu cultivation is well known in the forests of Ganjam, Upper Godavari and other districts. This is

a shifting cultivation prevalent generally in hills. Here the hillman—the Khond and Savara of Ganjam, and the Reddi and Koya of Upper Godavari selects an area generally on the hill side, cuts all forest growth and burns it on the area before rains. I give these localities as I know them personally. After the first rains, he rakes up the soil with a sharp stick or so, dibbles and sows red grain, maize, and other crops. He uses this area for crop like this 4 or 5 years until it becomes too poor to be of further use to him. Then he leaves this and goes to another. He returns to this after its putting on fresh vegetation again sufficient to give him manure for a similar purpose. The hills like those of Parlakinidi too fully crowded with hillmen are devoid of any timber, even small poles except isolated trees left here and there for fruit or shade. It is with greatest difficulty the forests could be saved from this podu cultivation by subjecting hillmen to the necessary limitations. The very idea of this podu cultivation is repugnant to the feelings of forestry from the facts mentioned below.

The podu cultivator first raids a premature crop of sapling or pole growth, limits its life by cutting unsystematically and before it becomes useful, prevents the production of timber, so necessary for life, and burns what he gets wholesale. In burning, the soil is baked, the hill side is rendered bare, denuding and exposing it to erosion. The surface covering is burnt and the chances of storage of water are minimized. The podu cultivator becomes the chief cause of fires in adjoining fire-protected forests, allowing it to escape or not being able to control it in hot summer. This I believe is what is termed *Tongya* cultivation in Burma. Thus far this has been an enemy to forestry and a poison to the forest growth.

Nature's plans are at times perplexing and inexplicable. The arsenic, a dose of which under usual conditions causes immediate death, becomes balm to save life when administered by doctors who study it. This very arsenic which makes us tremble at the very approach is very earnestly purchased, preserved and used for relief at a time of despair. Now its qualities are praised and its bad effects forgotten.

When this is so, it is no mistake if we refer to this podu cultivation as a factor of utility if it has any wholesome results in it and forget its bad effects for a while. I saw new podu sites with heaps of poles half burnt and was shocked at the sight. But as I walked along the hill sides in the podus of advanced age, I found them to be very thickly stocked with beautiful pole sized forest of good uniformity and wondered how such nice crop of poles could come on these podus. I found these five patches on the sides of hills in Pondakhole and Upper Godavari. These suggested the idea of a 15 year coppice worked coupe on a good soil. I found similar crops on the deserted level fields at the base of hills in valleys in Baibali Reserve in Ganjam and other portions. On seeing these, it often struck me that many of the uniform sized small poled patches of sal, which I found in sal forests in Ganjam, might have been the sites of this sort of cultivation one day. These passed down to us in the midst of unrestricted grazing and dangerous uncontrolled fires. I demurred at the idea but it would appear that many of our forests are deserted podu fields especially those mentioned above. This made me refer to the hill sides with forest growth, which have been under rigid protection and escaped the bane of this podu cultivation. But none of these compared favourably with these patches of podu area in closeness, uniformity or soundness of stock. If this has a bearing on regeneration

question, why not we use this as a means, as they did in Tongya plantations with the necessary modifications to regenerate areas which show stubborn barrenness or scanty reproduction in spite of best protection against fire?

B. V. Jogeswara Rao,
Ranger.

Aids to the identification of some timber specimens.

The present state of our knowledge of timber characters is such as to make our usual method of identifying timber samples, rather empirical. One finds it not very difficult to make out the species, and even the variety of botanical specimens, with the aid of the floral, or other characters, and a "flora"; but when one has to deal with a sample of timber, a hard nut has to be cracked, and at times the matter has only to end with a sigh of despair. This is partly because we can have, in wood samples, only a glimpse of the tree in question, without the floral and vegetative characters to help us, and partly because our tests in timber identification are wanting in number and kind. The deficiency can, I believe, be made up in part, if chemical and microscopical tests, are, among others, invented, and applied, making our method more scientific and certain. Then and then only can we hope to reach that stage of knowledge when every possible, and every thing possible of, timber are known to enable us to prepare an elaborate analytical key for the woods of India.—at least Southern India,—which is one of the greatest of our desiderata.

The chief difficulty in the way of identification lies in the fact that there is not, in timbers, that constancy of generic characters which is the rule in such parts of the tree as the flowers, or even the leaves. In the genus 'Dalbergia',

for instance, while three species—*D. sissoo*, *D. latifolia*, *D. cultrata*—have hard dark-coloured woods, others have soft white woods without heart-wood, and one species (*D. paniculata*) is 'sui generis' in that its wood is divided into concentric rings of alternate layers of wood, and bark-like tissue. Much less frequent is the constancy of 'family' characters. Instances need hardly be mentioned. But, in general it may be remarked that there is usually some constancy in the wood structure of one and the same genus, which enables us to make a very near guess at the correct genus.

There are thus a few groups that can easily be recognised: The woods of gymnosperms (*Gnetales* excepted) are all characterised by the absence of 'pores'—that is, vessels or tracheæ—and the presence of "bordered pits" which are evident under a microscope. A monocot wood, again, can be easily distinguished from a dicot.

Going to natural orders, the woods of 'Anonaceæ' are all characterised by 'regular ladder-like transverse bars.' Those of Sapotaceæ have wavy concentric lines with the pores zig-zagging, and generally have some shade of red, which distinguishes them from those of the closely allied Ebenaceæ, which has woods of a whitish, grey, or black colour. Concentric lines of soft texture are very common in the Leguminosæ, in some Guttiferæ, Celastrineæ, Meliaceæ, Boragineæ. A close and even grained wood pertains to most species of Rubiaceæ. The alternate bands of soft and firm tissue invariably found in *Ficus* render the genus exceedingly uniform in character, and its recognition easy.

Again, in certain woods, the pores, medullary rays, smell, colour etc., afford a clue by being peculiar. Let us substantiate this.

Pores: As already observed, the absence of 'pores'—better known as 'vessels'—indicates that we are dealing with a Gymnosperm. In other woods they give a clue by their characteristic size and arrangement; in size they range from the extremely small ones of boxwood, to the extremely large ones of "lianes" or climbers. The distribution may be even, as in Boxwood, Ficus etc., uneven, as in Terminalia tomentosa, Acacia arabica, Cedrela Toona etc., or in groups or chains as in Mesua, Bassia, Melia etc.,. A Strychnos can be readily recognised by the two kinds, and arrangement, of the pores; the large ones are scanty—a microscopic examination showing that these are really 'islands of phloem' characteristic of the genus—but very prominent; the minute ones are numerous, and arranged in irregularly ramified patches of very variable shape, giving, as Gamble says, a very fantastic pattern to a cross-sectional face of the wood.

Medullary rays: These again afford a clue to certain timbers, by their relative breadth, number, and disposition. Somewhat broad rays point to Dilleniaceæ,—where they appear on a radial section as darker coloured plates,—Rhizophoræ, or Myrsineæ. In Shorea robusta they are uniform, moderately broad and clearly visible on a radial section as numerous interrupted bands. In Carallia integerrima they are "of two classes, extremely broad, and fine, marked on a vertical section as broad irregular shining plates" suggesting at once a comparison with the oak, and giving rise to the 'silver grain' so valuable in the eyes of Cabinet maker. In Grevillea robusta the rays are likewise prominent—showing a beautiful silver grain—meeting the wavy concentric bands of pale tissue.

*Here, is an instance of a decisive test given by a microscope. In fact it was this anomaly revealed by this instrument that enabled me to find out the identity of a certain timber section in the museum.

Smell: Some timber specimens can be recognised by their characteristic smell, when a fresh cut is made, or even without it—the heartwood being tested always. Sandalwood needs hardly any mention. Erythroxylon monogynum has a pleasant resinous smell; Ægle marmelos a strong aromatic one; teak, white cedar, etc., have a peculiar smell characteristic of each, which can easily be recognised by a little practice.

Colour:—This, in itself, any more than other individual characteristics such as are mentioned above, cannot afford a decisive test for a timber sample. It is, of course, to be borne in mind that each timber character, such as the nature of pores, medullary rays, colour, smell, hardness, grain, the so called "annual rings," etc., can, in itself, have only a corroborative value, and but rarely forms a decisive test. But most of the instances above cited are striking peculiarities which enable an easy identification by a single character. As regards colour, an instance is afforded by Pterocarpus Marsupium which stains yellow when damp.

Above, are mentioned, but a few rough-and-ready methods of guessing the identity of certain timber samples; that is all. Let me, however, conclude, by reiterating that timber identification can be made more scientific, certain, and easy, by our studying more of the characters of timber, and applying tests of a greater number and kind, invoking the aid of chemistry in particular.

G. Viswantham,
Curator, Gass Forest Museum.

Athletics at the Madras Forest College during March, April and May.

What with the fact that the other local Colleges were busy with examinations and the slight ill-health of some members of our team the months of March and April were a slack season for the club.

During the short time that the other colleges could spare we played 2 foot-ball matches, one with the Agricultural College and the other with Stanes European High School.

We met the Agricultural College on their grounds on Tuesday 13th March. We took up the offensive; and the well constituted rush of a combined front resulted in a goal to the credit of the Forest College. Unfortunately for us Mr. Bennett, our centre forward was obliged to leave the field owing to an injury to his knee a few minutes after we had changed over. The forward line being now weakened and our defence being rather poor due to the absence of another of our best players, the opponents who displayed some skill in dribbling and passing gained the day by 1 goal.

We played Stanes School the next Tuesday on our ground in the Coronation Park. Mr. Bennett's absence from the team told upon the efficiency of our attack. Thanks to the half-backs the forward line was well fed; but the opponents kept their ground. The teams were well balanced and there was a keenly contested game which it appeared would end in a draw; but at almost the last moment the Stanes team put in a goal with the result that we lost the day to the tune of nil to one.

Both Divisions being out on tour for the latter part of April and most of May, no practice games could be had for want of a proper ground. The Senior Division had an idea of starting Volley-ball in camp; but the absence of a suitable ground stood in the way.

The Junior Division, however, had the pleasure of taking part in a couple of cricket matches at Ooty.

On 15th May Narasinga Rao played for a combined Forests and Police team against the Ooty Gymkhana but did not 'come off' either as to bowling or batting. Shankara Alwa and Timmaya fielded as substitutes. In a big scoring game the Gymkhana won.

Shankara Alwa and Narasinga Rao were included in the Y. M. I. A. Union against the Ooty Gymkhana on 17th May. The Gymkhana team won by about 100 runs. Narasinga Rao was unfortunate to be run out after scoring 20. Shankara Alwa carried out his bat for 3.

This being the last note of the sort for the current college year we avail ourselves of this opportunity to tender our heartfelt thanks to the members of the staff of the college for the keen interest which they as usual have been evincing in the matter of Athletics. Our special thanks are due to Mr. Bennett, our Vice-President for his endeavours to make us keen sportsmen and for having made us realise the vital truth of the motto "*mens sana in corpore sano.*"

N. T. Tampi.

Forest College Camp at Sadivaiyal, 1917.

As customary, both divisions of the College camped together at Sadivaiyal, but this year the camp took place

in February. The nights were somewhat chilly but the early mornings and the evenings were delightfully crisp and bracing.

The seniors underwent the usual Working Plans examination and the juniors were usefully employed in road aligning, bridge construction etc. In addition, both divisions made sowings of sandal seeds in an attempt to introduce this valuable species in the valley. It is hoped that notes on results will find place in future issues of the journal.

In the 3rd issue of the journal brief notes on the games played and on the Marathon race run at the camp were given. The latter deserves more detailed mention. The length of the course hitherto has been estimated from the map at about $7\frac{1}{2}$ miles and it was decided to obtain a correct knowledge by actual chaining. The distance proved to be 6 miles 5 furlongs and 100 feet. The mere mention of the distance without some description of the course is misleading and the following brief notes will indicate its severity. The start and finishing points at the camp site are at approximately 1550 feet above M. S. L. The course runs along the rather rough and very much up and down cart road, crossing two large unbridged streams, to the foot of the Muthukulum Ghat, which is about 1700 feet above M. S. L. Thence up the winding foot-path to an elevation of approximately 2200 feet. Thence back to the road along the same path and thence following two compartment lines over rough undulating ground with 2 or 3 steep-banked nullahs to cross before rejoining the road, about $1\frac{3}{4}$ miles from the camp. The actual difference of level, therefore, is about 650 feet, but the total rise and fall is more owing to the several changes in alternating ascent and descent.

As stated in the notes already referred to, the time this year of the first man was $4\frac{1}{4}$ minutes better than last year's, but what was better, there was a very close finish between the first two and the third was not far behind as the appended times show.

A noteworthy point was that the senior students trained for the event whereas the juniors did not, a fact reflected in the result.

It is suggested that the Marathon race should offer another opportunity for an inter-division competition as well as an individual one.

The usual method in such events is to take the order of finishing of a definite number of competitors of each kind—say the first 10 and add together the numerals indicating the order of finishing, the lesser total being that of the winners. The appended figures show that taking the first 10 seniors and the first 10 juniors in the last Marathon race the totals are 91 and $144\frac{1}{2}$ in favour of the senior division.

Seniors.		Juniors.	
1. C. S. Nanjappa,	52 minutes.	3. U. Thimmayya,	$52\frac{1}{4}$ minutes.
2. T. Balaramaswami,	52 „ 30" secs.	5. Parameshwaram Pillai,	$59\frac{1}{4}$ „
4. Thiruvengadam	58 „	6. S. Shankara Alwa,	
9. N. Kesava Pillai,		7. J. Venugopal Naidu,	
10. Ramachendra Ayyar,		8. M. Narasinga Rao,	
11. P. M. Mathew,		19 $\frac{1}{2}$. G. Bartholomeusz (tied with-	senior).
12. Doraiswami Ayyar,		21. Abdul Gaffar,	
13. Mahadeviah,		23. V. Arasaratnam,	
14. Rama Rao Kini,		25. E. S. Krishna Rao,	
15. A. Subramaniah,		27. A. Bhaviah,	
—		—	
91	Totals.	144 $\frac{1}{2}$	

A feature of the camp was the presence of wild elephants in the vicinity, one of which visited the camp at least on two occasions. It has been suggested that he came up to listen to (and perhaps to obtain instruction in) trumpeting from the College peon, at all events the former was heard practicing later on not far away. For ourselves unless the distance between us is very great we prefer the music of the College Peon.

C. Fischer.

**Key for the identification of the trees
and important shrubs and climbers to be met
with around the Madras Forest College at
Komattiyeri in the South Vellore
Forest Division (Javadi Hills.)**

The list is necessarily incomplete since it is based on only two visits to the locality; one for nine days in February 1916 and the other for 3 weeks in November of the same year. The dates of flowering & fruiting are also only those actually observed during those two visits, they are indicated by the figures 2, 3 & 9, for February, March and September respectively. The vernacular names are shown in italics and are those used in the locality; they are obtained partly from local enquiry by myself and partly from Mr. Wilson's Javadi Sandalwood Working Plan.

When the name given differs from that used in the "Flora of British India" the latter is added in brackets.

The figures in brackets e. g. "L. sim*(60)" indicates that the next number begins the converse i. e. "L. com." will be begun with No. 61.

The following abbreviations are used.

ab.	=above	Lt.	=leaflet-s
ac.	=acute	mar.	=margin
acm.	=acuminate	mem.	=membranous
alt.	=alternate	Ner.	=nerve-s-d
ap.	=apex	num.	=numerous
b.	=broad	ob.	=obtuse
ba.	=base	obg.	=oblong
bel.	=below	obv.	=obovate
cau.	=caudate	opp.	=opposite
cor.	=coriaceous	orb.	=orbicular
cord.	=cordate	ov.	=ovate
cre.	=crenate	pa.	=pair-s-ed
d.	=diameter	pel.	=pellucid
den.	=denate	Pet.	=petiole-s-d
dis.	=distichous	pin.	=pinna-e
el.	=elliptic	pint.	=pinnate
ent.	=entire	prom.	=prominent
Fl.	=flower-s	pub.	=pubescent
fol.	=foliate	publ.	=puberulous
Fr.	=fruit	pun.	=punctate
Gl.	=gland	Rch.	=rhachis
gla.	=glabrous	rou.	=round-ed
gld.	=gland-dotted	Sc.	=scale-s-y
glr.	=glandular	sca.	=scabrous
Ha.	=hairs-ry	ser.	=serrate
his.	=hispid	ses.	=sessile
Infl.	=inflorescence	sim.	=simple
L.	=leaf, leaves	Sp.	=spine
l.	=long	St.	=stipule-s-lar
lat.	=lateral	stel.	=stellate
lan.	=lanceolate	Ten.	=tendril-s
lin.	=linear	tom.	=tomentum-ose
lo.	=lobe-s-d		

A. **Trees** (85).

I. L. sim. (60).

1. L. alt. (43).

(i) Juice milky (10).

§Thorny

- 1.
- Euphorbia Nivulia*
- Ham. (Euphorbiaceæ) Fl. 2.

§§Not thorny (10).

(a) L. sca. or. his.

(b) Mar. den.

- 2.
- Streblus aspera*
- Lour. (Urticaceæ) Fl. 9.

(bb) Mar. ent.

- 3.
- Ficus gibbosa*
- Bl. var:
- parasitica*
- Koen. (Urticaceæ)
-
- often epiphytic.

(aa) L. not sca.

(b) L. at least 3 times as l. as b.

- 4.
- Plumeria acutifolia*
- Poir. (Apocynaceæ) Fl. 9 Planted.

(bb) L. not more than twice as l. as b.

(c) L. 3-or more-Ner. at ba.

(d) Aerial roots present.

- 5.
- Ficus bengalensis*
- Linn. (Urticaceæ) Fl. & Fr. 2 & 9.

(dd) No aerial roots.

(e) L. acm.; pet. over $1\frac{1}{2}$ " l.; Infl. axillary.

- 6.
- Ficus infectoria*
- Roxb. (Urticaceæ).

(ee) L. obtusely pointed; Pet. under $1\frac{1}{4}$ " l;
Infl. from short branches from the
stem and larger branches.

- 7.
- Ficus glomerata*
- Roxb. (Urticaceæ) Fl. 9; Fr. 2.

(cc) L. 1. Nor. at ba.

(d) L. not shining.

- 8.
- Bassia latifolia*
- Roxb. (Sapotaceæ).

(dd) L. shining.

(e) Lat. Ner. num.

- 9.
- Ficus Benjamina*
- Linn. (Urticaceæ) Fl. 9.

(ee) Lat. Ner. 7-8 pa.

- 10.
- Artocarpus integrifolia*
- Linn. (Urticaceæ) Planted.

(ii) Juice watery.

§Thorny (17).

(a) L. gld.

- 11.
- Atalantia monophylla*
- Corr. (Rutaceæ)
- Kat-elumichai*
- .
-
- Fl. & Fr. 9.

(aa) L. not gld.

(b) Stem only spinous; Ner. of L. num.

- 12.
- Bridelia retusa*
- Spreng (Euphorbiaceæ).

(bb) Sp. on branches; Ner of L. not
num.

(c) L. rufous tom. bel.

- 13.
- Diospyros Chloroxylon*
- Roxb. (Ebenaceæ)
- Karuvak-*
-
- kanai*
- Fr. 2.

(cc) L. not rufous tom. bel.

(d) L. white or buff tom. bel.

(e) L. very oblique; Fr. $\frac{3}{4}$ " d., woody.

- 14.
- Zizyphus zylopyra*
- Willd. (Rhamnaceæ)
- Kottai*
- .

(ee) L. not or very slightly oblique; Fr. $\frac{1}{2}$ " d.,
fleshy.

- 15.
- Zizyphus Jujuba*
- Lam. (Rhamnaceæ) Fl. 9; Fr. 2.

(dd) L. not white or buff tom. bel.

(e) L. under $2\frac{1}{2}$ " l., ap. rou., gla. bel.

- 16.
- Ximenia americana*
- Linn. (Olacaceæ)
- Kattanji*
- .

(ee) L. over $2\frac{1}{2}$ " l., ap. acm. or subob. pub.
bel.

- 17.
- Alangium Lamarckii*
- Thw. (Cornaceæ)
- Alanji*
- . Fl. 2.

- §§ Not thorny. (43).
 (a) L. not lo. (39).
 (b) L. cre. or ser. (25).
 (c) L. white, grey or rufous pub. or tom.
 bel.
 (d) L. sca. with white discs ab.
18. *Cordia fulvosa* Wight (Boraginaceæ)
 (dd) L. not sca. ab.
 (e) Tom. stel.
 (f) L. mem.; Pet. 4-6" 1.
19. *Givotia rottleriformis* Griff. (Euphorbiaceæ).
 (ff) L. hard; Pet. 1-½ 1".
20. *Cordia Wallichii* G. Don. (Boraginaceæ).
 (ee) Tom. not stel.
 (f) Ap. of L. rou.
Zizypus xylopyra Willd. see No. 14.
 (ff) Ap. of L. ac.
21. *Trema orientalis* Bl. (Urticaceæ) Fl. 9.
 (cc) L. not white, grey or rufous bel.
 (d) L. gla.
 (e) L. obv., ses or subscs.
22. *Careya arborea* Roxb. (Myrtaceæ).
 (ee) L. obg., Pet.
23. *Terminalia Arjuna* Bedd. (Combretaceæ) *Attumadi*.
 Fl. 9; Fr. 2 & 9.
 (dd) L. ha. or tom.
 (e) Ba. of L. 6-Ner.
24. *Grewia tiliaefolia* Vahl (Tiliaceæ) *Thadachi*. Young
 Fr. 9.
 (ee) Ba. of L. not 6-Ner.
25. *Casearia tomentosa* Roxb. (Samydaceæ) Fl. 2 & 9.

- (dd) L. ent. (39).
 (c) L. with scarlet Sc. bel.
26. *Mallotus philippinensis* Muell-Arg. (Euphorbiaceæ)
Kamila, *Kapila*, Fl. 9 Fr. 2.
 (cc) L. without Sc.
 (d) L. under 1" 1., close set.
27. *Phyllanthus Emblica* Linn. (Euphorbiaceæ) *Nelli*.
 (dd) L. at least 1' 1., not close set.
 (e) L. pub. or tom. at least bel. (33).
 (f) L. sca. with white discs ab.
Cordia fulvosa Wight see No. 18.
 (ff) L. not sca.
 (g) Ner. of L. straight & parallel.
Bridelia retusa Spreng see No. 12.
 (gg) Ner. of L. not conspicuously straight
 & parallel.
 (h) L. cor. and hard.
 (j) L. ashy or buff bel.
 (k) Tom. stel.
Cordia Wallichii G. Don. see No. 20.
 (kk) Tom. not stel.
28. *Semicarpus anacardium* Linn. (Anacardiaceæ) *Serankottai* Fr. 2.
 (jj) L. neither ashy nor buff bel.
 (k) Bark deeply cracked, resembling crocodile
 hide.
29. *Terminalia tomentosa* Bedd. (Combretaceæ) *Kari-madai* Fr. 2.
 (kk) Bark not resembling crocodile hide.
 (l) Main Ner. of L. 6-10; Pet. less than ½ 1.
30. *Diospyros melanoxylon* Roxb. (Ebenaceæ) *Karunthumbi*. Fr. 2.

- (ll) Main Ner. of L. 10-20; Pet. $\frac{1}{2}$ " 1.
 31. *Buchanania latifolia* Roxb. (Anacardiaceæ) *Kat-maa*.
 (hh) L. not cor. or hard.
 (j) L. rufous tom. bel.
Diospyros Chloroxylon Roxb. see No. 13.
 (jj) L. not rufous bel.
 (k) Ba. of L. 3-Ner
Alangium Lamarekii Thw. see No. 17.
 (kk) Ba. of L. not 3-Ner.
 (l) L. with translucent dots.
Casearia tomentosa Roxb. see No. 25.
 (ll) L. without translucent dots.
 (m) Young parts silky ha.; Pet. usually with 2 Gl.
 at top.
 32. *Terminalia Chebula* Retz (Combretaceæ) *Kadukkai*.
 (mm) Young parts rufous tom.; Pet. without Gl.
 33. *Polyalthia cerasoides* B. & H. f. (Anonaceæ) *Guthi*.
 Fl. & Fr. 9.
 (ee) L. gla. (39).
 (f) Ner. of L. pel.
Terminalia Arjuna Bedd. see No. 23.
 (ff) Ner. of L. not pel.
 (g) L. 2" 1. or less, obcuneate.
 34. *Erythroxylon monogynum* Roxb. (Linaceæ) *Sembulichan*. Fl. 9.
 (gg) L. 2 $\frac{1}{2}$ " 1 or more.
 (h) L. cor. and hard.
 (j) L. at least 3 x as 1. as b.; bark not
 cracked.
 35. *Mangifera indica* Linn. (Anacardiaceæ) *Ma-maram*.

- (jj) L. not more than 2 x as 1. as b.;
 bark deeply cracked.
Terminalia tomentosa Bedd. see No. 29.
 (hh) L. not cor. and hard.
 (j) Bark smooth, white or yellowish.
 36. *Anogeissus latifolia* Wall. (Combretaceæ) *Mammai*.
 Fr. 2.
 (jj) Bark neither smooth, white nor
 yellowish.
 (k) L. dis.; St. scarious.
 37. *Holoptelia integrifolia* Planch. (Urticaceæ) *Avali*.
 Fr. 2.
 (kk) L. not dis.; exSt.
 (l) Ap. of Pet. usually with 1 or 2 Gl.
Terminalia Chebula Retz. see No. 32.
 (ll) Gl. absent.
 (m) L. shining ab.
 (n) Bark dark grey; L. el.
 38. *Diospyros sylvatica* Roxb. (Ebenaceæ) Fr. 9.
 (nn) Bark pale grey; L. obg.
 39. *Ehretia laevis* Roxb. var. *canarensis* (Boraginaceæ)
Vellattan. Fl. 2.
 (mm) L. not shining.
Polyalthia cerasoides B. & H. f. see No. 33.
 (aa) L. lo.
 (b) L. 2-lo.
 40. *Bauhinia racemosa* Lam. (Leguminosæ) Young Fr. 9.
 (bb) L. 3-or more lo.
 (c) L. over 3' d.
 41. *Borassus flabellifer* Linn. (Palmaceæ) *Tadi*. Planted.

- (cc) L. under 1' d.
 (d) L. white tom. bel.; lo. ac.
 42. *Cochlospermum Gossypium* DC. (Bixaceæ) Fl. 2.
 (dd) L. velvety bel., not white
 tom.; lo. cau-acm.
 43. *Stereulia urens* Roxb. (Sterculiaceæ) Fl. 2.
 2. L. opp. or whorled (60).
 (i) St. interpetiolar (48).
 § L. pub. bel.
 44. *Adina cordifolia* Hook. f. (Rubiaceæ).
 §§ L. gla.
 (a) L. not shining.
 45. *Stephegyne parvifolia* Korth. (Rubiaceæ) Fl. w.
 (aa) L. shining at least ab.
 (b) St. free.
 46. *Ixora parviflora* Vahl (Rubiaceæ) Fl. 2 and 3.
 (bb) St. connate.
 (c) L. very cor., polished ab.
 47. *Canthium didynum* Roxb (Rubiaceæ) *Nekkini*. Fl. 2.
 (cc) L. nor cor., not polished.
 48. *Morinda citrifolia* Linn. (Rubiaceæ) *Nona*.
 (ii) St. not interpetiolar (60)
 § Juice milky.
 49. *Wrightia* R. Br. (Apocynaceæ) *Palai* Fr. 2 & 9.
 §§ Juice watery (60).
 (a) L. ses. or nearly so.
 (b) L. apparently 3-Ner. at ba.
 50. *Strychnos potatorum* Linn. f. (Loganiaceæ) *Tettan-*
kottai.

- (bb) L. not at all 3-Ner. at ba.
 (c) L. gla.
 (d) Ner. of L. prom., arcuate.
 51. *Lagerstræmia parviflora* Roxb. (Lythraceæ) Fr. 2.
 (dd) Ner. of L. not prom.,
 reticulate.
 52. *Pleurostyliæ Wightii* W. & A. (Celastraceæ) *Kashan*.
 Fl. & Fr. 9.
 (cc) L. pub. bel.
 53. *Psidium Guyava* Linn. (Myrtaceæ) *The Guava*. Fl. 9.
 Planted.
 (aa) L. distinctly Pet. (60).
 (b) L. ha.
 (c) L. over 12" 1.
 54. *Tectona grandis* Linn. (Verbenaceæ) Fl. 9; Fr. 2.
 (ce) L. under 12" 1.
 (d) L. glr. at ap. of Pet.
 55. *Gmelina arborea* Linn. (Verbenaceæ).
 (dd) L. not glr. at ap. of Pet.
 (e) L. gla. ab., publ. bel.
 56. *Premna corymbosa* R. & W. (Verbenaceæ) Fl. & Fr. 9.
 (ce) L. densely stel. pub. ab. and bel.
 57. *Premna tomentosa* Willd. (Verbenaceæ) *Podanganari*.
 Fr. 9.
 (bb) L. gla.
 (c) L. gld.
 58. *Eugenia Jambolana* Lam. (Myrtaceæ) *Nagai*.
 (cc) L. not gld.
 (d) L. apparently 3-5 Ner. at ba.
 59. *Strychnos nux vomica* Linn. (Loganiaceæ) *Yetti*. Fr.
 2 & 9.

- (dd) Lt. not at all 3-5 Ner. at ba.
60. *Santalum album* Linn. (Santalaceæ) Fl. & Fr. 2 & 9.
 II. Lt. com. (85).
 I. Lt. alt. (84).
 (i) Lt. digitate.
61. *Bombax malabaricum* DC. (Malvaceæ)
 (ii) Lt. 3-fol.
 § Lt. pel-pun.
62. *Aegle Marmelos* Corr. (Rutaceæ) Fr. 2.
 §§ Lt. not pel-pun.
 (a) Lt. obv., under 2" l.
63. *Rhus mysurensis* Heyne (Anacardiaceæ) *Seppula*.
 Fr. 2.
 (aa) Lt. rhomboid or ov., over
 3" l.
64. *Erythrina suberosa* Roxb. (Leguminosæ).
 (iii) Lt. 1-pint. (76).
 § Thorny.
 (a) Pet. & Rehi. jointed; Lt.
 smelling of limes.
65. *Limonia crenulata* Roxb. (L. acidissima Linn.-
 Rutaceæ) *Nairda*.
 (aa) Pet. & Rehi. not jointed;
 Lt. smelling of aniseed.
66. *Feronia Elephantum* Corr. (Rutaceæ) *Vela*. Fr. 2 & 9.
 §§ Not thorny (76).
 (a) Lt. gld.
67. *Chloroxylon Swietenia* DC. (Rutaceæ-Meliaceæ)
Porasu.
 (aa) Lt. not gld. (76).
 (b) Lt. paripint.
 (c) Lt. 20 or more.

68. *Tamarindus indica* Linn. (Leguminosæ) *Puliya-*
maram. Fr. 2.
 (cc) Lt. less than 20.
 (d) Lt. gla.
69. *Cassia Fistula* Linn. (Leguminosæ) *Konnai*. Green.
 Fr. 9.
 (dd) Lt. pub. bel.
 (e) Lt. 2-3 pa.
70. *Sapindus laurifolius* Vahl. (S. trifolius Hiern-
 Sapindaceæ) Fl. & Fr. 2.
 (ee) Lt. 5-8 pa.
71. *Chukrassia tabularis* A. Juss. Var: *velutina* (Meliaceæ)
 Fr. 9.
 (bb) Lt. imparipint. (76).
 (c) Lt. publ. bel.
72. *Dalbergia lanceolaria* Linn. f. (Leguminosæ) *Velangu*,
Gatti-pachalai.
 (cc) Lt. gla.
 (d) Main Ner. num., close, prom.
73. *Pterocarpus Marsupium* Roxb. (Leguminosæ) *Vengai*.
 (dd) Main Ner. neither num., close nor
 prom.
 (e) Lt. opp.
74. *Pongamia glabra* Linn. (Leguminosæ) *Pungam*. Fr. 2.
 (ee) Lt. alt.
 (f) Lt. 1" l. or less.
75. *Dalbergia paniculata* Roxb. (Leguminosæ) *Velangu*,
Pachalai.
 (ff) Lt. over 1" l.
76. *Dalbergia latifolia* Roxb. (Leguminosæ) *Iruvadi*.

- (iv) L. 2-or 3-pint. (S4).
 § Thorny.
 (a) Bark light coloured.
 (b) Lt. fewer than 30 pa., ob.
77. *Acacia leucophloea* Willd. (Leguminosæ) *Velvelam*.
 Fr. 2.
- (bb) Lt. more than 30 pa., ac.
78. *Acacia Suma* Kurz (Leguminosæ) Fr. 2.
- (aa) Bark dark coloured.
79. *Acacia ferruginea* DC. (Leguminosæ) Fr. 2.
- §§ Not thorny (S4).
 (a) Rh. & rhachides of L.
 articulated.
80. *Moringa pterygosperma* Gaertn. (Moringaceæ) Planted.
- (aa) Rh. & rhachides not
 articulated.
 (b) Pin. 6 or more pa.; Lt. less
 than $\frac{1}{4}$ " b.
81. *Albizzia amara* Boiv. (Leguminosæ) *Thurinja*, *Usil*.
 Fr. 9.
- (bb) Pin. 4 pa. or fewer; Lt. over
 $\frac{1}{4}$ " b.
 (c) Lt. 5-9 pa., 1" 1 or more.
 (d) Gl. between each pa. of Lt.
82. *Albizzia Lebbek* Benth. (Leguminosæ) *Vaghai*. Fr. 9.
- (dd) Gl. absent or only between
 terminal pa. of Lt.
83. *Albizzia procera* Roxb. (Leguminosæ).
- (cc) Lt. 10-20 pa., under 1" 1.
84. *Albizzia odoratissima* Benth. (Leguminosæ) *Selai-
 vaghai*. Fr. 2.

2. L. opp.
85. *Vitex altissima* Linn. (Verbenaceæ) *Mailadi*. Fl. 9.
 Do. var: *alata* *Mailadi*. Pet. with ab. wing, widest at
 ba.
- B. Shrubs & undershrubs (135).**
 I. L. sim. (135).
 1. L. alt. (107).
 (i) Thorny (92).
 § L. very small; stems
 flattened.
 (a) Main Sp. sim.
86. *Opuntia monacantha* Haw. (Cactaceæ) Fl. & Fr. 2.
- (aa) Main Sp. fasciated.
87. *Opuntia Dillenii* Haw. (Cactaceæ) *Sapathu-kalli*,
Naga-kalli. Fl. & Fr. 2 & 9.
- §§ L. not very small; stems
 not flattened.
 (a) L. bearing Sp.
88. *Solanum indicum* Linn. (Solanaceæ) Fl. 9; Fr. 2.
- (aa) L. not bearing Sp.
 (b) Sp. bearing Fl. & L.
89. *Gymnosporia montana* Benth. (Celastraceæ) Fl. 9.
- (bb) Sp. not bearing L. & Fl.
 (c) Juice milky.
90. *Plecosperrum spinosum* Trè. (Urticaceæ) *Achingudi*.
 Fl. 2.
- (cc) Juice watery.
 (d) L. cor.; ba. rou.
91. *Ximenia americana* Willd. (Olacaceæ) *Kattanja*.
- (dd) L. mem., ba. tapering.
92. *Flueggia leucopyrus* Willd. (Flueggia-Euphorbiaceæ)
Veppula. Green Fr. 9.

- (ii) Not thorny (107).
- § L. ent. (100).
- (a) L. gla. (98).
- (b) L. dis. (97).
- (c) L. ses. $\frac{1}{2}$ " b. or less.
- 93. *Phyllanthus polyphyllus* Willd. (Euphorbiaceæ) Fl. & Fr. 9.
- (cc) L. distinctly Pet., $\frac{1}{3}$ " b. or more.
- (d) Straggling, semi-scandent.
- 94. *Phyllanthus reticulatus* Poir. (Euphorbiaceæ) Fl. 2 & 9; Fr. 9.
- (dd) Erect, not at all scandent.
- (e) St. present, minute.
- (f) Calyx enlarged in Fr.
- 95. *Breynia patens* Rolfe (Euphorbiaceæ) Fl. & Fr. 9.
- (ff) Calyx not enlarged in Fr.
- 96. *Breynia rhamnoides* Muell-Arg. (Euphorbiaceæ) Fl. 2; Fr. 2 & 9.
- (ec) St. absent.
- 97. *Fluggea microcarpa* Bl. (Euphorbiaceæ).
- (bb) L. not dis.
- 98. *Dodonea viscosa* Linn. (Sapindaceæ) *Virali*. Fl. 2.
- (aa) L. ha. at least bel.
- (b) L. gla. ab., silky bel.; ha. not stel.
- 99. *Argyreia cuneata* Ker (Convolvulaceæ) Fl. 9; Fr. 2. Sometimes scandent.
- (bb) L. velvety ab., densely woolly bel.; ha. stel.
- 100. *Solanum verbascifolium* Linn. (Solanaceæ) Fl. & Fr. 2 & 9.

- §§ L. not ent. (107).
- (a) L. lo.
- (b) Lo. of L. toothed.
- 101. *Hibiscus vitifolius* Lim. (Malvaceæ) Fl. & Fr. 9.
- (bb) Lo. of L. ent.
- 102. *Jatropha Curcas* Linn. (Euphorbiaceæ) *Katamanakku*. Fl. 2.
- (aa) L. not lo. (107).
- (b) L. with large teeth.
- (c) Fl. blue, under 2" 1.
- 103. *Micandra physalioides* Gaertn. (Solanaceæ) Fl. 9. Run wild near villages.
- (cc) Fl. white, 6-9" 1.
- 104. *Datura fastuosa* Linn. var: *alba* C. B. Clarke (Solanaceæ) Fl. & Fr. 2 & 9.
- (bb) L. with small teeth.
- (c) L. dis.
- 105. *Grewia hirsuta* Vahl (Tiliaceæ) Fl. 9; Fr. 2.
- (cc) L. not dis.
- (d) L. gla. or nearly so.
- 106. *Grewia orientalis* Linn. (*G. columnaris* Sm.-Tiliaceæ) Fr. 9.
- (dd) L. stel. ha. ab. & bel.
- 107. *Grewia flavescens* Juss. (*G. pilosa* Lam.-Tiliaceæ) Fl. & Fr. 9.
- 2. L. opp. or whorled (125).
- (i) Thorny (116).
- § Juice milky.
- (a) L. 1" b. or more; Sp. sim.
- 108. *Carissa Carandas* Linn. (Apocynaceæ) *Kilasedi*. Fl. 2 & 9; Fr. 9.

- (aa) L. less than 1" b.; Sp. often forked.
109. *Carissa spinarum* Linn. (Apocynaceæ) *Kilasedi*. Fl. 2 & 9; Fr. 9.
- §§ Juice watery.
- (a) St. interpetiolar.
- (b) L. pub. bel.
110. *Randia dumetorum* Lam. (Rubiaceæ) *Marakalan*, *Karai*. Fl. 9; Fr. 2 & 9.
- (bb) L. Gla. bel.
- (c) Sp. ending reduced branchlets.
111. *Randia malabarica* Lam. (Rubiaceæ) Fr. 2.
- (cc) Sp. supra-axillary.
112. *Canthium parviflorum* Lam. (Rubiaceæ) Fr. 9.
- (aa) St. not interpetiolar.
- (b) L. pub., ser.
113. *Lantana Camara* Linn. (Verbenaceæ) Fl. 9.
- (bb) L. gla., not ser.
- (c) L. rigid, shining.
- (d) Sp. straight, grooved.
114. *Azima tetracantha* Lam. (Salvadoraceæ) Fl. 2.
- (dd) Sp. recurved, not grooved.
115. *Scutia indica* Brogn. (Rhamnaceæ) Fl. 2; Fr. 9.
- (cc) L. neither rigid nor shining.
116. *Gmelina asiatica* Linn. (Verbenaceæ) Fl. 9.
- (ii) Not thorny (125).
- § St. interpetiolar.
- (a) L. shining, polished.
- (b) L. under 3" 1.; St. connate.
117. *Gardenia gumnifera* Linn. (Rubiaceæ).

- (bb) L. 3" or more 1.; St. free.
118. *Webera corymbosa* Willd. (Rubiaceæ) *Teranni*. Fl. 2.
- (aa) L. not shining.
- (b) L. under 3" 1.; St. free.
- Randia malabarica* Lam. See No. 111.
- (bb) L. over 3" 1.; St. connate.
119. *Pavetta indica* Linn. (Rubiaceæ) Fr. 9. L. gla.
- Do. var: *tomentosa* Fr. 9. L. tom.
- §§ St. not interpetiolar.
- (a) Juice milky.
- (b) L. gla., ba. ac.
120. *Nerium odorum* Soland. (Apocynaceæ) Fl. 9. Run wild.
- (bb) L. cottony tom., ba. cord.
121. *Calotropis gigantea* R. Br. (Asclepiadaceæ) Fl. 9.
- (aa) Juice watery.
- (b) L. ent., under 2½" 1.
- (c) L. gla., ba. rou.
122. *Cadaba indica* Linn. (Capparidaceæ) Fl. 2.
- (cc) L. rough ab. with bristly ha., ba. cuneate.
123. *Ehretia buxifolia* Roxb. (Boraginaceæ) Fl. & Fr. 9.
- (bb) L. not ent., over 4" 1.
- (c) L. mem., sinuately lo., ba. cord.
124. *Martynia diandra* Glox. (Pedaliaceæ) Fl. 9. Run wild.
- (cc) L. rigid, ent., ba. ac.
125. *Clerodendron serratum* Spreng (Verbenaceæ) Fl. 9.
- II. L. com. (135).
1. L. 3-fol.
126. *Allophilus Cobbe* Bl. (Sapindaceæ) Fl. 9.

2. L. 1-pint. (134).
 (i) L. paripint.
 § Lt. ser.
127. *Cipadessa baccifera* Miq. (*C. fruticosa* Bl.-Meliaceae)
Sevattai. Fl. 9; Fr. 2 & 9.
- §§ Lt. ent.
 (a) Lt. 20 pa. or more, under
 1" 1.
128. *Sebastiania aculeata* Poir. (Leguminosae).
- (aa) Lt. 16. pa. or fewer, 1" 1.
 or more.
- (b) An. undershrub; Lt. 3-5 pa.
129. *Cassia occidentalis* Linn. (Leguminosae) Fl. & Fr.
 2 & 9.
- (bb) A shrub; Lt. 10-16 pa.
130. *Cassia montana* Heyne (Leguminosae) Fl. 9.
- (ii) L. imparipint. (134).
 § Undershrubs; Lt. under
 1½" 1.
- (a) Lt. gla. bel.; Rh. rough.
131. *Æschynomene indica* Linn. (Leguminosae) Fl. 9.
- (aa) Lt. pub. bel.; Rh. smooth.
- (b) distinctly Pet.; pods gla.
132. *Tephrosia purpurea* Pers. (Leguminosae) *Kolinji*. Fl.
 & Fr. 2 & 9.
- (bb) L. nearly ses.; pods velvety.
133. *Tephrosia villosa* Pers. (Leguminosae) Fl. & Fr. 9.
- §§ Large shrubs; Lt. over
 1½" 1.
- (a) L. gld.
134. *Murraya exotica* Linn. (Rutaceae) Fl. 2.

- (aa) L. not gld.
Cipadessa baccifera Miq. see No. 127.
3. L. 2-pint.
135. *Dichrostachys cineria* W. & A. (Leguminosae) Fl. 9;
 Fr. 2.
- C. Bamboos.**
 I. Thorny.
136. *Bambusa arundinacea* Willd. *Mungil, Peruvarai*.
- II. Not thorny.
137. *Dendrocalamus strictus* DC. *Mungil, Siruvarai*.
- D. Climbers** (188).
 I. Leafless.
138. *Sarcostemma intermedium* Dec. (Asclepiadaceae)
 Fl. 2.
- II. Leafy (188).
 1. L. sim. (176).
 (i) L. alt. (168):
 § Climbing by Ten. (149)
 (a) L. ending in Ten.
139. *Gloriosa superba* Linn. (Liliaceae) Fl. 9.
- (aa) L. not ending in Ten.
 (b) Ten. Sim.
 (c) L. softly glr.-pub. bel.
140. *Vitis Linnæi* Wall. (Vitaceae) Fl. 9.
- (cc) L. not glr.-pub. bel.
 (d) L. generally over 2" d.
 (e) Lo. of L. spinous-den.
141. *Momordica Charantia* Linn. (Cucurbitaceae) Fl. 9.
- (ee) Lo. of L. sinuate-den. or ent.
142. *Coccinia indica* W. & A. (*Cephalandra indica* Naud-
 Cucurbitaceae) Fl. & Fr. 9.

- (dd) L. 2" d. or less.
143. *Blastania Garcini* Cogn. (*Ctenolepis Garcini* C. B. Clarke-Cucurbitaceæ).
- (bb) Ten. divided (149).
- (c) L. & branches with cobwebby wool.
144. *Vitis tomentosa* Heyne (Vitaceæ).
- (cc) No cobwebby wool.
- (d) L. not lo.; St. glr.
145. *Vitis gigantea* Bedd. (Vitaceæ).
- (dd) L. lo.; St. not glr.
- (c) L. lo. more than half way down.
146. *Bryoniopsis laciniosa* Naud. (*Bryonia laciniosa*-Cucurbitaceæ).
- (ee) L. lo. not half way down.
- (f) L. pun.
147. *Luffa agyptiaca* Mill. (Cucurbitaceæ) Fl. 9.
- (ff) L. not pun.
- (g) L. gla. bel.; male Infl. with large bracts.
148. *Trichosanthes palmata* Roxb. (Cucurbitaceæ) Fl. 9.
- (gg) L. pub. bel.; male Infl. without bracts.
149. *Trichosanthes cucumerina* Linn. (Cucurbitaceæ) Fl. 9.
- §§ Ten. absent (168).
- (a) Thorny (154).
- (b) L. minute, spinous; with axillary cladodes
150. *Asparagus racemosus* Willd. (Liliaceæ) Unripe Fr. 2.
- (bb) L. conspicuous, not spiny; no cladodes.
- (c) L. with silvery Sc. bel.
151. *Elaeagnus latifolia* Linn. (Elaeagnaceæ).

- (cc) L. without Sc. bel.
- (d) L. quite ent., gla. bel.
- (e) Shoots rufous tom.; L. shining a.
152. *Capparis horrida* Linn. f. (Capparidaceæ) Fl. 2.; Fr. 9.
- (ee) Shoots not rufous tom.; L. not shining.
153. *Capparis sepiaria* Linn. (Capparidaceæ) Fr. 9.
- (dd) L. minutely den.; densely silky bel.
154. *Zizyphus ænoplia* Mill. (Rhamnaceæ) *Surai*. Fl. 9; Fr. 2.
- (aa) Not thorny (168).
- (b) L. gld.
155. *Embelia viridiflora* Scheff. (Myrsinaceæ) *Pulichchedi*. Fl. 2.
- (bb) L. not gld.
- (c) L. gla (165).
- (d) L. ciliate, orb.-reni-form.
156. *Cisampeloa Pareira* Linn. (Menispermaceæ) Fl. 2 & 9.
- (dd) L. eciliate, not orb. reniform (165).
- (e) L. thick, succulent.
157. *Basella rubra* Linn. (Chenopodiaceæ) Fl. 2 & 9; Fr. 2.
- (ee) L. not thick nor succulent (165).
- (f) L. 3-7-Ner. at ba.
- (g) L. 7-Ner at ba., ba. cord.
158. *Tinospora cordifolia* Miers (Menispermaceæ) Fl. 2.
- (gg) L. 3-5-Ner at ba., ba. rou.
159. *Dioscorea oppositifolia* Linn. (Dioscoriaceæ) Fl. 9.

- (ff) L. 1-Ner. at ba. (165).
 (g) L. ent. (163).
 (h) L. cord. at ba.
160. *Opilia amentacea* Roxb. (Olacaceæ) Fl. 2 & 3; Fr. 9.
 (hh) L. not cord. at ba.
 (j) L. shining ab.
161. *Ventilago madraspatana* Grah. (Rhamnaceæ) *Vembadam*. Fl. 2 & 9.
 (jj) L. not shining.
 (k) L. 2" 1 or less; ap. mucronate.
162. *Marua ovalifolia* Camb. (*M. arenaria* H. f.-Cappari-
 daceæ) Fl. 2.
 (kk) L. rarely less than 2½" 1.; ap. not
 mucronate.
 (l) Stems smooth; L. ov.
163. *Ipomœa staphylina* R. & S. (Convolvulaceæ) Fl. 2.
 (ll) Stems grooved; L. lin.-obg. to obv.-obg.
164. *Aristolochia indica* Linn. (Aristolochiaceæ) Fl. 9.
 (gg) L. not ent.
 (h) Branches warty; L. ov. or obv.
165. *Celastrus paniculata* Willd. (Celastraceæ) Fl. 9.
 (hh) Branches smooth; L. lan.
Ventilago madraspatana Grah. see No. 161.
 (cc) L. not gla.
 (d) L. ent.
 (e) L. silvery Sc. bel.
Elæagnus latifolia Linn. see No. 151.
 (ee) L. without Sc.
 (f) L. cord at ba.
166. *Argyreia hirsuta* Arn. var. *coacta* (Convolvulaceæ)
 Fl. 9.

- (ff) L. not cord at ba.
 (g) L. 3-5-Ner. at ba., ov.-obg.
167. *Cocculus villosus* DC. (Menispermaceæ).
 (gg) L. 1-Ner. at ba., lan.
Ventilago madraspatana Grah. see No. 161.
 (dd) L. not ent.
 (e) L. not shining ba. rou., un-
 equal.
168. *Ventilago calyculata* Tal. (Rhamnaceæ) *Vembadam*.
 Fl. 9; Fr. 2.
 (ee) L. shining ab., ba. ac.,
 symmetric.
Ventilago madraspatana Grah. see No. 161.
 2. L. opp. (176).
 (i) Juice milky (174).
 § Young parts fulvous tom.
169. *Ichnocarpus frutescens* Ait. (Apocynaceæ) *Mannali-
 venukodi*. Fl. 9.
 §§ Young parts not fulvous
 tom. (174).
 (a) L. with small Gl. just
 ab. Pet.
170. *Marsdenia volubilis* T. Cooke (*Dregea volubilis* B. &
 H.-Asclepiadaceæ) Fl. & Fr. 9.
 (aa) L. without Gl.
 (b) L. gla.
 (c) Slender twiner; St. Gl.
 present.
171. *Hemidesmus indicus* R. Br. (Asclepiadaceæ).
 (cc) Woody twiner; no St. Gl.
172. *Secamone emetica* R. Br. (Asclepiadaceæ) Fl. 9
 Fr. 2.

- (bb) L. not gla.
 (c) L. broad-ov. or suborb.; Pet.
 $\frac{3}{4}$ " 1. or more.
173. *Dæmia extensa* R. Br. (Asclepiadaceæ) Fl. & Fr. 2.
- (cc) L. narrow ov. or el.; Pet. $\frac{1}{2}$ "
 1. or less.
174. *Gymnema sylvestre* R. Br. Asclepiadaceæ) Fl. 9.
- (ii) Juice watery.
 § Ba. of L. 1-Ner.
175. *Hiptage Madablota* Gaertn. (Malphiaceæ) Fl. & Fr. 2.
- §§ Ba. of L. 3-11-Ner.
 (a) Ba. of L. 3-5-Ner.
Dioscorea oppositifolia Linn. see No. 159.
- (aa) Ba. of L. 7-11-Ner.
176. *Dioscorea bulbifera* Linn. (Dioscoriaceæ)
- II. L. com. (188).
 1. L. 3-7-fol. (181).
 (i) Thorny.
 § L. gld.
177. *Toddalea aculeata* Lam. (Rutaceæ) Fl. 9; Fr. 2.
- §§ L. not gld.
 (a) L. snow-white tom. bel.
178. *Dioscorea tomentosa* Heyne (Dioscoriaceæ) Fl. 9.
- (aa) L. not white bel.
179. *Dioscorea pentaphylla* Linn. (Dioscoriaceæ) Fl. 9.
- (ii) Not thorny.
 § Lat. Lt. very small, ent.,
 mem.
180. *Jasminum auriculatum* Vahl. (Oleaceæ) *Katummalligai*. Fl. 2 & 9; Fr. 9.

- §§ Lt. subequal, not ent.,
 fleshy.
181. *Vitis trifolia* Linn. (*V. carnos*a Wall.-Vitaceæ) Fl. & Fr. 9.
2. L. pedate or digitate.
 (i) L. 7-11-fol., pedate;
 St. inconspicuous.
182. *Vitis pedata* Vahl. (Vitaceæ) Fl. 9; Fr. 2.
- (ii) L. 5-fol., digitate; St.
 large ear-shaped.
183. *Vitis auriculata* Wall. (Vitaceæ) Fl. & green Fr. 9.
3. L. 1-point.
184. *Derris scandens* Benth. (Leguminosæ) Green Fr. 9.
4. L. 2-point.
 (i) Gl. on pet. & Rech.
 § Lt. 40-50 pa.
185. *Acacia pennata* Willd. (Leguminosæ) Fl. 9; Fr. 2.
- §§ Lt. 12-30 pa.
186. *Acacia Intsia* Willd. (Leguminosæ) *Seengai*. Fl. 9; Fr. 2.
- (ii) No Gl. on Pet. or Rech.
 § St. leafy, pint.
187. *Cæsalpinia Bonducella* Flem. (Leguminosæ) Fl. & Fr. 9.
- §§ St. sim. prickles.
188. *Pterolobium indicum* A. Rich (Leguminosæ) *Karindu*. Fl. 9; Fr. 2.
- C. Fischer.

**List of contributions to the Gass Forest
Museum since 26th March 1917.**

No.	Particulars.	Contributor.
1.	Elephant fetus	E. C. M. Mascarenhas, Esq.
2.	Sandal inflorescence showing phyllody.	P. M. Lushington, Esq.
3.	Watch chain made from lac.	C. Mahony, Esq., I. A. R. O., Sitapur, U. P.
4.	Photograph showing mode of carrying stones at Coonoor.	Mr. N. T. Tampi, Student, M. F. C. (1915—17) division.
5.	Twelve photographs (Sylvicultural).	E. Marsden, Esq.
6.	Photograph of an elephant kraal.	E. M. Crothers, Esq.
7.	Loan of :	
	(i) One mounted bison head.	C. E. C. Fischer, Esq.
	(ii) One panther skin with mounted head.	
	(iii) Four elephant tusks.	
	(iv) Two elephant feet (mounted).	
	(v) One turtle shell.	

Gazette Notifications.

March 20, 1917.

The Board grants privilege leave for one month to Mr. H. B. Bryant, Conservator of Forests, Central Circle, from 11th April 1917 with permission to affix the Easter holidays to the leave.

The leave on medical certificate for one month granted to Ranger Muhammad Asadulla Ghatala is extended by four months.

M. R. Ry., B. V. Jogeswa Rao, Ranger, Kurnool West, is transferred to Upper Godavari for the charge of Cherla range.

March 27, 1917.

M. R. Ry., S. M. Krishnaswami Ayyar, Ranger, fourth grade transferred from the Northern Circle is posted to the Ambur range of the North Vellore Division.

April 3, 1917.

Mr. W. H. Woodhouse Adolphus, Extra Assistant Conservator of Forests to the charge of Tinnevely Cum Ramnad Forest Division during the absence of Mr. D. T. Barry granted privilege leave for one month.

M. R. Ry., Sanniah, Deputy Ranger, second grade, incharge of Kurnool range, is promoted to Ranger VIth grade, acting with effect from date of taking over charge of the range; the transfer of Ranger B. V. Jogheswara Rao from Kurnool West to Upper Godavari is cancelled.

M. P. Subbayya, Acting Deputy Ranger, third grade will be considered to have acted as Ranger sixth grade during the period he was in charge of Mettupalyam range.

Mr. A. M. C. Littlewood, Extra Assistant Conservator of Forests, to be Extra Deputy Conservator of Forests, Sub-protom vice M. R. Ry., V. Subramanya Ayyar Avargal on foreign service as Conservator of Forests, Travancore.

April 10, 1917.

M. R. Ry., E. K. Krishnan, Proby. Extra Assistant Conservator of Forests, to be District Forest Officer, North Vellore, vice Muhammad Habibulla Sahib Bahadur granted leave.

On relief in Parlakimedi Maliahs, M. R. Ry., K. Narayana Nayar, Ranger, fourth grade, is posted to Upper Godavari for the charge of Nugur range.

April 17, 1917.

M. R. Ry., E. K. Krishnan and Mr. W. H. Woodhouse Adolphus are confirmed as Extra Assistant Conservators with effect from 23rd January 1917.

M. R. Ry., Rao Sahib E. C. M. Mascarenhas Avargal District Forest Officer, South Salem is granted privilege leave for one month from 16th April 1917.

M. R. Ry., S. Ramaswami Ayyar, Ranger on leave, is posted to Berhampur range, temporarily, pending return of students from the Madras Forest College.

M. R. Ry., S. Venkataswami Nayudu, temporary Ranger, sixth grade, is transferred from Tinnevely to Madura for the charge of new Nattam range.

Probationary Ranger G. N. Subba Rao, is posted to South Vellore for training as Ranger.

April 24, 1917.

M. R. Ry., C. D. Parthasarthi Chetti, Ranger fourth grade, is granted extension of leave for three months from 26th January 1917.

M. R. Ry., S. Doraswamy Ayyar, Ranger, fifth grade, is on relief at Anchetti by Mr. J. A. Aranha, posted to the Salem West range.

May 1, 1917.

Mr. C. Mahony, Ranger, second grade incharge of Bukkapattanam range is appointed to the Indian Army Reserve Officers.

M. R. Ry., D. C. Bhide, Ranger, fifth grade, incharge of Madakasira range, will relieve No. 1 at once and hold charge of Bukkapattanam range in addition to the Madakasira range as a temporary measure.

B. V. Vaideswara Ayyar, Deputy Ranger, first grade, Guntur district, is appointed to act as Ranger, sixth grade and is posted to the charge of Bukkapattanam range.

May 8, 1917.

The privilege leave for three months granted to M. R. Ry., S. Ramaswami Ayyar, is extended by three months' leave on medical certificate.

M. R. Ry., B. Sanniah, Ranger, fourth grade is posted to Nugur Range, Upper Godavari. D. V. Krishna Rao, Deputy Ranger, third grade in charge of both Nugur and Cherla ranges, will remain in charge of Cherla range.

M. R. Ry., K. Narayana Nair, Ranger, fourth grade, is posted to Cherla range, Upper Godavari.

M. R. Ry., P. Mathuramuthu Pillai, Ranger, fourth grade, Madura District, is granted privilege leave for fifteen days from or after 3rd May 1917.

May 15, 1917.

M. R. Ry., C. Balayya Naydu, Ranger, fourth grade, sub-protom is reverted to his permanent post in the fifth grade of Rangers with effect from 1st April 1917.

Consequent on the promotion of Saiyid-ud-in Ahmed Saheb Bahadur, Ranger, second grade, incharge of Kodur Range, as temporary Extra Assistant Conservator under Special Forest Officer, Parlakimedi Maliahs.

M. R. Ry., C. S. Chinadurai, Ranger, third grade, in charge of Balapalli Range, South Cuddapah District, to hold charge of Kodur Range in addition to his own.

M. R. Ry., A. Rama Hebbar, Ranger, fourth grade, Kurnool West, is granted privilege leave for one month from date of relief.

Deputy Ranger M. Paul, will hold charge of Gundlabrahmeswaram Range vice, Rama Hebbar on leave.

M. R. Ry., A. Hanumantha Rao, Extra Assistant Conservator, incharge of South Cuddapah District, on relief by Mr. K. G. Belliappa, is transferred to Chittoor District to work under the orders of the District Forest Officer until further orders.

May 22, 1917.

M. R. Ry., T. K. Ramaswami Ayyar, Ranger, third grade, in charge of Gidhout range, North Cuddappah district, is granted privilege leave on medical certificate for one month with effect from date of relief.

M. R. Ry., C. Sankunni Ranger, second grade, North Malabar, is granted privilege leave under article 260 of the C. S. R. for four weeks from or after 1st June 1917.

Syed Ibrahim Albeiz, Ranger, fifth grade is granted leave on medical certificate for one month and twenty days from 8th March 1917.

May 29, 1917.

M. R. Ry., C. G. Ganapathi, Ranger fifth grade, Kurnool South, is granted leave without allowance for three months from date of relief.

In continuation of the list published in our last issue we beg to acknowledge with thanks the receipt of subscriptions from the following gentlemen as noted below.

Any omission may kindly be brought to the notice of the Manager.

	Rs.	A.	P.
F. R. Madan, Esquire.	6	0	0
E. C. M. Mascarnhas, Esquire.	11	0	0
H. A. Latham, Esquire.	11	0	0
T. Clear, „	11	0	0
A. M. C. Littlewood, Esquire.	6	0	0
R. Bourne, Esquire.	6	0	0
W. Adolphous, „	6	0	0
G. W. Thompson, Esquire.	11	0	0
M. R. Ry., K. A. Chengappa, Avergal.	6	0	0
„ A. Hanumantha Rao, Avergal.	6	0	0
„ G. Venugopal Naidu, „	6	0	0
„ E. K. Krishnan, „	6	0	0
Mr. K. C. Joseph	3	0	0
M. R. Ry., P. B. Thammayya.	3	0	0
„ A. Krishnamachari.	3	0	0
„ T. K. Ramaswami Ayyar.	3	0	0
„ S. Sreenivasa Rao.	3	0	0
„ B. Venketarangam Naidu.	3	0	0
„ Narayana Ayyangar.	3	0	0
„ S. Chinnadurai.	3	0	0
„ V. K. Krishnan.	3	0	0
„ R. Sreekanta Pillai.	3	0	0
„ Abdul Quadhir Sahib Bahadur.	6	0	0
„ Y. P. Lakshumanayya.	3	0	0
„ Jesudasan Pillai.	3	0	0
„ A. K. Sheriff.	3	0	0
„ Mohammed Hossen.	3	0	0
„ E. Padhmanabha Pillai.	6	0	0
„ P. Sankunni Menon.	3	0	0
„ T. I. Chacko.	3	0	0
„ K. Devayya.	8	0	0
„ I. Sambasiva Rao (Junior student).	3	0	0
„ U. K. Thammayya do	1	0	0
The late Mr. H. F. Arbuthnot.	11	0	0